

# A Survey of Certification for Cardiopulmonary Resuscitation in High School Athletic Coaches

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## ABSTRACT

**Background:** Cardiopulmonary resuscitation (CPR) can increase survival in instances of sudden cardiac arrest. Nationally, high school coaches are the first responders to sudden cardiac arrest in up to one-third of high school athlete collapses, but little is known about the status of their CPR certification. The primary goal of this study was to assess the proportion of Wisconsin high school coaches that are certified in CPR.

**Methods:** A prospective web-based survey was developed and distributed to high school athletic directors in Wisconsin.

**Results:** Seventy-eight percent of respondents reported that coaches are the primary responders to a collapse. The majority of high schools do not require CPR certification and only 50% of coaches are currently CPR certified. Athletic directors with greater than 12 years of experience were the most likely to have an emergency action plan in place ( $P=0.004$ ).

**Conclusion:** In Wisconsin, the proportion of coaches who act as the primary responder to a collapse is greater than previously reported. Although the majority of coaches in Wisconsin serve as the primary responder to an episode of sudden cardiac arrest, only about 50% are CPR certified. Due to the severe consequences of sudden cardiac arrest, CPR certification among coaches should be required.

## INTRODUCTION

Although sudden cardiac arrest (SCA) is a relatively rare event in the pediatric population, with an incidence of 4.4/100,000 in high school student athletes, it has a devastating and long-lasting effect on families, society, and the economy given the number of life years potentially lost.<sup>1</sup> Historically, the survival rate for children following a witnessed SCA was estimated to be about 11%.<sup>2</sup> However, 1 recent study found that 64% of high school athletes with SCA survived until discharged from the hospital.<sup>1</sup>

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One reason for this increased survival rate is the early utilization of automated external defibrillators (AEDs), but timely initiation of cardiopulmonary resuscitation (CPR) also is likely a contributing factor as 94% of the victims in the study received CPR before use of an AED.<sup>1</sup>

Outcomes following SCA are highly dependent on time elapsed from collapse to defibrillation, making effective responses from a bystander a critical determinant of survival.<sup>3</sup> The likelihood of survival for a victim of SCA without defibrillation decreases by 7%-10% for every minute that defibrillation is delayed.<sup>3</sup> However, survival decreases by only 3%-4% per minute when effective bystander CPR is initiated early followed by defibrillation, improving a victim's chance of survival up to 3-fold and improving neurological out-

comes.<sup>4</sup> Cobb et al demonstrated that 90 seconds of CPR before defibrillation can increase survival when response intervals are longer than 4 minutes.<sup>5</sup> With the average time from collapse to arrival of emergency medical services (EMS) estimated to be 7 minutes, survival almost certainly is as dependent on CPR as it is on defibrillation.<sup>3</sup>

The status of CPR certification of coaches in the state of Wisconsin is currently unknown. There is no state requirement for high school coaches to be certified in CPR and the Wisconsin Interscholastic Athletic Association (WIAA) does not require coaches to be CPR certified. The primary goal of this study was to determine the proportion of CPR-certified coaches in Wisconsin. The secondary goals were to determine who the respondents to a collapse would be, the estimated incidence of collapse, the frequency with which emergency action plans had been implemented, and attitudes regarding a possible state-wide requirement for CPR certification of high school athletic coaches.

## METHODS

### Research Design

This study was a prospective, web-based survey of high school athletic directors. The study was approved by the Institutional Review Board of the University of Wisconsin School of Medicine and Public Health.

### Subjects

Subjects were recruited using an e-mail database of athletic directors from high schools throughout Wisconsin. The database was obtained from the WIAA and used with its approval. An e-mail invitation to complete the survey was sent to all 504 athletic directors. One e-mail address was invalid. The sample population comprised 503 athletic directors.

### Survey Design

An initial draft of the survey questionnaire was created and modified after it was piloted with pediatric academic faculty, researchers, and pediatric sports medicine physicians from the University of Wisconsin. The questionnaire was reviewed by the WIAA medical board and approved for use with the athletic directors. The online survey website Qualtrics (Qualtrics, Provo, Utah) was used to create the layout of the web questionnaire, which consisted of 16 multiple response questions (Box). Several questions used a Likert scale for responses. The survey included questions regarding the presence of an emergency action plan (EAP)—an EAP is a written policy that details the plan for a response to a SCA at a school and is developed by the school, local EMS responders and local physicians.

The survey, including the informed consent, was e-mailed to all 503 athletic directors on May 1, 2012. After 2 weeks, follow-up e-mails were sent weekly to nonresponders for 4 weeks.

### Data Analysis

Data were tabulated through the UW Qualtrics online survey website and the chi square statistic was used to compare responses with  $P < 0.05$  used as the level of significance.

## RESULTS

A total of 243 athletic directors started the questionnaire and 240 were completed, for a 48% response rate. The 3 questionnaires that were not submitted as final but that contained partial responses were included in the data analysis (Table 1).

Athletic directors from large schools had the highest response rate. The remaining athletic directors were from schools with enrollments of less than 400 and a mean student population of 300.

All but 1 conference in the state had at least 1 athletic director respond. Lakeland Conference, located in western Wisconsin, had the highest response rate among conferences; 13 of 21 athletic directors responded. The remaining conferences were from

### Box. Survey Questionnaire

1. What is the enrollment of your high school?
2. What conference does your school belong to?
3. What sports does your school offer? (check all that apply)
4. For which sports is there an athletic trainer present at most practices? (check all that apply)
5. For which sports is there an athletic trainer or physician present at most competitions? (check all that apply)
6. Please indicate who is the typical primary responder to an injury or collapse at practices.
7. What is the average response time for EMS to arrive to an athletic event, if needed?
8. Does your school require your coaches to be CPR certified?
9. To your knowledge, what percentage of coaches at your school are CPR certified?
10. Do you feel coaches should be CPR certified?
11. Do you feel coaches should be required by law to be CPR certified?
12. Of the following, please rank these potential obstacles to obtaining CPR certification for coaches at your school. Please rank from 1 to 4 with 1 as the most significant obstacle, to 4 as the least significant obstacle.
13. To your knowledge, has there ever been an on-the-field collapse of one of your players at a practice or game?
14. To your knowledge, has there ever been an on-the-field collapse of an adult (parent, coach, administrator, fan) at a practice or game?
15. How long have you been the athletic director at your school?
16. Does your school have an emergency action plan for a sudden collapse at a sporting event?

Abbreviations: EMS, emergency medical services; CPR, cardiopulmonary resuscitation.

all regions of the state including the urban areas of Milwaukee and Madison as well as the rural northern areas of the state.

The mean athletic director tenure was 4 years. The majority of athletic directors had less than 6 years of experience. Twenty-one percent of athletic directors were in their positions for over 12 years.

Football was identified as the sport with an athletic trainer present at the highest percentage of practices (55%). For competitions, respondents indicated that 88% of football games were attended by a trained responder. However, basketball, wrestling, and volleyball were attended by a trained provider at fewer than 67% of competitions. Nine of 14 sports had a trained responder present at competitions less than 50% of the time.

### Primary Responders

A coach was identified as the primary responder to a collapse in 78% of cases (Table 2). Most athletic directors estimated an EMS response time to an emergency call at his or her school to be between 4 and 9 minutes. Twenty-one percent of schools stated that it would take more than 9 minutes for EMS to respond to an emergency call. A small minority of schools have an EMS response time of less than 3 minutes. Twenty-nine percent of athletic directors indicated that there had been a collapse of a high school athlete at his or her school and 25% reported the collapse of an adult at an event.

**Table 1.** Demographics of Responding Schools

Category	Percentage
<b>Enrollment (Number of Students)</b>	
0-100	11
101-200	15
201-300	16
301-400	13
401-500	6
>500	38
<b>Athletic Director Tenure (Years)</b>	
1-3	37
3-6	22
7-9	12
9-12	8
>12	21
<b>Sports Offered by School</b>	
Baseball	93
Basketball	99
Cross country	88
Football	92
Golf	80
Gymnastics	24
Hockey	40
Soccer	58
Softball	89
Swimming and diving	39
Tennis	45
Track and field	93
Volleyball	98
Wrestling	80
<b>Schools with Trainer at Practice</b>	
Baseball	26
Basketball	47
Cross country	21
Football	56
Golf	3
Gymnastics	9
Hockey	6
Soccer	22
Softball	26
Swimming and diving	11
Tennis	10
Track and field	33
Volleyball	40
Wrestling	35
<b>Schools with Trainer at Competitions</b>	
Baseball	44
Basketball	66
Cross country	36
Football	88
Golf	4
Gymnastics	19
Hockey	30
Soccer	48
Softball	40
Swimming and diving	12
Tennis	6
Track and field	52
Volleyball	55
Wrestling	63

### CPR Certification of Coaches

The majority of Wisconsin high schools do not require CPR certification of coaches (Table 3). A small subset of respondents indicated that their school had a requirement for some, but not all, coaches to be certified. When asked to estimate the percentage of current coaches at his or her school who were CPR certified, athletic directors were given ranges of responses in 20% increments. The mean percentile of CPR-certified coaches in Wisconsin was 41% to 60%. Schools in which a collapse had occurred tended to also have requirements of CPR certification for coaches but this did not reach the level of statistical significance ( $P=0.12$ ).<sup>6</sup>

Eighty-six percent of athletic directors either agreed or strongly agreed that coaches should be CPR certified. Only 4% of respondents disagreed that coaches should be CPR certified. However, when asked if coaches should be required by law to be CPR certified, only 55% agreed.

The most frequently identified obstacle to obtaining CPR certification of coaches was time. Financial difficulty was the next highest obstacle identified, followed by the large number of coaches who would need to certify and the lack of availability of CPR training opportunities.

### Emergency Action Plans

Overall, 75% of those responding to the survey reported having an EAP at their school currently. Athletic directors with the longest tenure—greater than 12 years—compared to athletic directors with tenures of 1 to 3 years were the most likely to have an EAP in place at their school ( $P=0.004$ ). There was no statistical difference in the implementation of EAPs between schools that had experienced a prior collapse and those who had not.

### DISCUSSION

Our study shows that only 32% of Wisconsin schools currently have a requirement for athletic coaches to be certified in CPR. It also shows that 40%-60% of high school coaches possess current CPR certification. Most athletic directors would like to have their coaches certified in CPR, although not necessarily required by law to be certified. The major perceived obstacles to statewide CPR certification of coaches are time and funding.

In 2011-2012 there were over 190,000 high school athletes in Wisconsin.<sup>7</sup> Assuming an incidence of SCA of 4.4/100,000 in this age group, 8-9 collapses per year would be expected in Wisconsin alone. Our results show that coaches are the primary responders to these collapses 78% of the time, which is significantly higher than the nationally reported coach response rate of 33%.<sup>1</sup> Our findings are similar to those reported by Cross et al, who showed that 89% of high school coaches in South Dakota are the first responders to a collapse, with 46% possessing current CPR certification.<sup>8</sup>

National data regarding requirements for CPR certification in high schools indicate that only 23 of 50 state athletic associations require coaches to be CPR certified.<sup>9</sup> Given the higher than expected number of coaches who serve as primary responder to a collapse and the lower than expected number of CPR certified coaches, the Wisconsin high school student athlete population is at risk for poor outcomes in the event of a collapse. The Inter-Association Task Force recommends that coaches for each team need to be certified in CPR and trained in the use of AEDs because an athletic trainer, physician, or school nurse cannot be universally present at all practices and games,<sup>10</sup> and we agree with this recommendation.

We found the EMS response rate in Wisconsin of 4 to 9 minutes to be consistent with the nationally reported average of 7 minutes.<sup>3</sup> Of particular concern is a substantial proportion of athletic directors who estimated the EMS response time to be greater than 9 minutes. If CPR is not initiated during this 9-minute interval, the athlete will have less than a 10% chance of survival. Given the lack of trainers present at most high school sports practices and competitions, the ideal trained responder is the coach who is always present at games and practices and can initiate CPR immediately.

It is now recommended that every institution that sponsors athletic events have an EAP.<sup>10</sup> Our results show that only three-quarters of schools in Wisconsin have an EAP. Schools that have experienced an athlete collapse previously and those athletic directors who have been at their jobs for the longest period of time are more likely to recognize the importance of having an emergency plan in place. Even if schools are unable to have CPR-certified coaches, at the minimum all high schools in the state of Wisconsin should have an EAP that is developed with EMS responders and reviewed annually with coaches.

Lastly, a majority of athletic directors believe that their coaches should be CPR certified. Surprisingly, however, athletic directors identified time as the greatest obstacle to achieving CPR certification for coaches. Currently there are several CPR courses that take less than 1 hour to complete and only require recertification every other year.<sup>11</sup> These courses decrease the time burden and hopefully will facilitate training of coaches. We expected that cost would be the leading limitation, and although it was the second-highest rated obstacle, Wisconsin already has a program to promote funding for high school CPR programs. For the past 10 years, Project ADAM in Wisconsin has been able to place AED/CPR programs in approximately 30% of all state schools.<sup>12</sup> If further funding sources can be identified, or if schools and coaches are willing to sponsor CPR certification, perhaps Wisconsin can increase its CPR certification rate and the safety of its young athletes.

**Table 2.** Responders and Collapse Data

Category	Percentage
<b>Primary Responder</b>	
Coach	78
Trainer	20
Other	2
<b>Emergency Medical Services Response Rate</b>	
1-3 min	5
4-6 min	44
7-9 min	30
10-12 min	14
>12 min	7
<b>Collapse of Athlete at Event</b>	
Yes	29
No	71
<b>Collapse of Bystander at Event</b>	
Yes	25
No	75

**Table 3.** Cardiopulmonary Resuscitation (CPR) Data

Category	Percentage
<b>School Requirement of CPR Certification</b>	
Yes, all sports	32
Yes, only a few sports	5
No	63
<b>Percent of Current CPR-Certified Coaches</b>	
0-20	20
21-40	14
41-60	22
61-80	17
81-100	27
<b>Attitude Toward CPR Requirement</b>	
Strongly disagree	3
Disagree	1
Neutral	11
Agree	37
Strongly agree	49
<b>Attitude Toward CPR Law</b>	
Strongly disagree	7
Disagree	16
Neutral	32
Agree	23
Strongly agree	23
<b>Obstacles to CPR Certification</b>	
Financial	20
Lack of CPR training available	7
Time	62
Too many coaches to certify	11

### Limitations

The primary limitation of this study was that it focused on athletic directors and not the coaches themselves. The proportion of CPR-certified coaches may be misrepresented if there were coaches who were actually certified without the knowledge of their athletic directors. In addition, because this study was performed only in

Wisconsin, the results may not be representative of CPR training among coaches in other regions of the United States. Finally, the survey itself is a novel tool which lacks validity assessments for reproducibility or sensitivity.

## CONCLUSION

In Wisconsin, the proportion of coaches who act as the primary responder to a collapse is greater than others have reported, and the proportion of CPR-certified coaches is lower than the national average. This discrepancy creates a dangerous gap in the emergency care of our adolescent athletes. Pediatricians and other health care providers should advocate for schools to develop EAPs and mandate CPR certification for coaches as 2 important steps to protect the safety of high school athletes.

**Acknowledgements:** We would like to thank Dr David Bernhardt and Dr Ellen Wald for their mentorship and guidance in the development of this project and manuscript.

**Funding/Support:** None declared.

**Financial Disclosures:** None declared.

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*WMJ* (ISSN 1098-1861) is published through a collaboration between The Medical College of Wisconsin and The University of Wisconsin School of Medicine and Public Health. The mission of *WMJ* is to provide an opportunity to publish original research, case reports, review articles, and essays about current medical and public health issues.

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