[Orthopaedic Surgery]

Emergency Department Usage and Medical Care Needs of Adolescent Participants in a High-Intensity Wrestling Camp

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Background: Thousands of children and adolescents attend high-intensity athletic camps each year; the rate and type of injuries sustained are unknown.

Hypothesis: Participants in a high-intensity athletic camp would have significant, identifiable health care needs associated with injuries and illnesses.

Study Design: Retrospective, observational study.

Methods: Acute medical care for camp participants was primarily provided in an academic medical center emergency department (ED). All participants treated in the ED or by a volunteer camp physician were included in the study. Medical and camp records for camp participants were reviewed and described.

Results: In sum, 263 participants attended the high-intensity wrestling camp in 2009. Seventy-eight (30%) were treated in the ED; median age was 15.8 years. Sixteen were seen more than once, totaling 96 visits. Thirty-four percent of visits included x-ray and 25% laboratory studies. Forty-four percent were skin complaints. One patient had methicillin-resistant *Staphylococcus aureus* infection; none had positive viral skin cultures. Musculoskeletal or facial trauma occurred in 37%, with 5 fractures. Injury rate was 1.9 per 1000 athlete exposures. Overall, 47% of campers sought medical care during camp; 11 (4.2%) left camp early because of illness or injury. Few wrestlers received follow-up care.

Conclusions: Illnesses and injuries requiring medical attention were common in this high-intensity sports camp. While many ED patients could have been treated in a clinic, 50% required ED medical resources for diagnosis or care.

Keywords: high-intensity athletic camp; injuries; emergency department

Thousands of children and adolescents participate in high-intensity athletic camps each year (eg, www.advantagebasketball.com/basketball_camps.htm, www.intensesocceracademy.com/, www.kenchertow.com/, <http://cocwrestling.org/>, www.jrobinsoncamps.com/, www.trainwithkenyans.com/), often traveling far from home to take part in programs designed to support competition at the highest level. One such high-intensity camp (J Robinson Camps, www.jrobinsoncamps.com/intensive_overview.php) provides

approximately 275 competitive wrestlers, aged 13 to 18 years, 4 weeks of intense training experience that has been compared to a military boot camp, with a coaching staff that includes Olympic medalists, all-American wrestlers, and coaches of National Collegiate Athletic Association championship teams.

Boys' high school wrestling has the second-highest injury rate of major high school sports, after football.⁴ Participants in high-intensity wrestling camps are expected to have significant medical needs. Previous studies have described the medical

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Table 1. Total use of medical care among camp participants.^a

Site	No. of Visits	No. of Patients	No. of Patients, Skin Complaints	Records Reviewed
UMMC ED	96	78	43	Yes
Other ED	2	2	0	No
Camp physician	51	51	51	Yes (limited)
Student health clinic	6	6	Unknown	No
Total	155	123	90	

^aUMMC, University of Minnesota Medical Center; ED, emergency department. Totals do not add up because some individuals were seen at more than 1 site.

care needs in a general summer sleepaway camp,⁵ injuries in a lacrosse camp,⁶ and outbreaks and prevention of herpes gladiatorum.¹⁻³

The intent of this study was to describe the illnesses, injuries, and medical care utilization of participants in a 4-week high-intensity summer wrestling camp to assess the medical needs of this group for administrators and health care providers.

METHODS

Setting

The University of Minnesota Institutional Review Board approved this study prior to data collection.

The University of Minnesota Medical Center emergency department (ED) was the primary source of acute medical care for the participants in the high-intensity wrestling camp from July 2 through July 30, 2009. All ED care was provided by attending physicians, board certified or board eligible in emergency medicine or pediatric emergency medicine. Care was also provided at camp by certified athletic trainers and a volunteer family physician who was available for approximately 2 weeks of the camp period (investigator BJA).

Camp participants live together in dormitories on the university campus. They engage in three 2-hour sessions of wrestling per day. Additional daily activities include running and weight training.

Study Inclusion Criteria and Sample Identification

All wrestling camp participants treated in the University of Minnesota Medical Center ED or seen by the volunteer camp physician were included in the study. Cases were identified by review of hospital records and camp physician records from the period of interest. Eight participants received care at the student health service clinic or other EDs; these records were not available for review.

Data Collection

Data included patient demographics, number of ED visits, visit timing, diagnostic and therapeutic interventions, discharge diagnosis, disposition, recommended follow-up, and discharge prescriptions.

Camp athletic trainers kept records of camp participants who were transported off-site for medical visits and of those who were discharged early from camp. In addition, each camp participant had a file containing brief, dated notes from athletic trainers and other camp staff.

Data Analysis

Injury rate per thousand athlete exposures was calculated on the basis of an average of 3 exposures per day for all 28 days of camp, without adjusting for participants discharged early from camp.

RESULTS

In 2009, there were 263 participants in the 28-day camp (Table 1). Seventy-eight camp participants (30%) were seen in the ED; 14 were seen twice and 2 were seen 3 times, for a total of 96 visits. None of the repeat visits were for the same complaint. Patients ranged in age from 14 to 18 years. Although girls do occasionally participate in the camp, all patients seen in the ED were male. Visits peaked in the third week of the 4-week camp. Skin conditions were a prominent complaint, leading to at least 1 medical visit for 90 individuals (34% of camp participants). Forty-seven percent of camp participants (123 individuals) required medical attention.

Thirty-four percent of ED visits included x-ray. Twenty-five percent of visits had laboratory studies. Only 1 patient, with transient shortness of breath who was diagnosed with dehydration, had both laboratory studies and a chest x-ray. Overall, 48 (50%) of the ED visits required ED care.

Table 2. Emergency department discharge diagnoses by visit.

Discharge Diagnosis (n = 98) ^a	No. (%)
Skin	43 (44)
Musculoskeletal or facial trauma	36 (37)
Non-skin infectious	6 (6)
Laceration	4 (4)
Exertional (eg, dehydration)	3 (3)
Anxiety related	2 (2)
Asthma	2 (2)
Closed head injury	1 (1)
Traumatic hematuria	1 (1)

Eighty-three percent of visits associated with musculoskeletal complaints included x-ray; of these, 18% showed fractures. The majority of laboratory studies were viral and bacterial cultures with gram stains for patients with skin complaints. All bacterial skin cultures were positive, most commonly for methicillin-sensitive *Staphylococcus aureus*; all viral skin cultures were negative. The majority of skin complaints were impetigo. The gram stain and culture results did not change management. There was 1 case of methicillin-resistant *S aureus* skin infection at the camp: a known abscess with cellulitis that was worsening on clindamycin. The patient was prescribed linezolid and discharged to follow-up at an infectious disease clinic. He did not return to camp and was lost to follow-up.

Skin diagnoses, primarily impetigo, were the most common (Table 2). Four had truncal soft tissue injuries, and 5 had facial injuries, including 1 pinna hematoma.

Eleven participants were discharged from the camp because of injury or illness, representing 4.2% of the initial participants.

DISCUSSION

This study shows that 47% of adolescents participating in a 4-week high-intensity wrestling camp had at least 1 illness or injury requiring medical attention; a majority of these were seen in the ED. Most ED visits involved low-acuity complaints that could have been addressed by an on-site camp physician or in a clinic or urgent care.

More than half the patients with skin complaints were treated by a volunteer camp physician. Although 35% of patients seen

in the ED for skin complaints had wound cultures, the cultures did not alter management.

No patients were diagnosed with herpes gladiatorum during this camp session. On the basis of previous research conducted at this camp,¹⁻³ all participants were strongly advised to take prophylactic valacyclovir during the camp session. Unfortunately, no data regarding use of valacyclovir were available. Despite a high prevalence of bacterial skin infections, only a single patient was found to be infected with methicillin-resistant *S aureus*.

Forty-two percent of ED visits were for lacerations or minor closed head trauma: the injury rate was 1.9 per 1000 athlete exposures. This is significantly lower than the 6.0 injuries per 1000 exposures reported in 458 high school wrestlers⁷ and the 2.5 injuries per 1000 exposures reported in a US high school athlete surveillance study.⁴

Limitations

This study is limited by its retrospective design. Data were gathered from routine medical and camp records, which were not designed to capture all information that may have been of interest to the study.

Calculation of injury rate per 1000 athlete exposures was limited by the study's focus on ED visits. The calculation was based on an average of 3 "exposures" per day. Exposure calculation was affected by (an unknown) number of participants who left camp early and alternative schedules. Data did not include student health services clinic (6 patients) and other EDs (2 patients).

CONCLUSIONS

Almost one-half of all participants in a 4-week high-intensity wrestling camp required medical attention. Minor skin complaints were the most frequent, followed closely by injuries. Contagious skin infections are relatively specific to wrestling. High-intensity sports camps should develop protocols for initial assessment of illnesses and injuries, as most do not require an ED visit.

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