

State Level Implementation of Health and Safety Policies Pertaining to Preventing Sudden Death and Catastrophic Injury in Secondary School Athletics

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4 **Abstract**

5 **Background:** Sudden death and catastrophic injury during sport can be attenuated with the
6 implementation of evidence-based health and safety policies. However, it is unknown as to the extent of
7 implementation of these policies within secondary school athletics.

8 **Purpose:** To provide an assessment of the implementation of health and safety policies pertaining to the
9 leading causes of sudden death and catastrophic injury in sport within secondary school athletics.

10 **Study Design:** Descriptive observational design.

11 **Methods:** A rubric for evidence-based based practices for preventing the leading causes of death and
12 catastrophic injury in sport was created. Five equally weighted sections for sudden cardiac arrest, head
13 injuries, exertional heat stroke, appropriate medical coverage and emergency preparedness comprised the
14 rubric. State high school athletic association (SHSAA) policies, enacted legislation and Department of
15 Education policies were extensively reviewed for all 50 states and District of Columbia. States meeting
16 the specific criteria in the rubric, which required policies to be mandated for all SHSAA member
17 secondary schools, were awarded credit; the weighted scores were tabulated to calculate an aggregate
18 score. States were then ranked from 1 (best) to 51 (worst) based on the aggregate score achieved.

19 **Results:** The median score on the rubric was 47.1% (range 23-78.75%). States ranked 1-10 (78.75%-
20 56.98%) were: NC, KY, MA, NJ, SD, MO, WA, HI, WI and GA, respectively. States ranked 11-20
21 (56.03%-50.55%) were: AR, NY, MS, WV, OR, IL, TN, AZ, TX and DC respectively. States ranked 21-
22 30 (49.40%-44.00%) were: VA, PA, FL, NM, AL, ME, RI, IN, NV and UT respectively. States ranked
23 31-40 (43.93%-39.80%) were: OH, DE, AK, VT, LA, MD, OK, CT, ID and SC respectively. States
24 ranked 41-51 (38.73%-23.00%) were: MI, ND, NE, NH, KS, WY, MN, MT, IA, CA and CO
25 respectively.

26 **Conclusion:** State grades ranged from 23% to 78.75% for implementation of evidence-based best
27 practices for preventing the leading causes of sudden death and catastrophic injury (sudden cardiac arrest,
28 traumatic head injuries, exertional heat stroke and exertional sickling) in sport. Continued advocacy for

29 policy development and implementation at the secondary school level surrounding sudden death and
30 catastrophic injury is warranted to optimize the health and safety of these student athletes.

31

32 **Key Terms:** Sudden Cardiac Death, Exertional Heat Stroke, Traumatic Head Injuries, Emergency Action
33 Plans, Pre-participation Examination

34

35 **What is known about the subject:** Evidence has shown that the implementation of evidence-based best
36 practices on topics related to sudden death during sport and physical activity such as access to automated
37 external defibrillators and heat acclimatization has reduced the incidence of sudden death in these
38 settings.

39

40 **What this study adds to existing knowledge:** This is the first study to date that has objectively graded
41 individual states on the implementation of evidence-based best practice recommendations for preventing
42 the leading causes of death during sport and physical activity. Providing an objective assessment of each
43 state high school athletic association, which collectively oversees the participation of over 7.5 million
44 youth athletes participate on a yearly basis will provide a basis for continued advocacy to ensure that the
45 health and safety of youth athletes participating in sport in the United States is optimized.

46

47 **INTRODUCTION**

48 With over 7.8 million secondary school athletes participating in sanctioned sports on an annual
49 basis, it is prudent that their health and safety remains paramount to those overseeing secondary school
50 athletics at all levels.²⁸ When examining the total number of secondary school athletes sustaining fatal or
51 catastrophic injuries from 1982-2015, there have been 735 fatalities (185 from direct causes, 550 from
52 indirect causes) and 626 catastrophic injuries (613 from direct causes, 13 from indirect causes), with
53 direct causes attributed to trauma (i.e., athlete-to-athlete or athlete-to-object contact) and indirect causes
54 being exertion based (i.e. sudden cardiac arrest, exertional heat stroke, asthma).²⁴ Furthermore, evidence
55 shows that 90% of all sudden death during sport are accounted for by four conditions: sudden cardiac
56 arrest, traumatic head injuries, exertional heat stroke and exertional sickling.^{9,24} While the risk of
57 mortality and morbidity is to those participating in secondary school athletics, various steps can be taken
58 to mitigate this risk and optimize emergency preparedness and care in this population.

59 The development and implementation of evidence-based best practices specific to factors
60 responsible for sudden death in sport and physical activity has been shown to reduce the risk of morbidity
61 and mortality.^{1,2,7,16,18,20} The National Collegiate Athletics Association (NCAA) has found success with
62 implementation of various health and safety policies such as heat acclimatization in 2003 and notification
63 of sickle cell trait status in 2010.¹ Similarly, evidence has shown that in states that have mandated heat
64 acclimatization for secondary school athletics, there have been zero exertional heat stroke (EHS) related
65 deaths since implementation whereas prior to implementation these states had 50% (22 of 44) of all EHS
66 related deaths from 1980-2015.⁷

67 While implementation of health and safety policies at the NCAA level affects member schools
68 across the United States, policy changes at the secondary school level are left to the individual states as
69 the National Federation of High Schools has no governing authority over the health and safety policies for
70 secondary school athletics. States have continued to make progress in enhancing the health and safety of
71 their student athletes;^{1,3,4,19,32,33} however, the extent of mandated policies on topics related to the leading
72 causes of sudden death in sport is unknown. Therefore, the purpose of this study is to provide a graded

73 assessment of the implementation of health and safety policies pertaining to the leading causes of sudden
74 death and catastrophic injury in sport at the state level for secondary school athletics.

75 **METHODS**

76 **Study Design**

77 This study utilized a descriptive observational design. Health and safety policies specific to the
78 leading causes of sudden death and catastrophic injury in sport and emergency preparedness were
79 quantified for all 50 states and the District of Columbia. For the purposes of this study, only policies that
80 were required or mandated to be followed by all state high school athletic association (SHSAA) member
81 schools were used. Policies that were recommended or encouraged were not included as it suggests that
82 individual schools were left to decide whether or not to implement evidence-based best practices. The
83 Institutional Review Board at the University of Connecticut deemed that this study was exempt from
84 Institutional Review Board approval, as this study did not involve human subjects.

85 **Rubric Development**

86 To provide an objective assessment as to where individual states ranked in terms of health and
87 safety policies aimed at preventing the leading causes of sudden death in sport, a grading rubric was
88 created (Table 1). Utilizing current evidence-based best practices for preventing sudden death in sport
89 within secondary school athletics¹¹ and supplementary position statements, consensus statements and
90 inter-association task force statements endorsed by some of the leading medical organizations within the
91 United States (Table 2),^{5,8,10,12-15,17,22,23} the grading rubric was created containing five equally weighted
92 sub-sections: sudden cardiac arrest, exertional heat stroke, traumatic head injury, appropriate health care
93 coverage and emergency preparedness. The weighting of the individual components within each sub-
94 section was derived from the number of components within each sub-section.

95 Following the completion of the grading rubric, the rubric was assessed for overall content. Five
96 experts in the areas of preventing sudden death in sport independently reviewed the rubric to establish
97 content validity. The five experts were board certified athletic trainers with either a PhD (n=3) or Masters
98 of Science (n=2) degree in exercise science with a collective of 38 years of clinical experience and 78

99 published peer-reviewed papers on topics related to sudden death in sport and physical activity. Upon
100 review of the rubric by the expert reviewers, all comments were tabulated and changes in the content of
101 the rubric were made when there was a majority consensus (≥ 3 of 5 expert reviewers agreeing) or if the
102 comment was substantiated by current evidence-based best practices.

103 **Data Collection Procedures**

104 Data on required health and safety policies for preventing sudden death in sport were collected
105 from state entities empowered to make statewide regulations for SHSAA member schools. SHSAA
106 handbooks, bi-laws and constitutions for the 2016-2017 academic year were obtained in addition to any
107 policies and procedures available via public assess sources (i.e., SHSAA's website). Relevant enacted
108 legislation signed by the respective state's governor as well as policies and procedures instilled by each
109 state's Department of Education were also obtained. For the purposes of this study, only publicly
110 accessible data was obtained and reviewed from the aforementioned entities..

111 Two researchers (WMA & SES) with 8 years collective experience researching health and safety
112 policies at the secondary school level, 14 years clinical experience as board certified athletic trainers and
113 27 peer-reviewed publications on the topic of preventing sudden death in sport and physical activity
114 independently reviewed the extent of policy implementation for each state based on the materials that
115 were acquired from the aforementioned entities. States were given credit for each rubric-specific criterion
116 met and the associated weighted value for each criterion was summed to provide an overall grade.

117 Following the independent review and grading, the two researchers met to compare their grades for each
118 state. Any discrepancies within the grading of individual components of the rubric were discussed
119 between the two researchers until a consensus was made. In the event of the two researchers being unable
120 to arrive at a consensus, a third researcher (DJC), who is a board certified athletic trainer with 24 years of
121 experience and 205 peer-reviewed publications on the topic of preventing sudden death in sport and
122 physical activity was brought in to make a final decision.

123 Following the final determination of each state's individual grade from the rubric, a round of
124 quality assurance was completed. Each state's rubric was sent to the executive director of that state's

125 respective SHSAA. In addition, the rubric was also sent to the attendees of the 2017 Collaborative
126 Solutions for Safety in Sport meeting, which consisted of representatives from each SHSAA and Sports
127 Medicine Advisory committee, as they were made aware of this project during the meeting held in March
128 2017 in Kansas City, MO. Individuals receiving the rubric were given 30 calendar days to review the
129 rubric and provide the researchers with any discrepancies from their perspective. If discrepancies existed,
130 the individuals were requested to provide a copy of the publically available policy in question for
131 assessment by the researchers. If the researchers confirmed that discrepancies existed, the rubric was
132 updated to reflect the changes in the data provided by the representatives from the SHSAA. Fifteen states
133 responded to emails within the 30-day period with eight states identifying discrepancies with the rubric
134 grades. The eight states that indicated discrepancies provided the appropriate documentation as to where
135 the policy was located for their state in which the researchers reviewed using the aforementioned steps
136 and made changes to the rubric if warranted. For the states that did not respond within the 30-day period,
137 it was assumed that the information listed was correct and no further changes were made.

138 **Data Analysis**

139 The scores for each state's rubric were tabulated to obtain an aggregate score, which was based
140 on a total score of 100. The scores were then transformed to a percentage and each state was ranked from
141 1 (state with the greatest number of health and safety policies required of their member schools) to 51
142 (state with the lowest number of health and safety policies required of their member schools). The rubric
143 grades are also presented as median and percentiles.

144 **RESULTS**

145 Table 3 depicts the rank of all 50 states and the District of Columbia pertaining to the
146 implementation of evidence-based best practices for preventing the leading causes of death and
147 catastrophic injury in sport. Of the 50 states and District of Columbia, the median score on the grading
148 rubric was 47.1%. States scoring in the top 10%, with a score of $\geq 60.46\%$ on the grading rubric, were
149 North Carolina, Kentucky, Massachusetts, New Jersey and South Dakota. Conversely, states scoring in

150 the bottom 10%, with a score of $\leq 33.68\%$ on the grading rubric, were Minnesota, Montana, Iowa,
151 California and Colorado. Individual state scoring is depicted in the associated Appendix.

152 **DISCUSSION**

153 The purpose of this study was to objectively grade each of the 50 states within the United States
154 and District of Columbia on the implementation of evidence-based best practice policies for preventing
155 the leading causes of sudden death and catastrophic injury in sport at the secondary school athletics level.
156 To our knowledge, this is the first time that an objective assessment and ranking of state's implementation
157 of health and safety policies specific to the leading causes of sudden death and catastrophic injury in sport
158 has been published. We found that the grades states received ranged from 23% to 78.75% with a median
159 score of 47.1%. In addition, we found that the state with the greatest number of evidence-based best
160 practice health and safety policies on this topic was the state of North Carolina, compared to the state of
161 Colorado, which had the least number of policies required of their SHSAA member schools.

162 Upon review of each state's policies, a large degree of variability was observed, which was
163 reflected in the subsequent scores and ranking for each state. States that tended to score higher on the
164 grading rubric had policies in place that covered evidence-based best practices in all five sub-sections of
165 the grading rubric. Conversely, states that tended to score lower on the grading rubric were lacking
166 policies in one or more sub-section all-together.

167 Examining the evidence-based best practices that all states required of their SHSAA member
168 schools to implement focused on the management of suspected concussion; if a concussion is suspected
169 the athlete is removed from play and not permitted to return until cleared by a healthcare professional.
170 Collectively, the only evidence-based best practices that were not readily met across the United States
171 pertained to the regulation of off-season strength and conditioning sessions. This is alarming as secondary
172 school student athletes have continued to die during strength and conditioning sessions and data from the
173 collegiate level has shown that off-season strength and conditioning sessions are responsible for the
174 greatest number of Division I football athlete deaths from 2000-2016.⁶

175 The large variability in policy implementation at the state level can be attributed to the
176 differences between states' procedures for developing and implementing health and safety policies at the
177 secondary school level. Within secondary school athletics, each state has the autonomy to develop and
178 implement health and safety policies, which is voted upon by each state's high school athletic association
179 upon receiving recommendations from their sports medicine advisory committee or enacted through state
180 legislation. While each state's sports medicine advisory committee, a committee comprised of licensed
181 healthcare professionals, may put forth proposed health and safety policies, the final decision on the
182 adoption and implementation of such proposed policies are typically the responsibility of the SHSAA
183 executive committee, which often does not have any medical expertise. Likewise, at the legislative level,
184 unless there is engagement from all stakeholders involved (i.e., sports medicine professionals, secondary
185 school administrators and legislators), health and safety policies for secondary school athletics may lack
186 essential components of evidence-based best practices.

187 Notwithstanding, most SHSAAs maintain positive professional relationships with their sports
188 medicine advisory committees (Pike AM, et al., unpublished data, 2017) and have made continued
189 progress in developing programs and policies to better protect their student athletes. Ultimately, to
190 optimize the health and safety of secondary school student athletes in the United State, the policies and
191 procedures to minimize risk of sudden death need to be created, implemented, evaluated, and refined by
192 the sports medicine advisory committee in each state and not the high school athletic association. This
193 would assure those with the most knowledge of serious potential medical consequences are the decision
194 makers for the implementation of best practices of these issues.

195 From a national level, the National Federation of State High School Associations (NFHS)
196 oversees the rules of 16 secondary school sports, which covers an estimated 7.8 million student athletes.²⁷
197 Rules passed down to each state from the NFHS focus on fair play, sportsmanship, minimizing risk,
198 maintaining the traditions of the sport and providing an even balance between offense and defense.²⁷
199 These rules are specific to each individual sport and involve topics such as playing field, sport-specific
200 equipment and personal protective equipment. While sport-specific rules for minimizing risk of injury

201 exist, such as wearing helmets, mouth guards, ear and eye protection to protect from traumatic face, skull,
202 brain and neck injuries,^{25,26,29-31} the NFHS does not currently have any rules pertaining to indirect causes
203 of sudden death such as sudden cardiac arrest or exertional heat stroke.

204 Identifying strategies to prevent sudden death in sport and physical activity has led to the
205 development of evidence-based best practices to guide patient care on topics such as sudden cardiac
206 arrest, exertional heat stroke, traumatic brain injury and overall emergency preparedness. Implementation
207 of policies related to the prevention and management of the leading causes of sudden death in sport has
208 proven successful in reducing the number of fatalities previously observed at both the collegiate and
209 secondary school level.^{1,2,7,18} Aside from reducing the number of fatalities associated with the leading
210 causes of sudden death during sport, implementation of heat acclimatization and environmental-based
211 activity modification policies has been shown to significantly reduce the incidence of exertional heat
212 illness as a whole (Cooper ER, et al., unpublished data 2017). Despite supporting evidence showing the
213 effectiveness of the aforementioned policies, many states have yet to fully adopt and implement these life-
214 saving policies within secondary school athletics as observed from our findings.

215 **LIMITATIONS AND FUTURE RESEARCH**

216 While the purpose of the current study was to evaluate policy implementation at the state level,
217 we did not capture policy implementation for all secondary schools within the United States. Private
218 and/or boarding secondary schools are often regulated by independent league organizations, and
219 therefore, are only obligated to abide by legislative mandates rather than policies in place by each
220 SHSAA. The current study also only examined policies required and/or mandated within the 2016-2017
221 academic year, which may not reflect the positive changes that states have made leading up to the
222 academic year in which data was collected. While data suggests that most SHSAAs maintain positive
223 professional relationships with their sports medicine advisory committees in driving policy changes, this
224 data is currently unpublished. Given prior literature investigating the effectiveness of mandated versus
225 recommended policies from a broader public health issue²¹ future research is needed to investigate the
226 effectiveness of mandated versus recommended policies within secondary school athletics on reducing the

227 incidence of sudden death in this setting. The current study only examined the implementation of
228 mandated policies as this requires all SHSAA member schools to follow the written policies, versus a
229 recommended policy in which individual schools/school districts are at the discretion of deciding what
230 policies to put in place for their school. Additionally, while this study identifies the current policy
231 requirements for secondary schools across the United States, future research should investigate the local
232 implementation of these policies in secondary schools.

233
234 **CONCLUSION**

235 When assessing health and safety policies pertaining to the leading causes of sudden death at the
236 state level for secondary school athletics, states only met 23-78.75% of evidence-based best practice
237 recommendations. Continued efforts by all entities (National Federation of State High School
238 Associations, State High School Athletics Associations, State Sports Medicine Advisory Committees,
239 Department of Education and State Legislature, etc.) overseeing secondary athletics within the United
240 States are warranted to better enhance the health and safety of our young student-athletes.

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Table 1. State grading rubric for assessing implementation of evidence-based best practices for preventing and managing the leading causes of sudden death in secondary school athletics.

Topic Areas	Specifications	Yes/No	Weighting (%)
Sudden Cardiac Arrest			
	Screening (PPE questions and Physician clearance)	Y	4
	<i>Require 4th Edition PPE forms from American Academy of Pediatrics or equivalent</i>		
	AED onsite at each venue or accessible within 1-3 minutes		16
	1A. AEDs are to be used under the advice and consent of a physician by individuals with proper training and certification	Y	2
	2A. AED should be stored in a safe place	Y	2
	3A. All athletic trainers, coaches, administrators, school nurses, and physical education teachers should have access to an AED on school property	Y	2
	4A. Institutions sponsoring athletic events/activities should have a AED on site or access to one at each athletic venue for practices, games, or other athletic events	Y	2
	5A. Individuals [all personnel involved with sponsored athletic events/activities] should be provided annual training and certification in CPR and AED use	Y	2
	6A. Location of AED should be well marked, publicized, accessible and known among trained staff	Y	2
	7A. The AED should be used only after enacting the EMS system.	Y	2
	8A. AEDs should be inspected frequently to ensure proper working order. This includes making sure the batteries are charged, and wires and electrodes are in good condition	Y	2
	Section Total		20
Exertional Heat Stroke			
	Heat Acclimatization		7
	1H. Days 1–5 are the first formal practices. No more than 1 practice occurs per day	Y	1
	2H. In days 1-5, total practice time should not exceed 3 hours in any 1 day	Y	1
	3H. On days 1-5, 1-hour maximum walk-through is permitted, however there must be a 3 hour minimum between practice and walk-through (or vice versa)	Y	1

<p>4H. During days 1–2 of first formal practices, a helmet should be the only protective equipment permitted (if applicable). During days 3–5, only helmets and shoulder pads should be worn. Beginning on day 6, all protective equipment may be worn and full contact may begin.</p> <p>Football only: on days 3–5, contact with blocking sleds and tackling dummies may be initiated</p> <p>Full-contact sports: 100% live contact drills should begin no earlier than day 6</p>	Y	1
<p>5H. Day 6–14, double-practice days must be followed by a single-practice day. On single-practice days, 1 walk-through is permitted, separated from the practice by at least 3 hours of continuous rest. When a double-practice day is followed by a rest day, another double practice day is permitted after the rest day.</p>	Y	1
<p>6H. On a double-practice day, neither practice day should exceed 3 hours in duration, and no more than 5 total hours of practice in the day. Warm-up, stretching, cool-down, walk-through, conditioning and weight-room activities are included as part of the practice time.</p>	Y	1
<p>7H. On a double-practice day, the 2 practices should be separated by at least 3 continuous hours in a cool environment.</p>	Y	1

Environmental-based activity modifications

1W. State requires all schools to have a heat modification policy	Y	0.625
2W. The heat policy is based off of WBGT (optimal measurement)	Y	0.625
3W. The recommended heat policy is based off of Heat Index (adequate alternative if WBGT is unavailable)	Y	0.625
4W. The environmental conditions guidelines are based off of epidemiological data specific to that state/region (for bigger states a more comprehensive analysis may be needed)	Y	0.625
5W. The heat policy has at minimum 4 levels of modification, including the modification of practice time	Y	0.625
6W. Policy includes modification of equipment (if applicable to the sport)	Y	0.625
7W. Policy includes modification of work:rest ratios, including unrestricted access to fluids	Y	0.625
8W. Policy mentions the use of a shaded area for rest breaks	Y	0.625

Cold water immersion tubs for onsite cooling for all warm weather practices Y 3

If exertional heat stroke is suspected, onsite cooling using cold water immersion before transport to the hospital Y 3

Screening questions on PPE (i.e., previous history, other predisposing factors) Y 2

Require 4th Edition PPE forms from American Academy of Pediatrics or equivalent

Section Total	20
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Traumatic Head Injuries

Comprehensive training and education for coaches (i.e. Heads up Football or equivalent) **10**

Football Coaches-8 Points

Y	8
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All Coaches-2 Points

Y	2
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Athletes not permitted to return to activity on the same day if a concussion is suspected Y **2**

Athletes not permitted to return to activity until cleared by an appropriate healthcare professional (MD, AT, DO, PA, APRN) Y **2**

Athletes are not permitted to start return-to-play until they fully return to school Y **2**

A minimum of a 5-step graduated return to play protocol required before full return to activity Y **2**

No more than 2 phases in any one day

If symptoms return during any one step, athlete must regress to previous step

Concussion related PPE questions Y **2**

Require 4th Edition PPE forms from American Academy of Pediatrics or equivalent

Section Total	20
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Table 1 Cont'd

Appropriate Health Care Coverage

Athletic Trainer Regulation **10**

Licensure-10 Points

Y	10
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Some Form (i.e. Registered)-5 Points

0	
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No Regulation-0 Points	0
Appropriate healthcare professional (e.g. Athletic Trainer) be onsite at collision/contact practices	10
<i>Required at all collision/contact practices and competitions-10 Points</i>	Y
<i>Recommended at all collision/contact practices and competitions-5 Points</i>	10
	0
Section Total	20

Emergency Preparedness

Emergency Action Plans	8
<i>1E. Every school or organization that sponsors athletics should develop an EAP specifically for managing serious and/or potentially life-threatening sport-related injuries (athletics emergency action plan, AEAP)</i>	Y
	0.8
<i>2E. The AEAP should be developed and coordinated with local EMS, school public safety officials, on site medical personnel or school medical staff, and school administrators</i>	Y
	0.8
<i>3E. Every school should distribute the AEAP to all athletics staff members</i>	Y
	0.8
<i>4E. The AEAP should be specific to each venue (including maps, directions, etc.)</i>	Y
	0.8
<i>5E. On-site emergency equipment that may be needed in an emergency situation should be listed</i>	Y
	0.8
<i>6E. The AEAP should identify personnel and their responsibilities to carry out the plan of action with a designated chain of command</i>	Y
	0.8
<i>7E. Appropriate contact information for EMS</i>	Y
	0.8
<i>8E. Plan should specify documentation actions that need to be taken post emergency</i>	Y
	0.8
<i>9E. AEAP should be reviewed and rehearsed annually by all parties involved</i>	Y
	0.8
<i>10E. Healthcare professionals who will provide medical coverage during games, practices, or other events should be included</i>	Y
	0.8
Coaching education required as part of coaching certification on topics related to preventing sudden death in sport	Y
	4
CPR/AED and First aid training are required for all coaches	Y
	4
<i>All Coaches-4 Points</i>	Y
	4
<i>Only Head Coaches-2 Points</i>	Y
	0
Sickle Cell Trait Status	Y
	2
<i>Require 4th Edition PPE forms from American Academy of Pediatrics or equivalent</i>	Y
	2

Regulation of S&C sessions

2

- 1S. *Conditioning periods should be phased in gradually and progressively to minimize risk of injury during transitional periods. Also, Introduce new conditioning activities gradually, especially during the early stages of a conditioning program*
- 2S. *Exercise and conditioning activities are not permitted to be used as punishment*
- 3S. *Requires appropriate supervision (i.e., coach certified in CPR/First Aid with education on the prevention of sudden death in sport or an Athletic Trainer onsite)*

Y	0.667
Y	0.667
Y	0.667
Section Total	20
Total Score	100

Abbreviations: PPE=Pre-Participation Examination, AED=Automated External Defibrillator, WBGT=Wet Bulb Globe Temperature, MD=Physician, AT=Athletic Trainer, DO=Doctor of Osteopathy, APRN=Advanced Practice Nurse Practitioner, CPR=Cardiopulmonary Resuscitation, EMS=Emergency Medical Services, EAP=Emergency Action Plan

Table 2. Medical and sport organizations endorsing evidence-based best practice recommendations on topics for preventing and managing the leading causes of sudden death in sport

	Inter-Association Task Force Documents					Consensus Statements		Position Statements		
	Secondary School Athletics ⁸	Sudden Cardiac Arrest ¹⁴	Conditioning Sessions ⁹	Heat Acclimatization ¹⁰	Pre-Participation Examination ⁵	Concussion ¹⁸	Preventing Sudden Death in Sport ¹²	Concussion ⁷	Exertional Heat Illness ¹¹	Emergency Action Planning ³
NFHS	NFHS	ACEP	AAP	AOASM			NATA*	NATA*	NATA*	NATA*
AMSSM	AAP	ACSM	AMSSM	AOASM	AOASM					
AOSSM	ACEP	AMSSM	NATA	AMSSM	AMSSM					
AOASM	ACSM	AOSSM	ACSM	ACSM	ACSM					
CATA	AHA	CATA	GSSI	GSSI	AAP					
GSSI	AMSSM	CSCCA	NSCA	NSCA	AAFP					
KSI	AOSSM	GSSI	AOSSM	AOSSM						
NATA	AOASM	KSI								
NCCSIR	APTA	NASM								
NCSF	NAEMSP	NATA								
ACSM	NAEMT	NSCA								
NIAAA	NATA									
NSCA	NCAA									
GFELLAR	AAEM									
	SCAA									

* Organization that published the position statement. Abbreviations: NFHS=National Federation of State High School Associations, AMSSM=American Medical Society for Sports Medicine, AOSSM=American Orthopaedic Society for Sports Medicine, AOASM=American Osteopathic Academy of Sports Medicine, CATA=Canadian Athletic Therapists Association, GSSI=Colorado Sports Science Institute, KSI=Korey Stringer Institute, NATA=National Athletic Trainers' Association, NCCSIR=National Center for Catastrophic Sport Injury Research, NCSF=National Council on Strength and Fitness, ACSM=American College of Sports Medicine, NIAAA=National Interscholastic Athletic Administrators Association, NSCA=National Strength and Conditioning Association, GFELLAR=Matthew A. Geller Sport-Related Traumatic Brain Injury Research Center, AAP=American Academy of Pediatrics, ACEP=American College of Emergency Physicians, AHA=American Heart Association, APTA=American Physical Therapy Association Sports Physical Therapy Section, NAEMSP=National Association of Emergency Medical Service Physicians, NAEMT=National Association of Emergency Medical Technicians, NCAA=National Collegiate Athletic Association, SCAA=Sudden Cardiac Arrest Association, NASM=National Academy of Sports Medicine, AAEM=American Academy of Emergency Medicine, CSCCA=Collegiate Strength and Conditioning Coaches Association, AAFP=American Academy of Family Physicians, BJSM=British Journal of Sports Medicine

Table 3. Ranking of states regarding the implementation of evidence-based best practices for preventing and managing the leading causes of sudden death in secondary school athletics.

Rank	State	Score, %	Rank	State	Score, %
1	North Carolina	78.75	26	Maine	47.10
2	Kentucky	71.13	27	Rhode Island	46.73
3	Massachusetts	67.40	28	Indiana	46.00
4	New Jersey	67.03	29	Nevada	45.00
5	South Dakota	60.58	30	Utah	44.00
6	Missouri	60.00	31	Ohio	43.93
6	Washington	60.00	32	Delaware	43.73
8	Hawaii	59.13	33	Alaska	43.40
8	Wisconsin	59.13	34	Vermont	42.38
10	Georgia	56.98	35	Louisiana	41.00
11	Arkansas	56.03	36	Maryland	40.63
12	New York	55.75	37	Oklahoma	40.50
13	Mississippi	55.25	38	Connecticut	40.00
14	West Virginia	54.33	39	Idaho	40.00
15	Oregon	53.59	40	South Carolina	39.80
16	Illinois	53.38	41	Michigan	38.73
17	Tennessee	52.73	42	North Dakota	38.00
18	Arizona	52.00	43	Nebraska	37.75
19	Texas	50.80	44	New Hampshire	36.00
20	District of Columbia	50.55	45	Kansas	35.75
21	Virginia	49.40	46	Wyoming	35.00
22	Pennsylvania	49.00	47	Minnesota	33.35
23	Florida	48.25	48	Montana	33.25
24	New Mexico	48.08	49	Iowa	33.00
25	Alabama	47.20	50	California	26.00
			51	Colorado	23.00