

Is the Preparticipation Physical Examination Replacing the Annual Well Child Examination among Student Athletes?

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ABSTRACT

Background: The goal of the preparticipation physical examination (PPE) is to promote health and safety during competition by screening athletes for injuries and illness. Historically it has been reported that the PPE may be the only medical evaluation that many student athletes receive. Our objective was to evaluate whether student athletes who have participated in our PPEs also receive routine well child care. In addition, we investigated parental perspectives regarding what should be included during the PPE.

Methods: A 29-question survey was distributed to parents of student athletes during 6 PPE sessions sponsored and hosted at local school districts. Descriptive statistics were used to characterize and summarize the data set.

Results: A total of 288 surveys were completed. All our student athletes had a primary care provider (100%), with the overwhelming majority of student athletes (90.9%) having both a well child examination and a PPE annually. Approximately 89% of parents believed that electrocardiograms prevented sudden cardiac death in sports. The majority of parents believed the PPE was an appropriate setting to discuss mental health and substance abuse.

Conclusion: The majority of student athletes complete both a well child examination and a PPE annually. Parents believe screening electrocardiograms are effective in preventing sudden cardiac death and that the PPE can prevent injuries from occurring. Parents also believe the PPE can serve as an opportunity to discuss mental health and substance abuse, which is consistent with the most recent PPE monogram. An educational handout should be provided to parents regarding the goals of the PPE.

that many student-athletes receive for several years, because parents may view the PPE as an adequate assessment of health.⁶ This may be especially true of student athletes from low-income families who cannot afford routine medical care. According to a 1980 study performed by Goldberg et al,⁷ the PPE served as the annual health assessment for 78% of student-athletes. In 1985, Risser et al,⁸ found that the PPE served as the annual health assessment for 88% of student-athletes. However, more recent data in 2012 suggest a potential change in trend, with 74% of insured and 46% of uninsured adolescents receiving an annual health supervision examination.³

Recommendations were updated for the PPE most recently in 2019 through the *Preparticipation Physical Evaluation Monograph*.³ In the conclusion of the monograph, it states the PPE is ideally performed by an athlete's primary care physician and should be a part of the preventive health examination [also known as the well child examination (WCC)].³ Since the monograph's release, no study (to our knowledge) has surveyed the parents of student athletes to inquire about whether their child has a primary care provider and undergoes annual health assessments. There is also a lack of research regarding parental knowledge of the objectives and content of the PPE. The purpose of our study was to evaluate whether student-athletes who have participated in PPEs also receive a preventive WCC. A secondary aim was to evaluate parental perspectives regarding what they feel is included and what they feel should be included during a PPE.

INTRODUCTION

Approximately 30 million athletes younger than 18 years undergo a preparticipation physical examination (PPE) to participate in sports every year.^{1,2} The goal of the PPE is to promote athlete health and safety while evaluating for conditions that are life-threatening or that predispose to injury.³ Although the sports physical examination is not intended to substitute for an athlete's regular health maintenance examination, it can serve as an entry point into the health-care system for adolescents without a medical home.³

PPEs routinely do not address important medical issues such as depression, substance abuse, physical activity, risk for pregnancy, sexually transmitted diseases, or immunizations.^{4,5} Historically, the PPE was felt to be the only medical evaluation

MATERIALS AND METHODS

A voluntary 29-question survey was developed by the authors (see Appendix^a). This study was submitted to and approved by the university's institutional review board. Study participants were recruited at registration for a PPE session sponsored and hosted at local school districts. The

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Table 1. Comparison of surveyed school districts

School district	School type	County population	Ethnicity	Mean family income	High school graduate or higher	Bachelor degree or higher
A	Public urban/inner city	25,770	Cau, 63.2%; AA, 2.2%; Hisp, 9.3%	\$37,511	78.7%	10.5%
B	Public suburban	9016	Cau, 92.3%; AA, 2.2%; Hisp, 3.5%	\$55,859	91.0%	31.4%
C	Public suburban	9270	Cau, 81.4%; AA, 7.0%; Hisp, 6.6%	\$46,514	86.6%	18.0%

AA = African American; Cau = Caucasian; Hisp = Hispanic.

survey was distributed to the parents of middle and high school student athletes during 6 mass PPEs at 3 high schools from June 2017 to July 2017. There were 2 PPE sessions performed at each area high school. Each of these high school districts had different demographic information, such as population number, ethnicity distribution, mean family income, and educational level (Table 1). Inclusion criteria included 1) being a parent/guardian of a student athlete who was present at the PPE and 2) being able to read and write in English. Consent was obtained from the subjects when the survey was distributed.

The participants completed the surveys during the student-athletes' PPE. A study team member was available to the participants to answer any questions related to terminology used in the questionnaire. The questionnaire was created to determine whether student-athletes who participated in the PPEs had a primary care provider, underwent an annual health assessment, and received routine vaccinations. In addition, participants were asked questions regarding what should be included in the PPE, such as providing counseling on mental health and sexual activity, as well as screening electrocardiograms (EKGs).

The survey was written at a middle school level to ensure comprehension based on a wide variety of educational backgrounds. Questionnaires were numbered, administered, collected, and stored in accordance with institutional review board specifications. Prior to administration, the survey was reviewed for accuracy by 3 family medicine physicians (including 2 fellowship-trained sports medicine physicians), 3 certified athletic trainers, and 1 sports medicine fellowship-trained orthopedic surgeon. The data were analyzed using descriptive statistics.

RESULTS

A total of 288 surveys were completed by the parents of the student athletes during our PPEs (Figure 1). Female student athletes composed 57% of our sample. Ethnically, 74.9% of our students were Caucasian; 6.6%, African American; and 18.5%, listed "Other." Hispanics (of any ethnicity) composed 20.1% of our sample.

All our student-athletes had a primary care provider (100%), with the overwhelming majority of student-athletes (90.9%) having both a WCC and PPE annually (Figure 2). Only 26 parents (9.16%) used the PPE as their child's

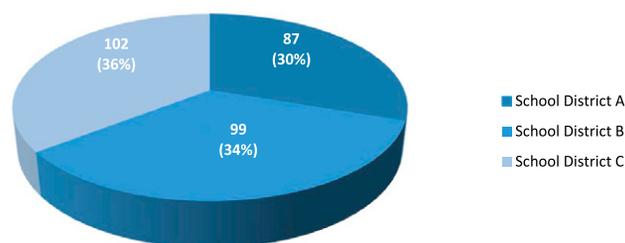
Surveys Completed

Figure 1. Distribution of surveys completed by high school district.

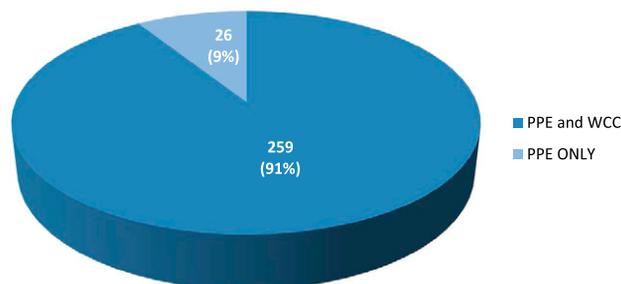
Preventative Care

Figure 2. Distribution of student athletes who had a preparticipation physical examination (PPE) and well child examination (WCC) versus PPE only.

annual health assessment, and 25 parents (8.68%) believed the PPE was identical to the WCC. The vast majority of parents (89.4%) believed that EKGs prevented sudden cardiac death in sports; 78.1% believed that EKG screening should be performed during the PPE. Most parents (69.7%) believed the PPE prevents minor injuries whereas 61.3% of parents believed the PPE prevented major injuries. The PPE was an appropriate setting to discuss mental health for 170 parents (60.1%), and 222 parents (70.9%) believed the PPE was an appropriate setting to discuss substance abuse. Interestingly, 185 parents (64.5%) completed the health questionnaire and health history for the PPE without the student-athlete's input. Most parents (65.0%) believed an eye doctor should have a role in the PPE; 69 parents (24%) believed a dentist should have a role in the PPE.

DISCUSSION

This survey demonstrated that the PPE is not replacing the WCC in our sample because the vast majority of our

student-athletes undergo both a PPE and a WCC annually. In addition, all our student-athletes had a primary care provider. This is in contrast to historical beliefs. The reason for this finding may be multifactorial. In the study by Goldberg et al⁷ in 1980, 78% of students used the PPE as their annual health assessment. Since that time, parents may have become more aware of the limitations of the PPE, including preventive health screening and provision of immunizations. Because of these limitations, parents may be ensuring their child receives comprehensive care by having them undergo a WCC annually. Another reason for this finding is the availability of health care. Every state now has the Children's Health Insurance Program (CHIP), which was signed into law in 1997 and provides health insurance to uninsured children and teens who are not eligible for or enrolled in medical assistance. CHIP benefits are different in each state; however, through the Commonwealth of Pennsylvania's CHIP program, children younger than 19 years are able to receive high-quality comprehensive insurance coverage that includes immunizations, routine well child visits, prescription drugs, dental care, vision care, and maternity care. At the time of our survey, approximately 360,000 children in Pennsylvania were enrolled in the CHIP program, which made Pennsylvania the fourth largest state with children enrolled in the CHIP program.⁹ Parents who were using the PPE previously as their child's only health assessment may now be using CHIP, which includes having a primary care physician and having a WCC. Last, the Pennsylvania Interscholastic Athletic Association requires student-athletes to obtain a PPE during the same academic year of sports participation, with the earliest examination being completed on June 1. Because of the short time frame in which the PPE must be completed before sports begin in the fall, parents may choose to have the PPE performed during mass PPEs because of their convenience, compared to scheduling a PPE with their primary care provider, which may not be as convenient to schedule.

The parents of our student-athletes may believe that the PPE plays a role in preventing injuries, as 69.7% believed the PPE prevented minor injuries and 61.3% believed the PPE prevented major injuries. Carek and Mainous¹ found similar results when surveying collegiate student-athletes; most athletes believed the PPE prevents or helps prevent injuries, when there is no clear evidence to support this assumption. Currently, the yield of the musculoskeletal examination is low in asymptomatic athletes who have no history of injury.¹ Similarly, Bahr¹⁰ conducted a review that demonstrated the inefficiency of current musculoskeletal screening techniques at predicting and impacting future injury risk. Although risk factors have been identified that are associated with injury risk, current musculoskeletal

screening tests are unlikely to predict injury with sufficient accuracy. Further education should be provided to parents of student-athletes regarding the goals of the PPE and its limited role in the prevention of injuries.

In our study, 89.4% of parents believed that EKGs prevented sudden cardiac death in sports, and 78.1% believed it should be incorporated in the PPE. In the US, the use of EKG screening in association with the PPE is a controversial topic. EKG screening can potentially identify life-threatening disorders, such as channelopathies and cardiomyopathies; however, many athletes have normal adaptations to athletic activity, such as left ventricular hypertrophy, and changes in the right ventricle can mimic pathological conditions.¹¹ Although the 12-lead EKG has been a mainstay of hospital-based cardiovascular practice for decades, it is an unproven diagnostic tool for reliable detection of cardiovascular disease in generally healthy populations.¹² The fifth edition of the *Preparticipation Physical Evaluation Monograph* states that the decision to add a screening test to the PPE requires careful consideration of the actual differential risk of sudden cardiac arrest/death in the target population compared with the expected false-positive and false-negative aspects of the proposed screening test.³ The American Medical Society for Sports Medicine position statement on PPE cardiac screening suggests that determining medical eligibility using an EKG as a screening tool should be based on the perceived risk of the athlete population, the individual physician's ability to interpret findings accurately, and the availability of a cardiology infrastructure.¹³ Currently, there are no definitive data that demonstrate EKG screening in sports prevents death. Malhotra et al¹⁴ conducted a study with 11,168 adolescent athletes in the English Football Association who participated in a cardiac screening program, which consisted of a health questionnaire, physical examination, electrocardiography, and echocardiography. Results of their study demonstrated that 75% of the athletes with sudden cardiac death had normal cardiac screening results.¹⁴ It does not appear that screening programs provide absolute protection against sudden cardiac death; however, 1 recent study did demonstrate that EKG screening, when performed by experienced clinicians, is superior to the American Heart Association 14-point evaluation (which is performed during the PPE) for the detection of cardiovascular disorders at risk for sudden cardiac death.¹⁵ In our survey, the majority of parents believed that EKG screening prevents death and should be conducted during the PPE. It has been shown that school-based automated external defibrillators combined with a comprehensive emergency action plan have been shown to decrease death from sudden cardiac arrest in the student-athletes.^{13,16} Future efforts should focus on educating

parents on the essential role of automated external defibrillators and emergency plans in improving sudden cardiac arrest outcomes. In addition, parents should be educated on the evolving status and the challenges of performing EKG screening on the US high school athlete. Because the fifth edition of the *Preparticipation Physical Evaluation Monograph* is encouraging that the PPE be incorporated in the routine health screening examination (WCC), the added use of EKG screening in the medical home with interpretation by a physician familiar with modern standards for EKG interpretation in athletes may be a subject of future investigation.

Mental health is an important aspect of student-athlete health. Student-athletes face numerous stressors, such as performance expectations, balancing of academic requirements, and dealing with injuries.¹⁷ Approximately 32% of students nationwide have symptoms of depression, 17% of students have seriously considered attempting suicide, and 7% of students actually attempted suicide one or more times.¹⁸ In our study, 60% of parents believed the PPE was an appropriate setting to discuss mental health. This may demonstrate that the majority of parents understand the importance of mental health in student-athletes. This is also in agreement with the fifth edition of the *Preparticipation Physical Evaluation Monograph*, which states that mental health screening during the PPE may promote early identification of athletes at risk for mental disorders.³ This can be challenging to achieve in the mass PPE setting because of the sensitive nature of the discussion and the number of people who are able to hear it. Therefore, positive answers to screening questions should initiate a private discussion between the athlete and physician, with subsequent referral to a mental health provider if needed.

Substance use and substance use disorders are prevalent among adolescents and young adults, including athletes at all levels.³ According to the Youth Risk Behavior Surveillance study, 60.4% of students drink alcohol, 28.9% of students have tried cigarette smoking, 42.2% of students have used an electronic vapor product, and 14.0% of students have taken prescription pain medicine (including drugs such as codeine, Vicodin, oxycontin, hydrocodone, and Percocet) without a doctor's prescription.¹⁸ In addition, 4.8% of students used any form of cocaine, and 35.6% of students used marijuana.¹⁸ Parents are likely aware of these risks and, as such, 70.9% of our parents believed the PPE was an appropriate setting to discuss substance abuse. This is consistent with the most recent PPE monograph goal of providing an opportunity for discussion of health and lifestyle issues.³ The challenge, again, is the sensitive nature of these discussions, especially in a mass PPE setting, where student-athletes are unlikely to reveal whether they are involved with substance abuse. Studies are needed to

determine whether the mass PPE setting is appropriate at all for substance use screening and whether we should be recommending that this be completed in the medical home.

One interesting finding was that 64.5% of the parents completed the PPE history form without the assistance of the student-athlete. Carek et al¹⁹ showed that discrepancies exist between information given by parents and that given by student-athletes during the annual PPE. Student-athletes should play a role in completing their history form because parents may not be aware that their child is experiencing symptoms. In contrast, student-athletes may not know their complete medical or family histories, which may contain important risk factors useful to the provider. It may be helpful for instructions to recommend that the athletes and their guardian fill out the health questionnaire together to decrease discrepancies.

Dental trauma, eye injury, and loss of vision are concerns in sports participation. In our study, 65% of the parents believed an eye doctor should have a role during the PPE, whereas only 24% of parents believed that a dentist should have a role during the PPE. These findings may indicate that some parents may like to incorporate a specialist's assessment regarding their child's dental and vision health prior to participation in sports.

There are several limitations to our study. Our study represents a convenience sample of parents at 3 local schools in Pennsylvania. A total of 288 surveys were completed; however, we were unable to determine the survey response rate. The reason for this is that many of the high school student-athletes were not accompanied by a parent when presenting for their PPE. There may be geographic bias because all school districts surveyed were in the same region. Because our survey asked retrospective questions, our results could have been impacted by recall bias. We are unsure of how many of our student-athletes use CHIP, which could be a potential source of internal bias in our study. CHIP benefits are different in each state; however, all states provide coverage for routine checkups, doctor visits, prescriptions, and immunizations. As a result of these limitations, the generalizability of our findings to other groups may be limited.

One final limitation is the validation of our survey. We created this original survey to answer our research questions because no validated instrument exists. We addressed content validity through an independent review of the questions. Each question was reviewed for content appropriateness and readability.

CONCLUSION

The majority of student-athletes complete both a WCC and a PPE annually. In addition, all our student-athletes had a primary care provider. This is in contrast to historical

beliefs that the PPE is the only medical evaluation that many student-athletes receive. Parental perception of what should be performed and what is being performed during the PPE are in contrast. Parents believe that screening EKGs should be incorporated in the PPE and that they are effective in preventing sudden cardiac death. Parents believe an eye doctor should have a role in the PPE, and they believe the PPE is an appropriate setting to discuss mental health and substance abuse. The majority of parents also believe that by having a PPE, student-athletes are a less likely to sustain major or minor injuries during sports. Further education should be provided to parents in the form of a handout that describes the objectives and limitations of the PPE. However, some parental perceptions (including screening for mental health and substance abuse) are consistent with the most recent PPE monograph. ❖

Supplemental Material

^aSupplemental Material is available at: www.thepermanentejournal.org/files/2021/20.298supp.pdf

Disclosure Statement

The author(s) have no conflicts of interest to disclose.

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Author Contributions

Eldra W Daniels, MD, MPH, Cayce A Onks, DO, MS, ATC, Robert A Gallo, MD, and Matthew Silvis, MD, participated in the study design, data acquisition and analysis, and drafting of the final manuscript. All authors have given final approval to the manuscript.

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