Preparedness Among Illinois High School Athletic Departments: Does Size Or Location Matter?

K Bell, H Prendergast, A Schlichting, E Mackey, M Mackey

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Abstract

Objective:To determine level of medical provider coverage for Illinois high schools athletic teams and coaching staff certification requirements for first-aid, CPR, and /or automated external defibrillator (AED) training.

Methods: Previously validated surveys were mailed to all Illinois High School Association (IHSA) member schools as part of an annual newsletter from the IHSA requesting information about their individual athletic programs.

Design: Prospective survey.

Outcome Measures: Prevalence of coaching staff certification requirements and medical coverage availability of physicians certified athletic trainers, school nurses, and ambulance personnel at IHSA sanctioned practices and athletic events.

Results: Forty-four percent (316/724) of survey forms were returned. Overall, 125 schools (41%) require first-aid certification, 111 schools (36%) require CPR certification, 57 schools (19%) require certification in AED use, and 15 schools (5%) require American Sport Education Program certification for their coaching staff. Of the 182 schools (58%) that do not require first-aid training of coaches, 169 schools (93%) have a medical provider available. The majority of IHSA member schools (92%) have at least one nurse, athletic trainer or physician responsible for medical care at athletic events. Seventy-three percent of schools have an athletic trainer, 192 schools (61%) have a nurse, and 136 schools (43%) have a physician responsible for medical care; 201 schools (64%) have more than one level of care. Availability of the medical care providers varied between practice and games. No providers were available during practice at 34% of schools while 32% of schools reported having a provider available during practice. During games, only 16% of schools reported no provider available, and 50% of schools had a provider available for all games. Availability of all levels of medical providers varied significantly by both geographic location and school size. The requirement for certification of coaching staff did not statistically differ between geographic locations or by size of HS.

Conclusion: Most of the IHSA HSs surveyed do not require coaching staff to be certified at any level in first-aid, CPR, or AED use. Despite the availability of a medical provider at most Illinois HS athletic practices or events, critical time may be lost while waiting for the trained individual to respond to an acute life-threatening event.

INTRODUCTION

Sport related injuries are a growing public health concern.([1,2,3,4,5]). There are no risk- free sports, and student athletes, both male and female, are prone to both acute and overuse injuries. Medical coverage providers play an essential role in the treatment of injuries and are the front line in injury surveillance([6,7,8]). Proper management of injury is dependent on availability and training of medical providers.([9]) Nonetheless, there is considerable variation in medical coverage for high school sports.([10,11,12,13,14,15,16,17])

Several studies have found that medical coverage can vary according to school enrollment and individual sport.([18])

Sports participation among high school students is at an all time high.([19,20]) Similarly, sports-related injuries have also substantially increased.([21]) Data from the National Hospital Ambulatory Medical Care Survey found that an estimated 2.6 million emergency department (ED) visits for sports-related injuries occurred in persons between the ages of 5 and 24 years of age. These ED visits accounted for approximately 68% of the total 3.7 million sports-related

injuries evaluated in the ED. ([22]) As sport participation and overall athletic intensity increases, the likelihood of adverse events is significant. As a result, a prepared coaching staff or designated healthcare provider for an athletic team is essential in timely management of sport-related injuries/events.

Sudden cardiac death in sports medicine is an uncommon but very visible incident.([23,24,25]) Each year, sudden cardiac arrest claims the lives of 350,000 people.([26]) The exact incidence of sudden cardiac arrest in athletes is unknown because there is no universal monitoring or reporting method.([27,28,29]) Since 1982, the number of deaths during athletic events due to indirect causes (arrhythmia resulting in cardiac arrest) has outnumbered deaths due to direct causes (traumatic injury) by a margin of 2:1.([30,31]) The majority of athletes with sudden cardiac arrest collapse during or immediately after a practice or a game setting.([32,33]) Studies have shown that in witnessed sudden cardiac arrest, death is most often due to a prolonged response time from onset of the fatal arrhythmia to defibrillation by trained treatment providers.([34,35,36,37,38])

The purpose of this study was to determine preparedness among Illinois High School Association (IHSA) member schools. To accomplish this goal, we sought to examine certification requirements for coaching staff and present conditions of medical coverage and delivery to high school athletic programs based upon geographic location and school size.

METHODS

STUDY DESIGN

This was a prospective, anonymous, cross-sectional survey-based study of all 724 Illinois High School Association (IHSA) sanctioned schools. Surveys were included in a quarterly mailing to all IHSA schools issued by the Illinois High School Association. The study protocol was submitted and reviewed by the Institutional Review Board.

SURVEY DEVELOPMENT

Selected survey questions were adapted from a previously validated survey instrument regarding medical coverage of high school sports.([39]). A 9-item questionnaire was developed for use in this study. The first section contained questions about school size, geographic location, and percentage of students participating in athletic activities. The second section contained closed-ended questions about designated individuals responsible for medical coverage, and percent availability of individual(s) for practice and scheduled games. The third section contained questions about health/safety certifications requirements and individual sports covered by the designated provider. The final section contained questions regarding the percentage of time that ambulances were present at scheduled games, and the number of times that an athlete required hospital evaluation within the last year.

Survey forms were returned to the principal investigators via postal mail or facsimile. Frequency counts and Chi-square p-values were calculated using SAS System software (version 8.01; SAS Institute Inc., Cary, NC). Uncorrected p-values are reported unless there were less than 5 occurrences in a cell, in which case a Fisher exact p-value is reported.

RESULTS

A total of 724 survey forms were mailed to Illinois High School athletic departments. There were 316 (43.6%) survey forms returned, with 306 survey forms (42.3%) completely filled out.

Surveys were returned by 147 rural (47%), 107 suburban (34%) and 61 urban (19%) high schools. (Table 1) The majority of schools participating in the survey had less than 500 students, however 119 schools (38%) had over 1000 students. Student participation in sports also varied widely by school, however all schools had some participation in sports and 53% of the schools estimated that about half of the student body participated in at least one sport program.

Figure 1

Table 1: Demographics of Responding Schools

	N (%)
Surveys Distributed	724 (100%)
Surveys Returned	316 (43.6%)
School Locale	
Rural	147 (46.7%)
Suburban	107 (34.0%)
Urban	61 (19.4%)
Missing	1 (0.3%)
School Size	
< 500 Students	138 (43.7%)
500-999 Students	59 (18.7%)
≥ 1000 Students	119 (37.7%)
Student Participation	
0%	0 (0%)
25%	71 (23.0%)
50%	163 (52.7%)
75%	74 (24.0%)
100%	1 (0.3%)

Of all survey respondents, only 125 Illinois high school athletic departments (40.8%) require that their coaching staff be certified in first aid. This requirement did not differ significantly by geographic location (p=0.89), with 58 rural athletic departments (40.8%), 41 suburban athletic departments (39.4%), and 26 urban athletic departments (43.3%) requiring first aid certification of coaches. (Table 2) Similarly, there was no significant difference in prevalence based on the size of the high school (p=0.74), with athletic departments at 57 small (<500 students) schools (42.2%), 24 medium (500-999 students) schools (42.9%), and 44 large (≥1000 students) schools (37.9%) requiring first aid certification of coaches. (Table 3)

Figure 2

Table 2: Health and Safety Certification Requirements by High School Locale

	Total	Urban	Suburban	Rural	p-value
Overall	306 (100%)	60 (19.6%)	104 (34.0%)	142 (46.4%)	-
First Aid	125 (41%)	26 (43.3%)	41 (39.4%)	58 (40.8%)	0.89
CPR	111 (36.3%)	25 (41.7%)	34 (32.7%)	52 (36.6%)	0.51
AED	57 (18.7%)	11 (18.3%)	20 (19.2%)	26 (18.4%)	0.98
ASEP	15 (4.9%)	4 (6.7%)	5 (4.8%)	6 (4.2%)	0.77

Figure 3

Table 3: Health and Safety Certification Requirements by High School Size

	Total	≤499 (small)	500-999 y (medium)	≥1000 (large)	p-value
Overall	306 (100%)	134 (43.8%)	56 (18.3%)	116 (37.9%)	-
First Aid	125 (41%)	57 (42.2%)	24 (42.9%)	44 (37.9%)	0.74
CPR	111 (36.3%)	54 (40.0%)	14 (25.0%)	43 (37.1%)	0.14
AED	57 (18.7%)	22 (16.4%)	10 (17.9%)	25 (21.6%)	0.57
ASEP	15 (4.9%)	9 (6.7%)	3 (5.3%)	3 (2.6%)	0.32

Coaches were required to maintain current certification in CPR by only 111 athletic departments (36.2%). This requirement did not differ significantly by community area (p=0.51), with 52 rural athletic departments (36.6%), 34 suburban athletic departments (32.7%), and 25 urban athletic departments (41.7%) requiring coaches to maintain certification in CPR. (Table 2) There was also no significant difference in prevalence based on the size of the high school (p=0.14), with athletic departments at 54 small schools (40.0%), 14 medium schools (25.0%), and 43 large schools (37.1%) requiring certification of coaches in CPR. (Table 3)

Only 57 high school athletic department respondents in Illinois (18.7%) required coaches to maintain certification in AED operation. This requirement did not differ significantly by geographic location (p=0.98), with 26 rural athletic departments (18.4%), 20 suburban athletic departments (19.2%), and 11 urban athletic departments (18.3%) requiring coaches to be certified in AED operation. (Table 2) There was also no significant difference in prevalence based

on the size of the high school (p=0.57), with athletic departments at 22 small schools (16.4%), 10 medium schools (17.9%), and 25 large schools (21.6%) requiring coaches to maintain certification in AED use. (Table 3)

There were 15 Illinois high school athletic departments (4.9%) that required coaches to be certified by the American Sport Education Program (ASEP). This requirement did not differ significantly by community area (p=0.77), with 6 rural athletic departments (4.2%), 5 suburban athletic departments (4.8%), and 4 urban athletic departments (6.7%) requiring coaches to be certified by ASEP. (Table 2) There was also not a significant difference in prevalence based on the size of the high school (p=0.32), with athletic departments at 9 small schools (6.7%), 3 medium schools (5.3%), and 3 large schools (2.6%) requiring coaches to maintain ASEP certification. (Table 3)

In the majority of IHSA member schools medical coverage to injured or acutely ill student-athletes was usually provided by athletic trainers, school nurses or physicians.(Tables 4 & 5) Athletic trainers were the designated medical care providers for acutely ill or injured athletes at 229 (72.9%) of the participating high schools. School nurses were available to provide care of athletes at 192 (61.1%) schools, and a physician provider was available for 136 (43.0%) schools participating in the survey. At least one athletic trainer, nurse, or physician was available at 289 (91.5%) of the participating schools, leaving 27 schools (8.5%) without any healthcare provider to assess or treat injured or acutely ill athletes. Twelve of these schools (7.6%) also do not require any health or safety certification of coaches. There were 8 schools (2.5%) that reported availability of an Emergency Medical Technician (EMT) or paramedic. All of these schools also had an athletic trainer, school nurse or physician available as well.

There was significant variation in healthcare provider availability depending on the specific sport being played, however because IHSA currently endorses 34 sports and activities, determining the availability of healthcare providers for practice and games for each of the sports would have been prohibitively time consuming for athletic directors completing the survey. All accounts of provider availability are based on the athletic director's estimate of overall availability.

The availability of the designated healthcare provider also varied between practices and games, with no provider available at practices at 100 schools (33.6%) and a provider available at all practices at 95 schools (31.9%). The median availability of the designated healthcare provider was approximately 50% for practices.

During games, there was no healthcare provider available at 49 schools (16.0%) and a provider was available at all games for 153 schools (49.8%). Half of the schools had a designated healthcare provider available at 75% of games.

The availability of an on-site ambulance for games was reported by 218 schools (69%), however 123 of those schools (56.4%) had an ambulance only for football games. The availability of an on-site ambulance during practices was not determined.

The availability of athletic trainers varied significantly (p<0.0001) by the locale of the high school, ranging from athletic trainers available at 62% of rural high schools to 94% of suburban high schools. (Table 4) The availability of athletic trainers also varied significantly (p<0.0001) by the size of the high school, ranging from 59% for smaller high schools to 87% for larger high schools. (Table 5)

Figure 4

Table 4: Healthcare Provider Availability by Location of School

		Location of School			
	Total	Rural	Urban	Suburban	p-value
Total	316 (100%)	147 (46.5%)	61 (19.3%)	108 (34.2%)	-
AT	229 (72.9%)	90 (61.7%)	38 (63.3%)	101 (93.5%)	<0.0001
RN	192 (61.1%)	83 (56.8%)	32 (53.3%)	77 (71.3%)	0.025
MD	136 (43.0%)	41 (27.9%)	22 (36.1%)	73 (67.6%)	<0.0001
EMT	8 (2.5%)	6 (4.1%)	2 (1.2%)	0 (0%)	0.112
Any EMT, AT, RN, MD	289 (91.5%)	129 (87.8%)	54 (88.5%)	106 (98.2%)	0.0089
>1 EMT, AT, RN, MD	201 (63.6%)	74 (50.3%)	33 (54.1%)	94 (87.0%)	<0.0001

AT= athletic trainer; RN=registered nurse; MD=medical doctor; EMT=emergency medicine technician

Figure 5

Table 5: Healthcare Provider Availability by Size of School

		Size of School			
	Total	<500	500-999	≥1000	p-value
Total	316 (100%)	138 (43.7%)	59 (18.7%)	119 (37.7%)	-
AT	229 (72.9%)	81 (58.7%)	45 (77.6%)	103 (87.3%)	<0.0001
RN	192 (61.1%)	65 (47.1%)	38 (65.5%)	89 (75.4%)	<0.0001
MD	136 (43.0%)	41 (29.7%)	22 (37.3%)	73 (61.3%)	<0.0001
EMT	8 (2.5%)	5 (3.6%)	1 (1.7%)	2 (1.7%)	0.554
Any EMT, AT, RN, MD	289 (91.5%)	117 (84.8%)	55 (93.2%)	117 (98.3%)	0.0005
>1 EMT, AT, RN, MD	201 (63.6%)	62 (44.9%)	42 (71.2%)	97 (81.5%)	<0.0001

AT= athletic trainer; RN=registered nurse; MD=medical doctor; EMT=emergency medicine technician

Likewise, the availability of school nurses also varied significantly (p=0.025) by the locale of the high school, ranging from 53% of urban high schools to 71% of suburban high schools. (Table 4) The availability of school nurses also varied significantly (p<0.0001) by the size of the high school, ranging from 47% of smaller high schools to 75% of larger high schools. (Table 5)

Physician availability also varied significantly by locale of the school and size of the school (p<0.0001 and <0.0001, respectively). (Tables 4 and 5) Of the 136 schools (43.3%) that had at least one physician available, 55 schools (40.4%) had more than one physician available. (Table 6) In total, of the 136 schools with physicians available, there were 203 physicians. An orthopedic surgeon was available at 66 schools (21%), a family medicine physician was available at 59 schools (19%), an Emergency Physician was available at 37 schools (12%), an internist was available at 7 schools (2.2%), and 34 schools (11%) had a physician from an unspecified specialty available to provide medical care for student-athletes. The availability of orthopedic surgeons varied significantly by location of the school (p<0.0001), with suburban schools twice as likely as urban schools and ten times more likely than rural schools to have an orthopedic surgeon available (43% vs. 22% vs. 4.1%, respectively). (Table 7) The availability of emergency Physicians, family Physicians, and internists did not differ significantly by location or size of the school.

Figure 6

Table 6: Physician Availability by Medical Specialty

	Total	Percent, All Schools	Percent, All Physicians
Overall	314	-	-
Total Schools with a Physician Available	136	43.3%	-
Schools with > 1 Physician	55	17.5%	-
Total Number of Physicians	203	-	100%
Medical Specialty			
Orthopedic Surgery	66	21.0%	32.5%
Family Medicine	59	18.8%	29.1%
Emergency Medicine	37	11.8%	18.2%
Other Specialty	34	10.8%	16.7%
Internal Medicine	7	2.2%	3.4%
Sports Medicine Trained	41	13.1%	20.2%

Figure 7

Table 7: Physician Availability by Size and Location of Schools

	Number of Students at School			
	<500	500-999	≥1000	p-value
Emergency Medicine	18 (13.0%)	7 (12.1%)	12 (10.2%)	0.77
Orthopedic Surgery	11 (7.9%)	7 (12.1%)	48 (40.7%)	<0.0001
Family Medicine	25 (18.1%)	6 (10.3%)	28 (23.7%)	0.098
Internal Medicine	4 (2.9%)	2 (3.4%)	1 (0.8%)	0.42
Other	6 (4.4%)	8 (13.8%)	20 (6.4%)	0.004

	Locale of School			
	Rural	Urban	Suburban	p-value
Emergency Medicine	19 (13.0%)	6 (10.0%)	12 (11.1%)	0.80
Orthopedic Surgery	6 (4.1%)	13 (21.7%)	47 (43.5%)	<0.0001
Family Medicine	23 (15.8%)	9 (15.0%)	27 (25.0%)	0.12
Internal Medicine	3 (2.0%)	1 (1.7%)	3 (2.8%)	0.88
Other	6 (4.1%)	6 (10.0%)	22 (20.4%)	0.0002

DISCUSSION

This is the first information-gathering survey of this kind for Illinois high school athletic programs. The authors chose to evaluate high school athletics because of the increasing numbers of student athletic participation and no previous defined baseline measurements for Illinois high schools.

There appeared to be a combined effort to provide medical coverage among IHSA member schools, with more than two thirds of the responding schools reporting several different providers associated with each athletic program. Medical coverage was provided most often by athletic trainers and this appears consistent with other states. Fewer Illinois schools had designated team physicians than schools in New York, southern California, and Michigan (43% versus 59-71%); however similar numbers to Iowa (43% versus 41%).[17,40,41,42,43]

There was considerable variability between medical coverage for practices and games with the majority of schools reporting no availability of a designated medical provider at practices and a median availability of 50% for

official games. The numbers were further affected by geographic location and school size with rural school being less likely to have a provider at practices or game. Given that the potential for injury is often greater during practice or nongame activities, this represents an area of concern and identifies an area for improvement. Studies have shown that a significant number of injuries occur during practice or nongame activities.([44,45])

Sudden cardiac arrest is the leading cause of death in athletes.([46,47,48]) In the last decade, pre-participation histories and physicals have become popular in an attempt to identify athletes at risk for sudden cardiac death.([49,50,51]). Recently, several studies have challenged the cost effectiveness of such screening while others have demonstrated a low sensitivity for detection of high risk athletes. ([52,53]). Death in a witnessed sudden cardiac arrest may be preventable in many cases.([54,55]) Effective treatment of these patients depends on individual responses of well-prepared athletic providers. In the majority of cases of sudden cardiac arrest, ventricular fibrillation is the most common arrhythmia.([38,56,57,58,59,60]) Studies have shown that survival is decreased by 7% to 10% per minute prior to defibrillation.([61]) The greatest survival benefit has been in victims where the collapse-to-shock interval of less than 5 minutes can be achieved. ([62,63]).

There have been no studies investigating the use of AEDs in high school athletics; however use of AEDs in other public areas has provided convincing data for the introduction of AEDs into athletics programs.([64]) Availability of automated external defibrillators(AEDs) have significantly improved survival from sudden cardiac death in the prehospital setting and have been adapted in many high school programs.([65,66,67]). In 2004, the American Heart Association introduced the Medical Emergency Response Plan for Schools which encourages schools to develop policies to respond to life-threatening medical emergencies including sudden cardiac arrest.([68]) Included in these programs should be mechanisms for establishment of AED programs for those institutions with an established need and the training of lay rescuers in first aid and CPR. ([69])This public health initiative has been favorably endorsed by several organizations including the American College of Emergency Physicians, the National Association of School Nurses, and the American Academy of Pediatrics.([70]) Currently the American College of Sports Medicine recommends AEDs as a preferred item to have available on the sideline at athletic competitions.([71])

The role of the coaching staff in timely management of potentially catastrophic events can not be overstated. While most injuries in high school sports could be classified as minor, life threatening events are always a possibility. In order to optimize effectiveness and favorably impact outcomes, advance preparation and training are required. In this study the majority of Illinois high school athletic departments do not require coaching staff to be certified at any level in first aid, cardiopulmonary resuscitation, and automated external defibrillation operation. Additional research is needed to determine the true impact of lack of certification on outcomes of acutely ill or severely injured high school athletes in Illinois.

Previous studies have identified athletic trainers as the most important members of the medical provider team because of the ability to supervise all aspects of athletic medical care delivery and to work closely with team physicians.([72]) Suburban IHSA member schools were more likely to have athletic trainers than rural or urban IHSA member schools (94% vs. 62-63%; $p < 0.0001$). In addition, suburban schools were more likely to have more than one designated medical provider than rural or urban school respondents (87% vs. 50%-54%, $p<0.0001$)

STUDY LIMITATIONS

The primary limitation of this study was the response rate. The response rate was less than 50% and potentially limits the impact of our findings and ability to draw significant conclusions. The surveys were distributed as part of the IHSA annual mailing and were returned in an anonymous manner making it difficult to follow-up with individual schools to encourage survey returns. Although the response rate compared well with response rates in previous similar studies for other states (25-94%) for future studies, it may be helpful to do repeated mailings or follow-up telephone calls to improve the response rate.([73]) Nonetheless, the similarity between survey response rates across the state, irrespective of school size and locale, suggests that representative sample may have been obtained. Other study limitations include shortcomings with the actual questionnaires. There was significant variation in healthcare provider availability depending on the specific sport being played, however because IHSA currently endorses 34 sports and activities, determining the availability of healthcare providers for practice and games for each of the sports would have been prohibitively time consuming for athletic directors completing the survey. All accounts of provider availability are based on the athletic director's estimate of overall

availability. In addition survey forms were only distributed only to IHSA member schools.

CONCLUSION

Medical coverage for high school athletic departments is crucial. While prevention of sports-related injuries is the ultimate goal, the reality of sports is that injuries can be an inevitable part of sports. There are no uniform requirements for coverage and often there may be gaps in availability of medical providers. Because life threatening events are often unpredictable and fortunately uncommon in high school athletics, a proactive approach is mandatory. The role of a well prepared coaching staff is imperative to providing a temporizing bridge to definitive emergency medical services (EMS). An overall team approach for medical coverage was noted among IHSA member schools surveyed with the majority of coverage provided by trainers and school nurses. However, there was significant variability in the availability of medical providers at both practices and athletic competitions. Despite the availability of an athletic trainer, nurse or physician at most Illinois high school athletic practices or events, critical time may be lost while waiting for a trained individual to respond to an injury or acute illness. Further studies with a better response rate are needed in order to make any significant conclusions and recommendations for medical coverage among Illinois high school athletic departments.

The goal of all high school sports program should be to provide an environment that allows student athletes to develop their full physical potential while establishing injury prevention and prompt recognition of life or limb threatening injuries as a priority.([41]) In the prehospital setting, the importance of early delivery of emergent health care can not be overstated.

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Author Information

Kameno Bell, M.D.
University of Illinois Emergency Medicine Residency Program

Heather M. Prendergast, M.D., FACEP
Assistant Professor, Department of Emergency Medicine, University of Illinois Medical Center

Adam Schlichting, M.P.H.
University of Illinois College of Medicine

Erin Mackey, B.A.
Research Assistant, Department of Emergency Medicine, University of Illinois

Mark Mackey, M.D., FACEP
mmackey@uic.edu, Department of Emergency Medicine, University of Illinois Medical Center