

## ORIGINAL RESEARCH

# Health care in high school athletics in West Virginia

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## ABSTRACT

**Introduction:** The purpose of this study was to determine the level of implementation of emergency preparedness procedures and administrative procedures to provide appropriate medical coverage to high school athletics in the predominantly rural US state of West Virginia. Particular attention was given to determine the extent to which the schools provided the recommendations for best practice in the National Athletic Trainers Association consensus statement outlining appropriate medical coverage for high school athletics.

**Methods:** A listing of all public schools participating in the state high school athletic association with at least one team participating in interscholastic competition was obtained from the state Department of Education office. An electronic survey was sent to the principal at each high school with instructions that an administrator or sports medicine professional complete the survey. A total of 62 respondents completed the survey (49.6% response rate). Most respondents were principals (92%), followed by athletic administrators (8%). The majority of schools reported a rural zip code at the school level based on the Rural Urban Community Area Codes. Measures assessed the school demographics, including size and rurality. Additional measures assessed the development and implementation of a comprehensive athletic healthcare administrative system, and the development and implementation of a comprehensive emergency action plan.

**Results:** The majority of respondents reported that there was a consent form on file for student athletes (91%) and comprehensive insurance was required for participation (80%). A third of the respondents (33%) reported that all members of the coaching staff were certified in first aid and cardiac pulmonary resuscitation (CPR) and 31% reported 'never' when asked if all coaches were required to be certified in CPR and first aid. When asked if there was a written emergency action plan (EAP) that outlines procedures to follow in emergency situations during athletic participation, 36% responded 'never' and 38% responded 'always'. When asked about specific limitations for health care to athletes the three main themes identified in qualitative analysis were lack of funding, lack of certified medical personnel, and the inability to locate certified medical personnel in a rural area.



**Conclusions:** This study confirmed expected barriers to health care for high school athletes in West Virginia, specifically the lack of funding and resources available to rural schools. In order to prevent a life threatening emergency or possibly sudden cardiac death, preparing and planning for emergencies should be an essential part of high school athletic programs. Rural areas face significant challenges in regards to funding and qualified personnel. Requiring first aid and CPR certification for coaches and requiring an EAP are two steps that could improve the health care provided to athletes. These are inexpensive and achievable steps that could be taken to improve the safety for athletes at high schools in both rural and non-rural areas.

**Key words:** athletics, emergency preparedness, health care, high school, rural, USA.

## Introduction

Participation in competitive sports at the youth level has seen a large number of participants recently, specifically in secondary school athletics. In 2013 the National Federation of High School Associations estimated that 7.8 million student athletes were participating in interscholastic sports<sup>1</sup>. Due to the significant number of individuals participating in sports, many organizations have adopted and provided recommendations to provide appropriate health care for this specific population of athletes. The National Athletic Trainers Association (NATA), the American Academy of Family Physicians, and the American Medical Association have all advocated for the employment of athletic trainers to provide appropriate medical coverage at high school athletic events<sup>2,3</sup>.

The recommendation for the provision of a healthcare system in high school sports is grounded in the epidemiological data present in the literature, which details a wide variety of sports-related injuries and conditions affecting high school athletics. Orthopedic injury rates in high school sports vary by gender and activity; however, the consistent theme present in the literature is that high school athletes are sustaining orthopedic injuries that require medical attention<sup>4,5</sup>. In addition to orthopedic conditions requiring medical care, special attention should be given to the incidence of general medical conditions relating to cardiovascular disease, with an estimated 100 deaths per year<sup>6</sup>, and heat-related illness, with an estimated 9000 cases treated by medical providers each year<sup>7</sup> in high school athletes alone. In the absence of a certified athletic trainer or other

healthcare provider, there is an increased reliance on coaches to provide the emergency care required to treat these conditions.

The emergence of sudden cardiac death as a pressing healthcare concern amongst athletic participants cannot be overlooked. While there is debate over the exact number of sudden cardiac emergencies that occur in high school sports, the most significant associated issue is its typical occurrence in an athlete who would otherwise be considered healthy and symptom free<sup>6</sup>. Recent literature has indicated that the incidence of sudden death appears to be eight times higher when compared to non-athletes<sup>8</sup>, while specifically the number of deaths in high school sports from indirect causes is significantly higher than for direct traumatic causes<sup>9</sup>. Numerous predisposing factors have been presented in the literature in an effort to specifically decrease sudden deaths in athletics relating to structural and functional abnormalities of the heart<sup>10</sup>.

Previously, authors have recommended the use of more advanced medical imaging including electrocardiograms, to identify the various cardiovascular conditions that may lead to sudden cardiac death. However, this is currently only recommended for those individuals who meet the American Heart Association's risk factors for a cardiovascular incidents<sup>11,12</sup>. The high number of false positive tests<sup>13</sup> along with the increasing cost of medical screening, US\$2 billion annually<sup>14</sup>, has made the use of advanced screening tools for all athletes a non-practical method for identifying abnormalities.



Assessing the level of medical services provided to secondary schools in a more rural area is of vital concern due to the fact that rural areas in the USA have disproportionate health disparities and fewer healthcare resources available when compared to more urbanized cities<sup>10</sup>. It is documented that individuals from rural communities do not seek the same preventative services as their urban counterparts<sup>15</sup> and have higher rates of obesity and sedentary lifestyles, which can lead to cardiac disease<sup>16,17</sup>. With only 29 people per square kilometer, West Virginia is the second most rural state in the nation<sup>18</sup>. West Virginia has elevated rates of health risk behavior and chronic disease and an above-average number of families and individuals living below the poverty line<sup>19,20</sup>.

The risk factors of rural healthcare availability and access, coupled with the increased time between cardiac events and advanced medical care in rural areas, are substantial barriers to providing the appropriate level of health care to student athletes in rural areas. Additionally, a number of previous studies have shown inconsistent medical coverage of high school sports, specifically football<sup>21,22</sup>.

Numerous recommendations have been made to provide a more cost-effective and efficient level of health care to secondary school athletics. These recommendations include providing access to automated external defibrillators (AEDs), implementing emergency action plans (EAPs) and providing medical coverage to all sporting events<sup>3,23,24</sup>. The purpose of this study was to determine the level of implementation of emergency preparedness and administrative procedures to provide appropriate medical coverage to high school athletics in the predominantly rural state of West Virginia. Particular attention was given to determine the extent to which the schools provided the recommendations for best practice in the NATA consensus statement outlining appropriate medical coverage for high school athletics<sup>3</sup>.

## Methods

### *Procedures*

A listing of all public schools participating in the state high school athletic association with at least one team participating

in interscholastic competition was obtained from the West Virginia Department of Education office. Out of the 125 secondary schools in the state, 62 schools were represented in this study, yielding a response rate of approximately 50%. The respondents classified the enrollment of their school as 1A (43.5%), 2A (19.4%), and 3A (35%). The majority of schools (66%) reported a rural zip code at the school level based on Rural Urban Community Area Codes (RUCAs). Each school administrator received an email letter describing the overall purpose of this study, the estimated time for completion of the questionnaire and an electronic link to access the survey instrument. The email also provided contact information for the investigators if the participants had questions or regarding the instrument or results of the study. An administrator from each school was asked to complete a survey specifically assessing policies, procedures and equipment in place at their respective school corresponding the consensus statement points. They were instructed to complete this survey honestly and were given the opportunity to provide feedback regarding the perceived barriers to health care provided. A total of 62 respondents completed the survey (49.6% response rate). The majority of the respondents were principals (92%), followed by athletic administrators (8%).

### *Instrumentation*

An online, cross-sectional, survey utilizing SurveyMonkey was used to gather demographic information along with responses on emergency preparedness. The electronic survey was designed to reduce mailing costs and encourage participation. The survey was organized and constructed to determine compliance with the NATA consensus statement on Appropriate Medical Coverage for Secondary Schools<sup>3</sup>. The areas specifically examined were aligned with consensus statement 2, 'Development and implementation of a comprehensive athletic healthcare administrative system', and statement 5, 'Development and implementation of a comprehensive EAP'. The questions were a component of the Self-Appraisal Checklist for Health Supervision in Scholastic Athletic Programs<sup>25</sup> originally utilized assessing medical care to secondary schools in Arkansas<sup>26</sup>. Open-ended questions assessed barriers and facilitators to successful sports medicine programs. All



questions were drafted using a Likert-type scale with five choices reflecting the level of preparedness and availability of services ('never', 'seldom', 'sometimes', 'always', 'do not know'). School demographics were also measured and school zip codes were collected to determine rurality based on RUCAs. This is a subcounty classification commonly used to classify rural/non-rural areas based on population density and population commuting patterns<sup>27</sup>.

## **Data analysis**

When responses were received, the statistical information was compiled and analyzed to determine completion of all questions. The Statistical Package for the Social Sciences for Windows v21.0 (SPSS; <http://www.spss.com>) was used to complete the statistical analysis. Descriptive statistics were gathered and analyzed for each of the individual questions in the instrument and were classified categorically into the recommendations provided in the NATA statement. In addition, all participants were given an opportunity to provide qualitative responses to open-ended questions, which were analyzed independently by three researchers for recurring themes. Only themes with 100% agreement among researchers were reported and discussed. Each respondent self-classified the school according to the class size of the West Virginia Secondary School Activities Commission classifications. Class 3A is identified as having 778 or more students, Class 2A is classified as 429–777 students, and Class 1A is classified as having 0–428 students.

## **Ethics approval**

This study was approved by the Concord University Human Subjects Review Board (project number S13-18).

## **Results**

### ***Consensus statement point 1: 'Develop and implement a comprehensive athletic healthcare administrative system'***

The majority of respondents reported that there was always a consent form on file for student athletes (91%) and

comprehensive insurance was required for participation in athletics (80%). However, when questioned if there was an ongoing method for maintaining records of weight and illnesses, 16% of schools responded 'never' and 8% of schools responded 'seldom'.

Over half (56%) reported that CPR and first aid certification records of all members of the coaching staff were always kept on file. Thirty-three percent of respondents reported that all members of the coaching staff were certified in CPR and first aid and 31% responded 'never' when asked if all coaches were certified in CPR and first aid (Table 1).

### ***Consensus statement point 5: 'Develop and implement a comprehensive emergency action plan'***

When asked if there was a written EAP that outlines procedures to follow in emergency situations during athletic participation, 36% responded 'never' and 38% responded 'always'. The majority (66%) reported that there was an adequate and readily available communication system between the athletic participation area and paramedical assistance. When asked if there was a written plan for the transportation of injured athletes in practice and in contests in an emergency situation only 38% responded 'always'. When asked if there was a written plan for the transportation of injured athletes in practice and competitions for contests in non-emergency situations an equal number of respondents (36%) responded 'never' and 'always' (Table 2).

The majority (76%) reported that there was an AED readily available and one school reported there was no AED present on site. A majority of the participants stated their school had more than one AED on site (62%; Tables 3,4).

### ***Open-ended question 1: 'What limitations does your school have in providing health care to athletes?'***

Three themes were present within the responses to the first open-ended question, including lack of funding, lack of certified medical personnel, and an inability to find certified personnel in a rural area (Table 5).



**Table 1: Assessment of development of the implementation of a comprehensive athletic healthcare system**

Survey item	Class	Never	Seldom	Sometimes	Always	Did not know
There is an ongoing method for maintaining records of weight, illness and other pertinent medical information regarding the athlete	1A	2	1	4	4	1
	2A	2	1	1	1	0
	3A	0	3	2	2	4
Guardian's consent for medical treatment is on file with the school health personnel and is available to the sports medicine staff	1A	0	0	2	24	0
	2A	0	0	1	11	0
	3A	0	0	0	19	2
A comprehensive insurance program for care of injuries to athletes is required.	1A	1	0	1	22	2
	2A	1	0	1	10	0
	3A	1	1	2	15	2
Administrators and coaches support and follow the recommendations of the sports medicine staff regarding treatment, rehabilitation and removal from competition	1A	0	0	0	26	0
	2A	0	0	2	10	0
	3A	0	0	1	20	1
A pre-participation evaluation including a medical history and examination is performed at least every 2 years.	1A	0	0	0	22	3
	2A	0	0	1	11	0
	3A	1	0	1	17	3
There is a file accessible to sports medicine staff of evaluation reports, major injuries and consultant reports	1A	0	1	4	18	3
	2A	1	1	1	9	0
	3A	0	1	2	13	6
All CPR/first aid certification records for all members of the coaching staff are kept on file at the school	1A	4	1	3	17	2
	2A	0	1	3	7	1
	3A	2	1	4	10	5
All coaching personnel in your school have current certification in CPR, emergency management of life threatening injuries	1A	2	4	4	10	4
	2A	1	0	4	4	2
	3A	1	2	6	4	6
The sports medicine personnel providing coverage at your school have current certification in CPR, emergency management of life threatening injuries	1A	1	1	0	19	3
	2A	0	0	1	9	1
	3A	1	0	0	15	4

Class 1A, 0–428 students. Class 2A, 429–777 students. Class 3A, 778 or more students.  
CPR, cardiac pulmonary resuscitation.

**Table 2: Assessment of development and implementation of a comprehensive emergency action plan**

Survey item	Class	Never	Seldom	Sometimes	Always
There is an adequate and readily available communication system between participation areas and medical assistance	1A	1	0	5	19
	2A	1	1	2	7
	3A	3	0	3	15
There is a written plan for the transportation of injured athletes in practice and in contests: Emergency	1A	9	1	5	10
	2A	4	1	0	6
	3A	11	1	1	7
There is a written plan for the transportation of injured athletes in practice and in contests: Non-Emergency	1A	8	1	4	10
	2A	4	1	0	5
	3A	11	1	1	7
There is a written EAP that outlines procedures to follow in emergency situations during participation in sports for all venues	1A	11	2	3	7
	2A	4	0	1	6
	3A	8	1	2	10
An effective communication system is available to permit immediate access to emergency medical services	1A	1	0	4	19
	2A	0	0	2	9
	3A	2	0	1	17

Class 1A, 0–428 students. Class 2A, 429–777 students. Class 3A, 778 or more students.  
EAP, emergency action plan.



**Table 3: Availability of automated external defibrillators at practice and competition**

Survey item	Class	Never	Seldom	Sometimes	Always
Your school has a readily available AED at all competitions and practices	1A	1	0	0	25
	2A	2	0	4	5
	3A	1	1	2	17

Class 1A, 0–428 students. Class 2A, 429–777 students. Class 3A, 778 or more students.  
AED, automated external defibrillator.

**Table 4: Number of automated external defibrillators at respondent schools**

Survey item	Class	0	1	2	3	4	5	≥6
How many AEDs are currently available at your school?	1A	0	11	6	2	4	0	1
	2A	0	4	4	0	1	0	0
	3A	1	3	4	4	2	2	0

Class 1A, 0–428 students. Class 2A, 429–777 students. Class 3A, 778 or more students.  
AED, automated external defibrillator.

**Table 5: Sample responses to open-ended questions (chosen responses based on recurring themes)**

<i>Question 1: What limitations does your school have in providing health care to athletes?</i>
'Football is the only sport required. I wish we could have a year-round athletic trainer for every sport'
'We live in a rural area, it is tough to get certified people. The certified people we have don't want the liability or to give the time required.'
'Not enough personnel and money to cover all sports, all the time'
'Number of personnel to spread over different sports. We only have one athletic trainer that is responsible for all sports.'
'Limited budgetary constraints; athletic trainer is paid from excess levy.'
<i>Question 2: What would make it easier to provide health care to athletes at your school?</i>
'Additional funding at the district level to provide for contracting with more medical personnel and certified athletic trainers.'
'Greater funding for athletic trainers at the county level to be present at all sports.'
'Athletic trainer for all sports throughout the school term.'
'A full time athletic trainer and a staff of aides from an elective course provided at the school.'

### **Open-ended question 2: 'What would make it easier to provide health care to athletes at your school?'**

Four themes were present within the responses to the second open-ended question, including providing more funding, more certified staff, appropriate treatment space/facilities, and continuing education (Table 5).

## Discussion

The survey examined the recommendations set forth in the Appropriate Medical Care for the Secondary School-Aged

Athlete summary statement published by NATA<sup>3</sup>. This study specifically reviews information related to statements 1 and 5.

### **Consensus statement point 1: 'Develop and implement a comprehensive athletic healthcare administrative system'**

The development of proper administrative procedures should be a critical component of all public facilities operations. One of the primary components of the administrative system should be proper education and oversight of the athletics



program. When no qualified medical personnel, such as an athletic trainer, is present at athletic events, coaches and other athletic staff are often relied upon to provide first aid and manage injuries to the participants. Ensuring that the athletic staff has proper knowledge in the areas of first aid, CPR and management of injuries is essential to the long-term health and safety of all those participating.

Through this study, the authors were able to assess the overall athletic staff's certification rates. One-third (33%) of the schools reported that they always required the coaching staff to maintain certification. Similarly, 31% reported that they never mandated all coaches remain certified in CPR and first aid. These numbers are consistent with a previous study that found less than 50% of coaches in rural South Dakota were currently certified in CPR and first aid<sup>28</sup>. According to the state athletic association, all coaches must achieve certification initially in CPR and first aid, but there is currently no requirement to maintain certification.

The academic preparation of high school coaches across the USA is typically in the form of an undergraduate physical education curriculum. Compared to an athletic trainer or other allied health professional, the level of preparation and coursework in this field committed to first aid and injury management and prevention is significantly lower. Unfortunately, in the absence of an athletic trainer at the high school, the coach is forced to assume the role of the medical provider and manage and treat injuries that have the potential to become life threatening.

Numerous studies have demonstrated the relatively low knowledge of high school coaches in regards to a variety of health-related issues associated with athletic participation, specifically in the management and recognition of concussion symptoms<sup>29,30</sup>, as well as alarmingly low passing scores on a first aid<sup>31</sup>, and knowledge of fluid replacement and hydration strategies<sup>32</sup>. The present study did not assess the coaches' knowledge in this area; however, the implementation of a healthcare administrative system with individuals possessing knowledge in these areas or at minimum enhancing education in the coaches is essential in reducing the risk of serious

injury. It has been documented that knowledge has increased after completion of educational workshops instructing coaches on management of sports related injuries<sup>33</sup>. This should be an important consideration when assessing the needs and planning of every interscholastic athletic program.

### *Consensus statement point 5: 'Develop and implement a comprehensive emergency action plan'*

The implementation of a comprehensive EAP is another method designed to decrease the risk of death in athletes<sup>24,34,35</sup>. This emergency plan should encompass all aspects of medical care including implementation of care to be provided, equipment available to be used in case of an emergency, communication methods to access emergency medical services and activate the emergency response, and transportation methods to and from the facility for injured and non-injured individuals<sup>24</sup>.

It has been previously reported that 79% of individuals suffering from sudden cardiac arrest survived in locations where an EAP was published compared to a 44% survival rate in locations where there was no EAP<sup>36</sup>. The results of the present study showed that only 38% of the schools in the state had a published EAP for all of the athletic venues and 36% reported that they did not. Currently, not all states have mandated that employment of athletic trainers or EAPs be present. Legislation requiring increased levels of health care and emergency planning in high schools has proven effective in Hawaii, which requires athletic trainers to be employed at every high school<sup>37</sup>, and in Tennessee, which saw an increase in EAPs and AEDs in the high schools after legislation was passed<sup>38</sup>.

Recently, there has been a major public effort to get AEDs and EAPs in all places where the public gathers, in order to decrease the risk of out-of-hospital mortality. AEDs are a widely accepted out-of-hospital method to provide care to an individual experiencing a cardiac event. Schools that possess written EAPs also tend to have an AED program in place to deal with sudden cardiac arrests<sup>39</sup>. This illustrates the need for every school to have a written EAP and associated cardiac



care plan to increase the survival rates of individuals with a sudden cardiac condition. This 'chain of survival' concept has been widely recommended by the American Red Cross as well in the literature<sup>40</sup>.

The results of the present study showed that the majority (76%) of schools in the state always had an AED present. This is consistent with results in other rural communities showing 81% of schools in the state of Vermont having at least one AED present<sup>34,41</sup>. While the present study did not look at the mortality rates associated with sudden cardiac arrests at the high schools, previous studies have shown survival rates of up to 71% when defibrillation was performed on site by an AED<sup>36</sup>. This is an increase of survival from previous studies that showed there was a 21% survival rate of sudden cardiac deaths from the years 2000 to 2006<sup>42</sup>.

Participants in the present study consistently expressed the desire to provide more medical services to the athletes, yet the major barrier prohibiting the provision of services was consistently cited as a lack of funding. This lack of financial support is commonly cited as the major mitigating factor in provision of health care<sup>43</sup>. Due to the economic hardship experienced by many in West Virginia, this barrier is not surprising.

Increasing funding along with increased legislation could very well prove to be an essential component to decrease the risk associated with athletic participation, specifically in underserved rural communities.

With only 20 out of the 56 schools responding stating that they currently had a Board of Certification certified athletic trainer on staff, along with a majority of the respondents stating that the healthcare provider was only present for football, identifying methods to provide improved care to high school athletics is essential to reduce the rate of sudden death amongst this population. Because advanced cardiac screening on every athlete is neither cost-effective nor practical, alternative methods should be examined and when possible implemented. While it is recommended that high school sports employ an athletic trainer, proper funding and

facilities for these positions is often lacking. Developing an EAP and requiring coaches to maintain first aid and CPR certifications are very easy and very low cost steps to enhance the health care of athletes. This is an essential component of all school athletic programs without a qualified medical professional present at practices and games. These two simple steps may help reduce the risk of a sudden cardiac event or other life-threatening injury and reduce the legal liability of the school district and employees.

Limitations in this study include problems associated with survey data including social desirability bias. Additionally, while every effort was made to ensure the confidentiality of their responses, school personnel might be hesitant to report information that would show non-compliance with state or national policies. While RUCA codes were used to measure rurality, the zip codes were at the school, not individual, level. Thus, the rural/non-rural designations might not be appropriate when considering some school locations may be placed outside of more densely populated areas to accommodate traffic and school facilities. Further, since the sample was collected from West Virginia, a largely rural state, the non-rural areas are unlikely to be considered urban. Additionally, with a 50% response rate, selection bias could influence results and thus the data might not be representative of the state or all rural areas.

## Conclusions

Preparing for a life-threatening emergency in secondary school athletics is vital to reducing the number of sudden cardiac deaths among young athletes. Alternative funding sources to provide AEDs and improve health care in rural communities should be a priority, especially in high-risk areas. Without proper funding, schools will continue to find it difficult to provide the appropriate level of health care recommended by numerous organizations, which may result in dangerous amounts of time waiting for advanced medical support to arrive. While the barriers in West Virginia are significant, inexpensive and achievable steps could be taken to increase the safety of athletics for students in this rural state.





Where appropriate healthcare providers are lacking at secondary school events, coaches should be required to maintain training and certifications in first aid, CPR and emergency care to ensure increased survival rates in the event of a catastrophic injury or event. Thus, increasing legislation or requiring all secondary schools to possess EAPs and AEDs as well as have qualified medical personnel at all events should be a priority for all individuals involved in secondary school athletics, in both rural and non-rural locations.

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