

High School Football Injury Rates and Services by Athletic Trainer Employment Status

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Context: Reported injury rates and services in sports injury surveillance may be influenced by the employment setting of the certified athletic trainers (ATs) reporting these data.

Objective: To determine whether injury rates and the average number of AT services per injury in high school football varied by AT employment status.

Design: Cross-sectional study.

Setting: We used data from the National Athletic Treatment, Injury and Outcomes Network and surveyed ATs about their employment setting.

Patients or Other Participants: Forty-four responding ATs (37.9% of all National Athletic Treatment, Injury and Outcomes Network participants) worked at high schools with football programs and were included in this study. Fourteen ATs were

full-time employees of the high school, and 30 ATs were employed as outreach ATs (ie, full-time and part-time ATs from nearby clinics, hospitals, and graduate school programs).

Main Outcome Measure(s): We calculated injury rates per 1000 athlete-exposures and average number of AT services per injury.

Results: Reported injury rates and services per injury were greater among full-time school employees compared with outreach ATs. However, injury rates did not differ when restricted to time-loss injuries only.

Conclusions: Our findings suggest that ATs who are full-time school employees may be able to identify and care for more patients with injuries.

Key Words: secondary school, medical services, coverage

Key Points

- Athletic trainers (ATs) who were full-time high school employees reported a higher overall injury rate in football players than did outreach ATs.
- The average number of AT services reported per football injury by ATs who were full-time high school employees was larger than the average reported by outreach ATs.

Much of the knowledge regarding sports injuries in the high school setting has been generated through sports injury surveillance.^{1–3} Sports injury-surveillance systems, such as the High School Reporting Information Online (RIO),¹ Athletic Training Practice-Based Research Network (AT-PRBN),² and National Athletic Treatment, Injury and Outcomes Network (NATION),^{3,4} rely upon team medical staff, particularly team athletic trainers (ATs), to collect injury and exposure data. A potential limitation of these injury-surveillance systems is that high school AT coverage may vary, with AT employment status ranging from full-time employment by the school to part-time outreach staff from non-school-related organizations.⁵ Variations in AT employment status may affect the time ATs are on site to identify and manage patients with injuries sustained during high school sports and may consequently affect the reporting of injury and subsequent AT services. The purpose of our study was to determine whether injury rates and the average number of AT services per injury in high school football players varied by AT employment status.

METHODS

The NATION system relied upon a convenience sample of high school sport programs reporting data for 27 sports from the 2011–2012 through 2013–2014 academic years. Previous publications^{3,4} have described the data-collection methods for injury and AT services in depth. Participating ATs collected data on injuries and athlete-exposures (AEs) occurring in school-sanctioned practices and competitions during the preseason, regular season, and postseason.³ The ATs also reported the subsequent AT services used to manage these injuries.⁴

Injuries were defined as those (1) occurring as a result of participation in an organized practice or competition and (2) requiring medical attention by a certified AT or physician.³ *Time-loss injuries* were those resulting in at least 24 hours of restriction from participation. A *reportable AE* was defined as 1 student-athlete participating in 1 school-sanctioned practice or competition.³ *Athletic trainer services* were defined as the application of any type of manual therapy, modality, exercise, evaluation, testing, or skill session during which the player interacted with the AT because of the injury.⁴

Table. Injury Rates and Average Numbers of Athletic Trainer Services per Injury, by Athletic Trainer Employment Status, National Athletic Treatment, Injury and Outcomes Network Study, 2011–2012 Through 2013–2014

Variable	Athletic Trainer Employment Status	
	Full-Time High School Employees (n = 14)	Outreach (n = 30)
Injury rates per 1000 athlete-exposures (95% confidence interval)		
Overall injury rate	29.7 (28.9, 30.5)	8.2 (7.6, 8.7)
Time-loss injury rate	4.6 (4.3, 4.9)	5.0 (4.6, 5.4)
No. of athletic trainer services per injury, mean \pm SD		
Overall	9.9 \pm 21.8	5.2 \pm 8.3
Athletic trainer evaluation or reevaluation	1.7 \pm 3.5	0.4 \pm 0.8
Physical performance test or measurement	<0.1 \pm <0.1	0.0
Therapeutic activities or exercise	3.5 \pm 12.0	1.7 \pm 4.8
Neuromuscular reeducation	0.5 \pm 3.0	0.2 \pm 1.5
Manual therapy techniques or massage	0.1 \pm 0.8	0.1 \pm 0.4
Modalities	2.1 \pm 4.9	1.9 \pm 3.1
Hot or cold packs	1.8 \pm 4.2	1.6 \pm 2.7
Whirlpool	0.2 \pm 1.2	0.1 \pm 1.0
Electrical stimulation	<0.1 \pm 0.7	0.1 \pm 0.7
Ultrasound	<0.1 \pm 0.3	0.0
Vasopneumatic devices	<0.1 \pm 0.3	0.0
Paraffin bath	<0.1 \pm 0.2	0.0
Contrast bath	<0.1 \pm 0.1	0.0
Iontophoresis/phonophoresis	0.0	0.0
Strapping	1.5 \pm 4.4	0.9 \pm 2.9
Gait training or crutch fitting	<0.1 \pm 0.2	<0.1 \pm 0.2
Wound care	0.5 \pm 1.6	<0.1 \pm 0.4

Athletic trainers were instructed not to report services that required less than 2 minutes. These AT services were categorized in manners similar to previous research.^{2,4} We opted to focus our analysis on football given that it comprised the largest proportion of injuries and AT services among all sports examined.^{3,4}

In August 2014, we retrospectively surveyed current and previous participating ATs (n = 116) to acquire information on their employment status while reporting data to NATION. Employment status was categorized as (1) ATs who were full-time employees of their high schools or (2) *outreach ATs*, defined as full-time or part-time ATs employed by non-high school-related organizations (ie, clinics, hospitals, graduate school programs).

Injury rates were calculated per 1000 AEs. Rate ratios (RRs) compared reported injury rates between full-time high school ATs and outreach ATs. Those RRs with 95% confidence intervals (CIs) not containing 1.0 were considered statistically significant. The average number of AT services per injury was also calculated, with independent-samples *t* tests comparing services by AT employment status. Although these statistics yielded wide standard deviations, parametric tests can be used in large public

health surveillance data sets such as those from NATION.⁶ The *t* test statistics yielding *P* values <.05 were considered statistically significant. All analyses were also conducted between full-time and part-time outreach ATs; however, no differences were found. The NATION system was deemed exempt by the Western Institutional Review Board (Puyallup, WA).

RESULTS

Fifty certified ATs responded (response rate = 43.1%); of these, 44 worked in high schools that had football programs. Fourteen (31.8%) of these 44 ATs were full-time employees of their high schools. The remaining 30 (68.2%) were outreach ATs, of whom 19 were full-time employees at a hospital or clinic and 11 were part-time graduate assistants from a nearby college or university. Outreach ATs were more likely to work with high schools that had smaller student enrollments (*P* < .001) and were in rural locations (*P* = .04).

Over the 3-year period (2011–2012 through 2013–2014), our subsample of 44 ATs reported 6034 football injuries, for an overall injury rate of 20.9/1000 AEs. Of these, 1404 (23.1%) resulted in time loss, for a time-loss injury rate of 4.9/1000 AEs. Across all 6034 injuries, 57 306 AT services were reported, for an average of 9.5 \pm 21.0 AT services per football injury. Commonly reported AT services were therapeutic activities or exercise (35.3%); modalities (21.5%), particularly hot or cold packs (18.5%); and strapping (ie, taping, wrapping, padding, splints; 15.8%).

Athletic trainers who were full-time high school employees reported a higher overall football injury rate than outreach ATs (29.7 versus 8.2 per 1000 AEs; RR = 3.6; 95% CI = 3.4, 3.9; Table 1). However, when restricted to time-loss injuries, the injury rates did not differ (4.6 versus 5.0 per 1000 AEs; RR = 0.9; 95% CI = 0.8, 1.0). The average number of AT services reported per football injury by ATs who were full-time high school employees (9.9 \pm 21.8) was larger than that reported by outreach ATs (5.2 \pm 8.3; *P* < .001). Findings were similar when stratified by AT service type.

DISCUSSION

Our study is the first to specifically compare injury and service reporting among ATs with different employment statuses in the high school setting. Compared with outreach ATs, ATs who were full-time school employees reported higher overall injury rates and average numbers of AT services in high school football. Our findings suggest that the data provided by sports injury surveillance may be associated with characteristics related to those ATs collecting the data. Future sports injury-surveillance programs and researchers should acknowledge the potential discrepancies in reporting that are associated with participating ATs' employment status.

Our results suggest that the effectiveness of ATs who are not full-time school employees may be limited as they may work only several times a week or a few hours a day at the school. Being employed in an outside setting may limit the time ATs can attend to, manage, and document or report student-athlete injuries, leading to lower reported rates.

High schools may opt to employ outreach ATs because of cost. However, our data lack further information on the actual amount of time that outreach ATs were on site at high schools. Such data will provide better insight into the factors that affect injury identification, reporting, and management by ATs.

Although overall injury rates differed by AT employment status, injury rates did not differ when restricted to time-loss injuries. With injuries resulting in less than 24 hours of time loss (ie, non-time-loss injuries), student-athletes may not have been fully restricted by the injury, and thus, may not have sought medical attention from ATs or may have self-treated (or both). However, student-athletes with access to a full-time, school-employed AT may have been more inclined to report these non-time-loss injuries because the AT was readily available, thus resulting in larger reported overall injury rates. Such athlete-to-AT communication may be highly variable across schools. Also, the decision making of reporting injuries when ATs were not present was not investigated by our data-collection methods. Future researchers should seek to gain a broader understanding of high school athlete practices regarding reporting injuries of varying severities.

Recent data indicate that fewer than 40% of public high schools in the United States have full-time ATs.⁵ When taken in context with the discrepancies noted here in injury reporting and AT services between different employment settings, it is possible a large number of high school football injuries are not being identified or treated. Unfortunately, many school districts face strict budgets that may not allow for full-time ATs in their high schools. High schools without full-time ATs may miss opportunities to identify and manage injuries and provide subsequent AT services to minimize secondary injury and time loss from activity. Our data demonstrate the importance of full-time ATs in the secondary school setting. Importantly, future authors should expand upon this study to include larger samples and more in-depth investigations of specific injuries that may or may not be reported by outreach ATs.

Furthermore, previously reported injury rates in high school football are high.⁷ These high injury rates likely have long-term implications for young athletes, as one of the biggest predictors for future injuries is previous injury.⁸ Also, there are known short- and long-term consequences of these injuries that may negatively affect the long-term health and physical well-being of these young athletes.⁹ Previously reported injury rates likely include data from both ATs employed full time by high schools and ATs employed as outreach. As our study shows, the differences in AT employment settings can potentially alter the rates of injuries reported and treated by ATs. Thus, previous reports of high school injury rates may actually be conservative estimates of true injury rates.

Limitations exist in this study. First, NATION relies upon a convenience sample of ATs working with high school sports. We obtained responses on AT employment status from only 43.1% of all participating ATs. Generalizability may also be limited in several ways. First, the current study focused solely on football.

Additional sports were not explored because they had lower injury rates and used fewer AT services, thus limiting the statistical power to perform the analyses that were done with this subsample of ATs. Second, compared with the full sample of participating ATs in NATION, the football injury rate in our subsample was higher (20.9 versus 15.3 per 1000 AEs)³ and the average number of AT services per injury was lower (9.5 versus 11.7).⁴ Third, although findings did not vary between full-time and part-time outreach ATs, we did not examine the amount of time outreach ATs spent at their designated schools, which may be associated with reported injuries and services. Last, high schools varied in size and location and also perhaps in overall staffing and athlete-to-AT ratios, which may be associated with the number of AT services provided. Our study also did not account for the health care providers other than ATs who may provide services to injured high school student-athletes. Future research is needed to continue refining our understanding of the association between AT employment status and the reporting of injuries and AT services.

Our results suggest lower reported injury rates and fewer AT services provided by ATs not employed full time by a high school. However, additional research is needed to explore variations in the types of outreach ATs used, the effect of other health care providers, and whether results are similar in other sports. Nevertheless, our findings advocate for the need to further explore the potential benefits of on-site ATs employed by high schools.

ACKNOWLEDGMENTS

This study would not have been possible without the assistance of the many high school ATs who participated in the program. This project was funded by the National Athletic Trainers' Association Research & Education Foundation (NATAREF) and the Central Indiana Corporate Partnership (CICP) Foundation in cooperation with BioCrossroads. The content of this report is solely the responsibility of the authors and does not necessarily reflect the views of the NATAREF, CICP Foundation, or BioCrossroads.

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