

# EMERGENCY PREPAREDNESS IN THE PAC-12 CONFERENCE

by

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## ABSTRACT

Not all sports medicine programs have the recommended equipment and supplies that the National Athletic Trainers' Association (NATA) has suggested in published position statements for appropriately managing emergency situations. Not all sports medicine programs have the recommended documentation of Emergency Action Plans (EAPs) that has also been published in position statements. The conditions covered in this study include the three most common causes of fatalities in football found in 2012, sudden cardiac arrest, catastrophic brain injuries, and exertional heat stroke, as well as seven additional causes of catastrophic injury and fatalities in sport: exertional sickling, asthma, cervical spine injuries, head-down contact in football, diabetes, exertional hyponatremia, and lightning. The Pac-12 institutions were surveyed about their recommended equipment and EAP elements suggested by the NATA. Eight institutions provided information and survey responses to be included in the study. We had two hypotheses: 1) There would be lower instances of sudden death and catastrophic injury in sport at institutions that have the NATA recommended amount and types of emergency equipment and supplies, as well as properly written emergency action plans for athletic trainers to use. 2) Institutions with the NATA recommended amount and types of emergency equipment and supplies, as well as properly written EAPs for athletic trainers to use would have higher confidence in emergency preparedness during treatment of potential catastrophic injury and sudden death incidences. We created a survey tool to

measure emergency preparedness of EAPs (EAP EP), emergency preparedness of equipment and supplies (Total Equipment EP), and confidence in emergency preparedness (EP Confidence). EAP EP Score and Total Equipment EP Score had a -0.955 statistically significant correlation ( $p=0.003$ ). EAP EP Score and EP Confidence had a 0.241 correlation with no statistical significance ( $p=0.646$ ). Total Equipment EP and EP Confidence had a -0.407 correlation with no statistical significance ( $p=0.423$ ). Neither hypothesis were supported or disproven with the survey results and data analysis. Further emergency preparedness research needs to be conducted to start rewriting national position statements.

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## INTRODUCTION

Athletic training education programs approved by the Commission on Accreditation of Athletic Training Education (CAATE) must have emergency preparedness embedded in their athletic training program curriculum due to CAATE established standards and necessity in the field. However, there is a constant frustration when athletic trainers who have this specific training do not have all of the specific equipment. Consequently, the athletic training profession has had a recent surge in research regarding sudden death and catastrophic injury in sport and the equipment needed for athletic trainers to properly manage and mitigate risk in cases of sudden death and catastrophic injury to optimize survivability. Through this research, it has become evident that not all sports medicine programs have all of the equipment recommended available to their athletic trainers to prevent sudden death and catastrophic injury in sport.<sup>1-5</sup> Although certified athletic trainers have the knowledge base to prevent such instances, many of the skills learned require the use of emergency equipment such as cold water immersion tubs, rectal thermometers, and automated external defibrillators (AEDs), to name a few. In order for athletic trainers to be adequately prepared for these incidences in sport, the necessary equipment needs to be available and documented for use in emergency action plans (EAPs). It is unknown if the presence of specific emergency equipment with a certified athletic trainer would reduce the risk of sudden death or catastrophic injury in sport as well as increase an institution's confidence in emergency preparedness. Secondly, it is unknown if the proper documentation of EAPs would

reduce the risk of sudden death or catastrophic injury in sport as well as increase an institution's confidence in emergency preparedness.

### ***Sudden Death and Catastrophic Injury in Sport***

The National Center for Catastrophic Sport Injury Research (NCCSIR) includes the following conditions in the definition of catastrophic injuries: fatalities, permanent disability injuries, serious injuries (fractured neck or serious head injury), temporary or transient paralysis, heat stroke due to exercise, sudden cardiac arrest, or sudden cardiac or severe cardiac disruption.<sup>6</sup> The NCCSIR is a national active surveillance program that launched in 1982 to track reported sudden death and catastrophic injuries that have occurred in organized sport in the United States at the collegiate, high school, and youth level of play.<sup>6</sup> In 2010 Boden et al. reviewed the football fatalities reported to the NCCSIR and found that high school and college football programs have approximately 12 fatalities annually, and that the incidence of fatalities is much higher at the college level. The risk of sudden cardiac arrest, catastrophic brain injuries, and exertional heat stroke increased, indicating a greater emphasis on diagnosis, treatment, and prevention.<sup>7</sup> In 2015 Asif et al. reported the most common NCAA deaths were sudden cardiac arrest, with the highest risk among males, black athletes, and basketball players.<sup>8</sup> In addition, the Pac-12 institutions began a Sports Injury Registry Management and Analytics Program (SIRMAP) in 2015 as a part of the Student-Athlete Health and Well-Being Initiative. The SIRMAP collects injury information from each institution's electronic medical record, including catastrophic injuries and incidences of sudden death.<sup>9</sup>

### ***Preventing Sudden Death in Sport: Needed Equipment and Supplies***

In 2012, Casa et al. published the “National Athletic Trainers' Association Position Statement: Preventing Sudden Death in Sports,” guiding the profession in emergency care.<sup>1</sup> Position statements are scientifically based and peer reviewed publications written by a team of authors considered experts on the topic in the NATA.<sup>8</sup> This specific position statement presented relevant information to the athletic trainer and specific guidelines about ten of the leading causes of sudden death or catastrophic injury in sports. The conditions covered include the following: asthma, catastrophic brain injuries, cervical spine injuries, diabetes, exertional heat stroke, exertional hyponatremia, exertional sickling, head-down contact in football, lightning, and sudden cardiac arrest.<sup>1</sup> The position statement describes equipment and EAP needs for immediate treatment of the ten conditions, these are listed below in Table 1.<sup>1</sup>

### ***The Emergency Action Plan***

In 2002, the NATA published a position statement for “Emergency Planning in Athletics.” This position statement detailed why emergency action planning is needed both professionally and legally in the athletic training field. Professionally, the athletic trainer needs to be prepared to treat patients suffering potentially limb-threatening or life-threatening emergencies in order to minimize risk to the injured patient. Legally, the athletic trainer needs to document how the EAP will be executed with as many specifics appropriate in order to avoid or fight a legal claim of improper care.<sup>13</sup>

Each written EAP should have the following documented: implementation, personnel, equipment, communication, transportation, venue location, emergency care facilities, and documentation. Implementation is the proper creation, education, and

**Table 1.** Equipment and Supplies Suggested by the NATA in Position Statement.

Condition	Equipment & Supplies
Asthma	<ul style="list-style-type: none"> <li>○ Inhalers</li> <li>○ Asthmatic medications</li> <li>○ Oxygen</li> <li>○ Peak flow meter</li> </ul>
Catastrophic Brain Injuries	<ul style="list-style-type: none"> <li>○ Emergency medical services (EMS)</li> <li>○ Concussion protocol</li> </ul>
Cervical Spine Injuries	<ul style="list-style-type: none"> <li>○ Spine board</li> <li>○ Rescue breathing equipment</li> <li>○ EMS</li> </ul>
Head-down Contact in Football	<ul style="list-style-type: none"> <li>○ Spine board</li> <li>○ Rescue breathing equipment</li> <li>○ EMS</li> </ul>
Diabetes	<ul style="list-style-type: none"> <li>○ Carbohydrates</li> <li>○ Glucagon</li> <li>○ EMS</li> </ul>
Exertional Heat Stroke	<ul style="list-style-type: none"> <li>○ Wet bulb globe temperature monitor</li> <li>○ Heat illness protocol</li> <li>○ Cold-water immersion tubs</li> <li>○ Rectal thermometer OR ingestible thermistors<sup>9,10</sup></li> </ul>
Exertional Hyponatremia	<ul style="list-style-type: none"> <li>○ Salty foods</li> <li>○ Oral hypertonic solution</li> <li>○ Intravenous hypertonic saline</li> <li>○ EMS</li> </ul>
Exertional Sickling	<ul style="list-style-type: none"> <li>○ High-flow oxygen with nonrebreather facemask</li> <li>○ Cold-water immersion tubs</li> <li>○ EMS</li> </ul>
Sudden Cardiac Arrest	<ul style="list-style-type: none"> <li>○ Automated external defibrillator (AED)</li> <li>○ EMS</li> </ul>
Lightning	<ul style="list-style-type: none"> <li>○ AED</li> <li>○ EMS</li> </ul>

rehearsal of the EAP. Personnel are the different people that would be involved in executing the plan and what their specific roles will be in case of emergency, for instance the athletic trainer, athletic training students, coaches, athletic directors, etc. Equipment is the documentation of all the necessary supplemental equipment that needs to be at the site and where they are at the site. Communication is the access to working telephones or other communication devices necessary to call emergency numbers and in order to give directions to the venue. Transportation is the description of what the patients would be transported with depending on the severity of the situation; often ambulance location or route should be documented for practices, games, etc. The venue location is the specific address or directions that will be given to the emergency medical services ambulance when traveling to the site. An emergency care facility is the documentation and identification of the designated emergency medical facility in respect to the venue in question as well as the entrances to these facilities. Lastly, the documentation is the written events that occurred when using an EAP, follow-up evaluation of the plan, the documentation of regular rehearsal, personnel training, and emergency equipment maintenance.<sup>13</sup>

### ***Statement of Purpose***

The purpose of this study was to understand if having emergency equipment and supplies present and a properly written Emergency Action Plan for use by certified athletic trainers would reduce the risk of sudden death and catastrophic injury in sport as well as increase institutional confidence in emergency preparedness during treatment of potential catastrophic injury and sudden death. We had two hypotheses. First, we hypothesized that there would be lower instances of sudden death and catastrophic injury

in sport at institutions that have the NATA recommended amount and types of emergency equipment and supplies, as well as properly written emergency action plans for athletic trainers to use. Second, we hypothesized that institutions with the NATA recommended amount and types of emergency equipment and supplies, as well as properly written EAPs for athletic trainers to use would have higher confidence in emergency preparedness during treatment of potential catastrophic injury and sudden death incidences.

## METHODS

We used a correlational prediction design. The predictor variable was the measured emergency preparedness of each institution: EAP Emergency Preparedness (EAP EP), and Emergency Preparedness for Specific Emergency Conditions (Total Equipment EP). The criterion variable were the number of sudden deaths and catastrophic injuries that have occurred at each institution (Catastrophic Injury/Death) and a qualitative measure of institutional preparedness after any potentially catastrophic incident at each institution, Confidence in Emergency Preparedness (EP Confidence). A nonprobability voluntary sampling method was used.

### *Subjects*

There are eight sports medicine departments in the Pac-12 NCAA Division I Conference. Each participating institution was randomly assigned a letter, A-H, for publication in order to protect the integrity of each institution. Consent was obtained with the IRB approved consent cover sheet on the survey (see Appendix A). There were no delimitations set for subject sampling.

### *Instruments*

Participants completed a survey (Appendix A) that inquired about the equipment and supplies and overall emergency preparedness for each Pac-12 Institution. The first

part of the “Emergency Preparedness in the Pac-12 Conference” survey asked for the amount of specific equipment and supplies available at each different facility or location there is an EAP written for. If items were brought from another facility for practices and competition, the survey responder was to star next to the amount, and if the items were acquired after August 1, 2014, the survey responder was to list the date acquired so that this would be accounted for in data analysis if applicable. After each location’s equipment and supplies were tallied, the survey provided the survey for total equipment and supplies available to the athletic training staff to use at all locations; this was included to ensure the survey responder counted each site correctly, including the equipment and supplies shared at different sites.

The second part of the “Emergency Preparedness in the Pac-12 Conference” survey that we titled the “Emergency Preparedness: Confidence Survey” was created to measure the incidences that resulted in an athlete’s catastrophic injury or death due to the ten different conditions from Table 1; these were measured from August 1, 2014 to when the survey responder completed the survey. This survey asked for details regarding the date, location and outcome of the incident, as well as the use of EAP, protocols, and equipment during the response. The survey had the athletic trainer completing the survey (the individual completing the survey was instructed to give to responding staff member if still available) rate their emergency preparedness on a Likert scale, 1=Not prepared, 10=Extremely prepared. We decided to create a Likert-type scale similar to that of Hodax et al. who used a 5 point scale (1=extremely unconfident, 5=extremely confident) to measure orthopaedic residents’ confidence in treating onfield injuries.<sup>15</sup> With the eight elements of the EAP, we decided to increase the scale to a 10 point scale. Qualtrics Survey Software (Qualtrics, 2017, Provo, UT/Seattle, WA, USA) was used to distribute



the survey and collect data electronically. We validated our survey by sending our survey out in August 2017 to athletic trainers who were working in the collegiate setting. Thirty-three athletic trainers responded and provided feedback about our survey.

### *Procedures*

The “Emergency Preparedness in the Pac-12 Conference” survey was sent in an email to each institutions’ sports medicine director at each of the 12 institutions in November 2017. We asked that surveys be returned within 30 days. After 30 days had passes with no response, a follow up email was sent to the sports medicine director. After another 30 days had passes with no response, an email was sent to another athletic trainer on staff that was not the sports medicine director. In the email there was a Qualtrics link as well as an attached PDF of the survey in Appendix A. Athletic trainers that responded with a request for a printed and mailed survey were mailed the “EAP Location Equipment & Supplies” surveys, and “Emergency Preparedness: Confidence Survey,” for the amount requested by the institution. These athletic trainers were provided a return envelope with appropriate postage to mail the completed surveys to the research institution if this was requested. No institutions requested paper copies. Our survey asked that the following be provided via email or sent in mail: EAPs for all sites, concussion policy, heat illness policy, and lightning policy. We also searched for these policies on each institutional website for athletic training. A total of seven institutions had EAPs posted online or provided EAPs via email. Once all survey results were received, each institution was randomly assigned a letter to identify the institution before data analysis. After all data was accounted for there were eight institutions included in this

study, thus "University A" through "University H" were used to blind institutions with random assignment.

Each individual "EAP Location Equipment & Supplies" survey was individually compared to the emergency equipment and supplies suggestions published in the "National Athletic Trainers' Association Position Statement: Preventing Sudden Death in Sports." The suggestion is that at each location athletic trainers work there is access to at least one of each of the equipment and supplies listed available to use at all times the athletic trainer is present.<sup>1</sup> One exception is the rectal thermometers and ingestible thermometers exchangeability; if one is present the other is not required also. The emergency preparedness of each institution was measured separately for each condition's equipment and supply recommendations: asthma, catastrophic brain injuries, cervical spine injuries (head-down contact in football included in this category), diabetes, exertional heat stroke, exertional hyponatremia, exertional sickling, and sudden cardiac arrest (lightning included in this category). For each condition, the Total Equipment EP score was calculated by the amount the institution had available for needed equipment and supplies suggested for that condition at each site. For example, if a location only had albuterol inhalers available, but no oxygen tanks or peak flow meters the score was 1/3. These were calculated at each site, and the mean of all site scores was the Total Equipment EP for that condition. We then used Excel to calculate the mean and standard deviation of all eight conditions' Total Equipment EP to find each institution's Total Equipment EP. If there was equipment shared between several facilities, these were marked as present at the site.

The EAPs were provided and published online were graded on a scale of eight to calculate the EAP EP. The EAPs received a grade of eight out of eight if all of the

following were documented in the EAP: implementation, personnel, equipment, communication, transportation, venue location, emergency care facilities, and documentation.

The amount of sudden deaths or catastrophic injuries in sport was collected over a period of three years, from August 1, 2014 to August 1, 2017. We collected these from each institution with the “Emergency Preparedness: Confidence Survey.” To validate the incidents recorded and gather incidents not recorded with our survey, we asked for data from Presagia Injury Zone/SIRMAP and the NCCSIR database. This data was required to be recorded in the electronic medical record, Presagia Injury Zone/SIRMAP used by most Pac-12 institutions as of 2015. Access to these records was available from the Presagia coordinator at the University of Utah; however, at the time of our study the Pac-12 data sharing agreement had not been finalized. The data from our institution was collected. We emailed the NCCSIR to collect records of catastrophic injury and sudden death from Pac-12 institutions from the three year period – there was no response, therefore no data was collected from the NCCSIR.

In addition to equipment and supplies, emergency preparedness was analyzed with a qualitative measure on the “Emergency Preparedness: Confidence Survey” for every reported incidence of possible catastrophic injury or sudden death by the institution. The final question “On a scale from 1-10, 1=Not prepared, 10=Extremely prepared, how would you rate your emergency preparedness in this situation?” produced a value of subjective quantitative emergency preparedness.

### *Statistical Analysis*

Microsoft Excel (Microsoft, 2013, Redmond, WA, USA) and SPSS (IBM, 2013, Armonk, NY, USA) were used to analyze the data using the correlational prediction design for each institution individually. Excel was used to calculate means and standard deviations of the emergency preparedness (Total Equipment EP) of the whole individual institution for each following condition: asthma, catastrophic brain injury, cervical spine injury/head-down contact in football, diabetes, exertional heat stroke, exertional hyponatremia, exertional sickling, and sudden cardiac arrest/lightning. Excel was also used to calculate means and standard deviations of the EAP emergency preparedness on the eight point scale of every provided EAP of individual institutions. The criterion variable of amount of catastrophic injuries and sudden death at each institution in the three-year time frame did not need data analysis, as it was just a single number. SPSS was used to calculate the EP Confidence median and interquartile range. The two predictor variables (EAP EP and Total Equipment EP) were correlated with the two criterion variables (Catastrophic Injury/Death and EP Confidence) using a Pearson bivariate and partial correlation coefficient using SPSS statistical software. Statistical significance was set at  $p \leq 0.05$ .

## RESULTS

A total of five institutions (University C, D, E, G, H) responded to the "EAP Location Equipment & Supplies" survey, and "Emergency Preparedness: Confidence Survey." Out of the five institutions, three institutions (University C, D, E) had responded to one or more emergency that could have led to a catastrophic injury or sudden death since August 1, 2014, and two institutions had responded to none in the time-frame. All institutions that responded reported that no emergencies resulted in catastrophic injuries or deaths from August 1, 2014 to August 1, 2017; thus, the "Catastrophic Injury/Death" criterion data became a constant criterion variable of zero and was not used to calculate a Pearson Correlation.

See Appendix B for the institution's individual Emergency Preparedness for Specific Emergency Conditions (Total Equipment EP) tables. All Total Equipment EP scores were on a continuous scale of 0 to 1 (0 meaning 0% prepared, 1 meaning 100% prepared), depending on the potential emergency the score was rated out of the suggested equipment the institution recorded was maintained at the specific EAP location. See "Emergency Preparedness for Specific Emergency Condition: Calculation Key" in Appendix B. Table 2 provides Total Equipment EP scores for each institution.

See Appendix B for institution's individual EAP Emergency Preparedness (EAP EP) tables. All EAP Emergency Preparedness scores were created on a continuous scale of 0 to 1 (0 meaning 0% prepared, 1 meaning 100% prepared) based on how many of the

**Table 2.** Institutional Total Equipment EP.

<b>Institution</b>	<b>Total Equipment EP</b>
University C	$0.467 \pm 0.350$
University D	$0.612 \pm 0.339$
University E	$0.674 \pm 0.276$
University G	$0.816 \pm 0.284$
University H	$0.118 \pm 0.167$

8 items were in the individual EAPs. Table 3 provides EAP EP scores for each institution.

The EAP EP Score and Total Equipment EP variables were used as predictor variables. The Confidence Survey asked the responder to rate how confident they were in the emergency preparedness in the specific incident being responded to on a scale from 1 to 10, therefore responses could vary from 0.100 to 1.000 for Confidence in Emergency Preparedness (EP Confidence). The EP Confidence variable was used as the criterion variable in the Pearson bivariate correlation. Table 4 lists all of the predictor and criterion variables used in the correlation for each institution response. Of the six responses, the EP Confidence ranged from 1.00 to 0.70 with a median (interquartile range) of 0.95 (1.00 to 0.80). This means that across the responding Pac-12 institutions there is an extremely high confidence in responding to emergency situations.

After running the Pearson correlation in SPSS the following correlations were found. See Table 5 for results of the statistical analysis. EAP EP Score and Total Equipment EP Score had a -0.955 statistically significant correlation ( $p=0.003$ ). EAP EP Score and EP Confidence had a 0.241 correlation with no statistical significance ( $p=0.646$ ). Lastly, Total Equipment EP and EP Confidence had a -0.407 correlation with no statistical significance ( $p=0.423$ ).

Each individual institution's Equipment EP results are presented in Appendix B in Table 6, Table 7, Table 8, Table 9, and Table 10. Each individual institution's EAP EP results are presented in Appendix B in Table 11, Table 12, Table 13, Table 14, Table 15, Table 16, and Table 17. The individual responses for EP Confidence are presented in Appendix B in Table 18.

**Table 3.** Institutional Total EAP EP.

<b>Institution</b>	<b>EAP EP</b>
University A	87.5%
University B	75.0%
University C	100%
University D	57.7% ± 12%
University E	62.5%
University F	37.5%
University G	87.5%



**Table 4.** Confidence Survey Incidences with Associated Measures.

Individual Response	EAP EP Score	Total Equipment EP	Catastrophic Injury/Death	EP Confidence
University C - Response 1	100%	46.7%	0	1.000
University C - Response 2	100%	46.7%	0	0.800
University C - Response 3	100%	46.7%	0	1.000
University D - Response 1	57.7%	61.2%	0	1.000
University E - Response 1	62.5%	67.4%	0	0.900
University E - Response 2	62.5%	67.4%	0	0.700

**Table 5.** Pearson Correlation Results from SPSS Statistical Analysis.

\*\* Correlation is significant at the 0.05 level.

	EAP EP Score	Total Equipment EP	EP Confidence
EAP EP Score Pearson Correlation		-0.955**	0.241
Significance (2tailed)		0.003	0.646
Total Equipment EP Pearson Correlation	-0.955**		-0.407
Significance (2tailed)	0.003		0.423
EP Confidence Pearson Correlation	0.241	-0.407	
Significance (2tailed)	0.646	0.423	

## DISCUSSION

The purpose of our study was to understand if having emergency equipment and supplies present and a properly written Emergency Action Plan for use by certified athletic trainers would reduce the risk of sudden death and catastrophic injury in sport as well as increase an institution's confidence in their emergency preparedness during treatment of potential catastrophic injury and sudden death. Neither of our hypotheses were met. The correlations between Catastrophic Injury/Death was not calculated due to the Catastrophic Injury/Death constant variable of 0 across all institutions that responded. Our first hypothesis was not able to be evaluated with our data set. We were able to evaluate our second hypothesis. There was no statistical significance to support nor disprove our hypothesis that institutions with the NATA recommended amount and types of emergency equipment and supplies, as well as properly written EAPs for athletic trainers to use, have higher confidence in emergency preparedness during treatment of potential catastrophic injury and sudden death incidences.

The correlation between EAP EP Scores and Total Equipment EP predictor variables was -0.955 with 0.003 statistical significance in our Pearson bivariate correlation. This correlation means that EAP EP Score and Total Equipment EP variables are negatively correlated for the six specific emergency response cases that were responded to by responding Pac-12 institutions. These are both predictor variables in this study and do not account for every institution that provided data; however, this correlation shows that institutions in the Pac-12 with higher EAP EP Scores will have

lower Total Equipment EP scores, and vice versa. This is interesting that institutions that were more prepared for emergencies with their documentation of EAPs were less prepared for emergencies when it came to their equipment & supplies available.

Although not statistically significant, the following findings from the data collection and analysis from this study are important to the Athletic Training and Emergency Preparedness field. Of all the institutions that responded, only one institution had a score of 1 (8/8) for EAP EP Scores. All institutions that responded to the online Qualtrics survey indicated that the EAPs they were recording information for were all written with the “Emergency Planning in Athletics” guidelines the NATA had published in 2002. According to our grading system, this was not the case. University C’s mean EAP EP was 100%, University D’s was 57.7%, University E’s was 62.5%, and University G’s was 87.5%. All of these institutions should have scored 100% because they indicated that they followed the NATA 2002 guidelines. Several issues were found with the documentation of EAPs at all institutions that shared protocols. Several EAPs had no address for the hospital the patient should be transported to, rather just a name and/or phone number for the hospital. Some EAPs had pictures of floor plans or maps on the EAP without an address or directions to tell EMS. Some EAPs had “see floor plan” listed, but there was no floor plan attached. No EAPs that were evaluated documented how often the plan was practiced, and some did not have the date the EAP was last updated. Some institutions had hospital names, addresses, and phone numbers listed on their “Visiting Team” websites but not documented in their EAPs. Often an ambulance was not specified as the transportation, and the EMS was just assumed to be an ambulance (this was assumed in data collection). Several EAPs did not have specific athletic training staff member names or roles listed for who would activate the EAP or

whom to contact if activated. Not all EAPs specified that athletic trainers, coaches, athletic training students, or other support staff were CPR and AED trained. One institution did not have a consistent name of the emergency room to be used throughout all of the EAPs. On one institution's EAP the documentation aspect stated that "ATC prepares transfer report for EMS personnel;" there was no information stating what was in the transfer report and if there was any other required documentation.

The "Emergency Preparedness: Confidence Surveys" data seen in Appendix B is a unique aspect of our study. Although the only measure used as a variable in our statistical analysis was the EP Confidence, the qualitative data about the athletic trainers who responded, what equipment and EAP was used, and the years certified the athletic trainers responding to the situation are all interesting to consider in the context of an emergency. Of the six "Emergency Preparedness: Confidence Surveys" documented, it was noted that there were revisions to one EAP after activating it.

Revisions made included a statement including the facility manager to contact since this EAP was activated by a visiting athletic trainer, and the home staff felt the care could have been improved if this contact was included in the plan. This is an example of the importance of revisions after activating the EAP when these thoughts are fresh in the minds of the EAP and policy authors.

Of the two heat illness policies shared for this study, neither had protocols reflecting a "cooling patient before transport" method that has been the recommended evidence-based practice by the NATA since 2015 when the "National Athletic Trainers' Association Position Statement: Exertional Heat Illnesses" was published.<sup>9</sup> All concussion protocols that were shared followed guidelines from the "National Athletic

Trainers' Association Position Statement: Management of Sport Concussion. <sup>17</sup>”

Regarding emergency equipment and supplies, several things came to light about the recommended equipment and supplies.<sup>1</sup> Several institutions responded that they would use a regular thermometer to assess rectal temperature – although appropriate if the temperature range reaches 112 degrees Fahrenheit, this was not counted in totals due to the NATA’s suggestions for a specific rectal thermometer or ingestible thermistor for continued monitoring in a heat illness cooling situation.<sup>1,11</sup> The wet bulb globe temperature (WBGT) monitor was maintained by few institutions, but several responded that they would just use an application on their smartphone. The issue with using a smartphone application is that the WBGT measurement is not being reported from the specific participation surface where the athlete is, but rather a weather station in the area – this confounds the WBGT reading, which could change the appropriate response of the athletic trainer. Several institutions response to inhaler amount was widely variable due to the varying number of student-athletes who would need them each year.

Athletic trainers need to be prepared for emergency situations at the athletic facilities for the participants they are providing care for. Although our EP Confidence measure is a subject measure, it is still telling that not all athletic trainers had 100% confidence in their emergency preparedness. This lack of confidence could have been due to the level of EAP EP as well as the level of Total Equipment EP. If an institution does not have all of the equipment and supplies suggested by the NATA, institutions should be able to use this research as a budgeting resource when stating the reasons they need to purchase different equipment and supplies.

### *Limitations*

Not all institutions in the NCAA Division I Pac-12 Conference responded to the surveys sent out. Seven institutions did not respond to the "EAP Location & Supplies" survey. Nine institutions did not respond to the "Total of University's Athletic Training Equipment & Supplies" survey. Seven institutions did not respond to the "Emergency Preparedness: Confidence Survey." We were unable to validate our six emergency situations recorded from our survey with Presagia Injury Zone/SIRMAP data, or NCCSIR data. The survey was filled out by one athletic trainer on staff, this could have led to assumptions about different facilities or changes this staff member may not have known about if it was not all recorded in an emergency document.

## CONCLUSION

Neither of our hypotheses were supported nor disproven. We were prevented from analyzing our first hypothesis due to a lack of data; therefore, we do not know if there are lower instances of sudden death and catastrophic injury in sport at institutions that have the NATA recommended amount and types of emergency equipment and supplies, as well as properly written emergency action plans for athletic trainers to use. Second, our data analysis did not support, or disprove, our second hypothesis that institutions with the NATA recommended amount and types of emergency equipment and supplies, as well as properly written emergency action plans for athletic trainers to use would have higher confidence in emergency preparedness during treatment of potential catastrophic injury and sudden death incidences.

This small window of research into the NCAA Division I Pac 12 Conference Emergency Preparedness in sports medicine departments has shown that although the National Athletic Trainers' Association has published guidelines about emergency planning and equipment/supply needs, they are not being thoroughly followed by institutions who generally have the financial means and knowledge to create safe environments for student athletes to participate safely.<sup>1,10,11,13</sup> These guidelines may not be thoroughly followed by these institutions due to updates in emergency planning and available technology. We suggest that the NATA publish a new "Emergency Planning in Athletics" position statement because it is currently 16 years old and may need to be

updated with newer technology and methods available to assist in Emergency Action Plans. Future directions of emergency planning should include the integration of smartphones, the documentation of the NATA suggested medical “Time Out” that occurs with a healthcare team before an athletic event to review the EAP, and a general checklist of EAP elements for EAP authors to reference. We also suggest that institutions evaluate the suggested equipment and supplies suggested to prevent sudden death in sport, take an inventory every year of what is in house, what may need to be purchased, and keep this available to all staff members and visiting teams – access to this information can only improve the rapid care these student-athletes may need if an emergency situation arises at these institution’s athletic facilities.



APPENDIX A

EMERGENCY PREPAREDNESS  
IN THE PAC-12 CONFERENCE

SURVEY

## EMERGENCY PREPAREDNESS IN THE PAC-12 CONFERENCE

It is unknown if the presence of specific emergency equipment with an athletic trainer would reduce the risk of sudden death or catastrophic injury in sport; there is a lack of published research regarding sudden death or catastrophic injury case studies. It is also unknown if the proper documentation of emergency action plans (EAPs) would reduce the risk of sudden death or catastrophic injury in sport. Therefore, the purpose of this study is twofold: to investigate if having emergency equipment available and protocol written in a proper EAP for use by Athletic Trainers reduces the risk of sudden death and catastrophic injury in sport, and if it increases institutional confidence in emergency preparedness.

Once all data is collected each institution will be randomly assigned a letter such as “University D” for de-identification during statistical analysis and publication. This research is important to the field since athletic trainers are trained to respond to sudden death and catastrophic injuries in sport, this research can help increase knowledge and awareness to save athletic lives.

### SURVEY

One certified athletic trainer in the university’s sports medicine department should complete the following survey, preferably an athletic trainer with extensive knowledge of the equipment and supplies. There are no risks involved in the completion of the following survey or the submission of emergency action plans or associated policies.

Please fill out the form on page 2 for every venue you have athletes participate. Please total all equipment with the form on page 3. If you are willing to share your EAPs for each location please attach or send with the provided packet you have requested. Do you have a written concussion, heat illness, and/or lightning protocol? If you are willing to share these protocols, please attach or mail.

By providing your signature below, completing this survey, providing emergency action plans and related policies you are consenting to share your information for the “Emergency Preparedness in the Pac-12 Conference” research being conducted at the University of Utah. If there are any questions or concerns please contact the primary investigator, Dana Friske by e-mail (dana.friske@utah.edu) or phone (608) 577-3460.

\_\_\_\_\_  
Printed Name of Athletic Trainer Completing Survey

\_\_\_\_\_  
Name of Participating University

\_\_\_\_\_  
Title of Athletic Trainer Completing Survey

\_\_\_\_\_  
E-mail of Athletic Trainer Completing Survey

\_\_\_\_\_  
Signature of Athletic Trainer Completing Survey

\_\_\_\_\_  
Date



**EAP Location:** \_\_\_\_\_

Please list the amount of the following functioning (non expired) equipment available at this location. If the equipment is brought from another facility for practices and competition please **star** next to the amount.

<b>Equipment &amp; Supplies</b>	<b>Amount</b>	<b>If acquired after 8/1/2014 please list date acquired</b>
Albuterol inhalers		
Oxygen tanks		
Peak flow meters		
Spine boards		
Rescue breathing equipment kits		
Glucagon		
Rectal thermometers		
Ingestible thermometers		
Cold-water immersion tubs		
Wet bulb globe temperature monitors		
IV hypertonic saline		
Oral hypertonic solution		
High flow oxygen w/ nonbreather face masks		
AEDs		
Other (please name)		

**Notes:**

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## Total of University's Athletic Training Equipment & Supplies

Please list the amount of the following functioning (non expired) equipment and supplies available throughout campus (should be able to tally each location checklist).

<b>Equipment &amp; Supplies</b>	<b>Amount</b>	<b>If acquired after 8/1/2014 please list date acquired</b>
Albuterol inhalers		
Oxygen tanks		
Peak flow meters		
Spine boards		
Rescue breathing equipment kits		
Glucagon		
Rectal thermometers		
Ingestible thermometers		
Cold-water immersion tubs		
Wet bulb globe temperature monitors		
IV hypertonic saline		
Oral hypertonic solution		
High flow oxygen w/ nonbreather face masks		
AEDs		
Other (please name)		

**Notes:**

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## Emergency Preparedness: Confidence Survey

Has your athletic training staff responded to any of the following circumstances that led or could have led to a catastrophic injury or sudden death since August 1, 2014?

- Asthmatic Episodes
- Catastrophic Brain Injuries
- Cervical Spine Injuries
- Diabetic Episodes
- Exertional Heat Illness
- Exertional Hyponatremia
- Exertional Sickling
- Head-down Contact in Football
- Lightning Injuries
- Sudden Cardiac Arrest

Please list the date, venue, if it was a practice or competition, what equipment was used, the patient outcome, if a protocol was used, if an EAP was activated, if a protocol or EAP was revised after the incident, and what was revised.

**Date:** \_\_\_\_\_ **Venue:** \_\_\_\_\_

**Please circle:** Practice    Competition    N/A (explain)

**Equipment used:**

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**Patient outcome:** \_\_\_\_\_

**Was a protocol used? Yes No Which one?** \_\_\_\_\_

**Was the protocol revised after the incident? Yes No**

**What was revised?**

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**Was the EAP activated? Yes No**

**Was the EAP revised after the incident? Yes No**

**What was revised?**

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**On a scale from 1-10, 1=Not prepared, 10=Extremely prepared, how would you rate your emergency preparedness in this situation? (circle) 1 2 3 4 5 6 7 8 9 10**

**How many years had the responding/supervising ATC been certified at the time of the incident?**

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**Was there more than one ATC that responded or supervised the response to this incident? Yes No**

**How many years had the additional responding/supervising ATC(s) been certified at the time of the incident?**

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APPENDIX B

EMERGENCY PREPAREDNESS

MEASURES TABLES

### Emergency Preparedness for Specific Emergency Condition: Calculation Key

- Asthma:** Albuterol inhalers, oxygen tanks, peak flow meters. 3.
- Catastrophic Brain Injuries:** EMS, written concussion protocol. 2.
- Cervical spine injury/head-down contact in football:** spine board, rescue breathing equipment, EMS. 3.
- Diabetes:** glucagon, EMS. 2.
- Exertional Heat Stroke:** Wet bulb globe temperature monitor, heat illness protocol, cold-water immersion tubs, rectal thermometer or ingestible thermistors. 4.
- Exertional Hyponatremia:** oral hypertonic solution, intravenous hypertonic saline, EMS. 3.
- Exertional Sickness:** high-flow oxygen with non-breather facemask, cold-water immersion tubs, EMS. 3.
- Sudden Cardiac Arrest/ Lightning:** AED, EMS. 2.

**Table 6. University C Emergency Preparedness for Specific Emergency Conditions.**

Emergency Condition	EAP 1	EAP 2	EAP 3	EAP 4	EAP 5	EAP 6	EAP 7	EAP 8	EAP 9	EAP 10	EAP 11	EAP 12	EAP 13	EAP 14	EAP 15	EAP 16	EAP 17	EAP 18	EAP 19	EAP 20	Total EP	EP SD	
Asthma	0	0	0	1/3	0	0	0	0	0	1/3	1/3	0	1/3	0	0	0	0	0	0	0	0	0.067	0.137
Catastrophic Injuries	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	
Cervical Injuries/ Head Down Contact	1/3	1/3	2/3	1	2/3	1/3	1/3	1/3	1/3	1/3	2/3	1/3	2/3	1/3	1	1/3	1/3	1/3	2/3	1/3	1/3	0.483	
Diabetes	1/2	1/2	1/2	1	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	0.542	0.161
Exertional Stroke	0	0	0	1/4	0	0	0	0	0	0	0	0	0	1/4	0	0	0	0	0	0	0.025	0.077	
Exertional Hyponatremia	1/3	1/3	1/3	2/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	2/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	0.367	0.103
Exertional Sickness	1/3	1/3	1/3	1	1/3	0	1/3	1/3	1/3	0	2/3	1	1/3	1/3	1/3	1/3	1/3	1/3	0	1/3	0	0.350	0.275
Sudden Cardiac Arrest/ Lightning	1	1	1	1	1	1/2	1	1	1	1/2	1	1	1	1	1	1	1	1	1/2	1	1/2	0.900	
<b>All Combined</b>																					0.467	0.350	



**Table 7. University D Emergency Preparedness for Specific Emergency Conditions.**

Emergency Condition	EAP 1	EAP 2	EAP 3	EAP 4	EAP 5	EAP 6	EAP 7	EAP 8	EAP 9	EAP 10	EAP 11	EAP 12	EAP 13	Total EP	EP SD
Asthma	1/3	0	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	0.308	0.092
Catastrophic Brain Injuries	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	0.000
Cervical Injuries/ Head Down															
Contact	2/3	2/3	2/3	2/3	2/3	1	1	1	1	1	1	1	1	0.872	0.169
Diabetes	1	1	1	1	1	1	1	1/2	1	1/2	1/2	1/2	1/2	0.808	0.253
Exertional Heat Stroke	1/2	1/2	3/4	1/4	0	0	0	0	0	0	1/4	0	1/4	0.192	0.243
Exertional Hypotremia	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	0.333	0.000
Exertional Sickling	1/3	1/3	2/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	2/3	1/3	1/3	0.385	0.125
Sudden Cardiac Arrest/ Lightning	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	0.000
<b>All Combined</b>														0.612	0.339

**Table 8.** University E Emergency Preparedness for Specific Emergency Conditions.

Emergency Condition	EAP 1	EAP 2	EAP 3	EAP 4	EAP 5	EAP 6	EAP 7	EAP 8	Total EP	EP SD
Asthma	1/3	1/3	1/3	0	0	1/3	1/3	1/3	0.250	0.154
Catastrophic Brain Injuries	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	0.500	0.000
Cervical Spine Injuries/ Head Down Contact	1	1	1	2/3	2/3	1	2/3	1	0.875	0.173
Diabetes	1	1	1	1/2	1/2	1/2	1/2	1/2	0.688	0.259
Exertional Heat Stroke	1/2	1/2	3/4	1/2	1/4	1/4	0	1/4	0.375	0.231
Exertional Hyponatremia	1	1	1	1	2/3	1	1	1	0.958	0.118
Exertional Sickling	2/3	2/3	1	2/3	2/3	1	1/3	1	0.750	0.236
Sudden Cardiac Arrest/ Lightning	1	1	1	1	1	1	1	1	1.000	0.000
<b>All Combined</b>									<b>0.674</b>	<b>0.276</b>

**Table 9. University G Emergency Preparedness for Specific Emergency Conditions.**

Emergency Condition	EAP 1	EAP 2	EAP 3	Total EP	EP SD
Asthma	1	2/3	1	0.889	0.192
Catastrophic Brain Injuries	1	1	1	1.000	0.000
Cervical Spine Injuries/ Head Down Contact	1	1	1	1.000	0.000
Diabetes	1/2	1/2	1/2	0.500	0.000
Exertional Heat Stroke	1/4	1/4	1/4	0.250	0.000
Exertional Hyponatremia	1	1	2/3	0.889	0.192
Exertional Sickling	1	1	1	1.000	0.000
Sudden Cardiac Arrest/ Lighting	1	1	1	1.000	0.000
				0.816	0.284

**Table 10.** University H Emergency Preparedness for Specific Emergency Conditions.

Emergency Condition	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Total EP	EP SD
Asthma	0	0	0	0	0	1/3	1/3	0	1/3	0	0	0	0	1/3	0	0	0	0	0	0	1/3	1/3	1/3	0.101	0.157
Catastrophic Brain Injuries	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000	0.000
Cervical Spine Injuries/ Head Down	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000	0.000
Contact	0	0	0	0	0	0	1/3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2/3	0.043	0.153
Diabetes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000	0.000
Exertional Heat Stroke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1/4	0.011	0.052
Exertional Hyponatremia	0	0	0	0	0	2/3	2/3	2/3	0	0	0	0	0	0	0	0	0	0	2/3	0	0	2/3	2/3	0.174	0.299
Exertional Sickness	0	0	0	0	0	1/3	1/3	0	0	0	0	0	0	1/3	0	0	0	0	1/3	0	1/3	1/3	2/3	0.116	0.191
Sudden Cardiac Arrest/ Lighting	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	0.500	0.000
																								0.118	0.167

**Table 11.** University A EAP EP

<b>University A EAPs</b>	<b>EAP EP Score</b>
EAP 1	7/8
EAP 2	7/8
EAP 3	7/8
EAP 4	7/8
EAP 5	7/8
EAP 6	7/8
EAP 7	7/8
EAP 8	6/8
EAP 9	7/8
EAP 10	7/8
EAP 11	7/8
<b>Mean</b>	<b>0.875</b>
<b>SD</b>	<b>0.000</b>

**Table 12.** University B EAP EP

<b>University B EAPs</b>	<b>EAP EP Score</b>
EAP 1	6/8
EAP 2	6/8
EAP 3	6/8
EAP 4	6/8
EAP 5	6/8
EAP 6	6/8
EAP 7	6/8
EAP 8	6/8
EAP 9	6/8
EAP 10	6/8
EAP 11	6/8
EAP 12	6/8
EAP 13	6/8
EAP 14	6/8
EAP 15	6/8
<b>Mean</b>	<b>0.750</b>
<b>SD</b>	<b>0.000</b>

**Table 13.** University C EAP EP

<b>University C EAPs</b>	<b>EAP EP Score</b>
EAP 1	8/8
EAP 2	8/8
EAP 3	8/8
EAP 4	8/8
EAP 5	8/8
EAP 6	8/8
EAP 7	8/8
EAP 8	8/8
EAP 9	8/8
EAP 10	8/8
EAP 11	8/8
EAP 12	8/8
EAP 13	8/8
EAP 14	8/8
EAP 15	8/8
EAP 16	8/8
EAP 17	8/8
EAP 18	8/8
EAP 19	8/8
EAP 20	8/8
<b>Mean</b>	<b>1.000</b>
<b>SD</b>	<b>0.000</b>

**Table 14.** University D EAP EP

<b>University D EAPs</b>	<b>EAP EP Score</b>
EAP 1	4/8
EAP 2	4/8
EAP 3	4/8
EAP 4	6/8
EAP 5	6/8
EAP 6	6/8
EAP 7	4/8
EAP 8	4/8
EAP 9	4/8
EAP 10	4/8
EAP 11	4/8
EAP 12	4/8
EAP 13	6/8
<b>Mean</b>	<b>0.577</b>
<b>SD</b>	<b>0.120</b>

**Table 15.** University E EAP EP

<b>University E EAPs</b>	<b>EAP EP Score</b>
EAP 1	5/8
EAP 2	5/8
EAP 3	5/8
EAP 4	5/8
EAP 5	5/8
EAP 6	5/8
EAP 7	5/8
<b>Mean</b>	<b>0.625</b>
<b>SD</b>	<b>0.000</b>

**Table 16.** University F EAP EP

<b>University F EAPs</b>	<b>EAP EP Score</b>
EAP 1	3/8
EAP 2	3/8
EAP 3	3/8
EAP 4	3/8
EAP 5	3/8
EAP 6	3/8
EAP 7	3/8
EAP 8	3/8
EAP 9	3/8
EAP 10	3/8
EAP 11	3/8
EAP 12	3/8
EAP 13	3/8
EAP 14	3/8
EAP 15	3/8
<b>Mean</b>	<b>0.375</b>
<b>SD</b>	<b>0.000</b>

**Table 17.** University G EAP EP

<b>University G EAPs</b>	<b>EAP EP Score</b>
EAP 1	7/8
EAP 2	7/8
EAP 3	7/8
EAP 4	7/8
EAP 5	7/8
EAP 6	7/8
EAP 7	7/8
EAP 8	7/8
EAP 9	7/8
EAP 10	7/8
<b>Mean</b>	<b>0.875</b>
<b>SD</b>	<b>0.000</b>



**Table 18. University Confidence Survey Responses.**

	University C #1	University C #2	University C #3	University D #1	University E #1	University E #2
Venue	EAP UC 18	EAP UC 1	EAP UC 8	EAP UD 11	EAP UE 3	EAP UE 8
Event	Practice	Practice	Practice	Competition	Practice	Practice
ATC Present?	Yes	Yes	Yes	Yes	Yes	Yes
Equipment Used	Spine board, cervical collar from EMS, face mask removal tools	Cold tub	Spine board, cervical collar from EMS	Gator, spine board, cervical collar	Spine board	AED
Outcome	Diagnosed concussion, cervical stinger, cervical strain, all resolved	Dehydration, exertional sickling event - resolved	Athlete RTP after recovering from whiplash and concussion from event	Successful transport to hospital, cervical spine fracture, walking	Full recovery	Full recovery
EAP Used	EAP UC 18	No	EAP UC 8	EAP UD 11	EAP UE 3	EAP UE 8
Revised?	No	N/A	No	No	No	Yes – statement including facility manager in EAP
EP Confidence	10/10	8/10	10/10	10/10	9/10	10/10
Years ATC Certified	11	9	2	15	30	5 (visiting)
2 <sup>nd</sup> ATC	7	13		30	17	
3 <sup>rd</sup> ATC	1			5	1	
4 <sup>th</sup> ATC				5	2	
5 <sup>th</sup> ATC					30	
6 <sup>th</sup> ATC					22	

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