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Efficacy of high school Pre-participation Physical Evaluation.

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EFFICACY OF HIGH SCHOOL PRE-PARTICIPATION PHYSICAL EVALUATION

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ABSTRACT

EFFICACY OF HIGH SCHOOL PRE-PARTICIPATION PHYSICAL EVALUATION

by Crystal Miles-Threatt

The Pre-participation Physical Examination (PPE) is an annual medical clearance required for athletic participation. Six medical organizations have endorsed the requirements for a PPE, and the California Interscholastic Federation offers a recommended form. However, because the use of this form is not mandatory, a lack of consistency occurs and some forms do not contain all the recommended requirements. This study analyzes the PPE process in California high schools to better understand whether the PPE process offers sufficient precautions to ensure athlete medical safety.

A questionnaire was distributed to high schools in the California Interscholastic Federation and 309 athletic directors responded. No correlation was identified and no significant differences were discovered between years of experience as an athletic director, having a certified athletic trainer and/or team physician, or the use of the California Interscholastic Federation recommended PPE form. Of the PPE forms that were analyzed, more than half were evaluated as adequate. However, the results showed that a number of PPE forms were last revised in 1999 and that some high schools were using outdated forms.

The school board is the deciding body for the format of the PPE form, but this study concludes that athletic directors or certified athletic trainers should play a more pivotal role in keeping the school board abreast of current guidelines and recommendations to help ensure the safety of high school athletes.

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Introduction

Participation in high school sports resulted in an estimated 1.4 million injuries at a rate of 2.4 injuries per 1,000 athlete exposures (i.e., practices or competitions) (Centers for Disease Control and Prevention, 2006). The Pre-Participation Physical Examination (PPE) is a required annual medical clearance for athletes participating in sports activity. It is used to identify factors that predispose young athletes to injury. The California Interscholastic Federation (CIF) recommends a particular PPE form endorsed by six medical societies (American Academy of Family Physicians [AAFP], American Academy of Pediatrics [AAP], American College of Sports Medicine [ACSM], American Medical Society for Sports Medicine [AMSSM], American Orthopedic Society for Sports Medicine [AOSSM], and American Osteopathic Academy of Sports Medicine [AOASM]).

The recommended PPE form was created not only to confirm medical clearance via physician's signature, but also to assist athletic directors (ADs), certified athletic trainers (ATCs), and coaches in identifying injuries and medical conditions. Some California high schools use a PPE form which only includes a physician's signature and one or two lines for comments. Although many athletic injuries are thought to be preventable (Linder, Durant, Seklecki, & Strong, 1981), it is difficult to ensure medical safety without sufficient medical information about the student-athlete.

Statement of the Problem

The pre-participation physical examination (PPE) includes a physical examination and health history information. The PPE process, on the other hand, involves not only the physical examination and health history, but also the timing, the location, and the medical personnel who are required to administer the physical examination and to review the athlete's health history. Many school boards, athletic directors, certified athletic trainers, coaches, parents, and student-athletes do not appreciate the significance of each stage in the PPE process because they may lack knowledge regarding its importance.

The California Interscholastic Federation (CIF) requires that each student-athlete receive an annual medical examination by a medical practitioner certifying that the student is physically fit to participate in athletics. The use of a variety of PPE forms within the CIF makes regulation difficult. The CIF also requires a health history on a school board-approved form. However, general misinformation concerning the format of the PPE form results in some high schools excluding the health history of the student-athlete. Ultimately, high schools are not required to use the CIF-recommended PPE form endorsed by AAFP, AAP, ACSM, AMSSM, AOSSM, and AOASM, nor do CIF bylaws state that high schools must use a comparable PPE form. If the required information necessary to screen athletes is omitted, the PPE is ineffective in reducing injury and protecting the athlete

Furthermore, the CIF fails to specify required credentials for acceptable medical practitioners. These deficiencies become a problem because some student-athletes receive clearance from practitioners not recognized by the American Medical Association

or the American Heart Association. For example, if the practitioner is not experienced in detecting key flags in the sensitive cardiac screening, an inaccurate test can be potentially dangerous for the athlete. The recommended PPE form identifies qualified medical practitioners.

Statement of the Purpose

The purpose of this study is to analyze the pre-participation physical examination (PPE) process in California high schools to better understand whether the PPE process offers sufficient precautions to ensure athlete medical safety. In addition, PPEs are assessed for congruency with the CIF-recommended form.

Chapter 1 is a brief synopsis of the thesis. Since an assumed risk of injury comes with high school athletic participation, the PPE form should provide a focused, preventive instrument for the well-being of high school athletes. It should also help ensure safer athletic participation. The CIF recommends such a PPE form, but cannot enforce its use. The CIF is only able to require a medical examination administered by a healthcare provider on a school board-approved health history form. The lack of consistency between the PPE forms could lead to inappropriately screened athletes if insufficient health history is provided. Thus, this inconsistency may hinder the overall healthcare of the individual.

Chapter 2 is a journal article, which will be submitted to the *American Journal of Sports Medicine* according to the journal's manuscript format. The article is based on a study that involved the distribution of questionnaires and a statistical analysis of non-CIF-recommended PPE forms. A review of the literature, together with a detailed

discussion of the results, is also included. The conclusion summarizes information from results and the discussion poses questions for future consideration and research.

Chapter 3 includes background and additional supporting information introduced in three sections: introduction, review of literature, and methods. The introduction states the problem and the purpose of the study, the delimitations and limitations of the study, as well as defining pertinent key terms. The review of literature introduces four topics regarding the PPE. The topics include: the difference between the PPE and the preventive health examination (PHE); the history of the PPE; the efficacy of the PPE; and the standardization of the PPE. The methods section discusses the study design. The study was influenced by three articles: "Profile of pre-participation cardiovascular screening for high school athletes" (Glover & Maron, 1998), "Current use of adequate pre-participation history forms for heart disease screening of high school athletes" (Gomez, Lantry, & Saathoff, 1999), and "Pre-participation screening of high school athletes: Are recommendations enough?" (Koester & Amundson, 2003).

Chapter 2

Journal Article

At the beginning of the high school sports season, a form is distributed by the athletic director, trainer or coach to every student-athlete who wants to try-out for a sports activity. The form is a pre-participation physical examination (PPE) form. The form must be signed by an approved healthcare professional medically clearing the student-athlete for sports participation, the parent or guardian consenting to their child's participation, and the student-athlete consenting to abide by the rules of sportsmanship. The form may include one or more of the following sections: emergency information, insurance information, general health information, sports health history, and a physical examination results section. The variation in the form content makes it difficult to compile a complete sports medical history of the student-athlete. This study will address the following questions: (1) How many high schools in California use the CIF-recommended PPE form or a modified version? (2) How many high schools in California use a PPE form that does not include the recommended information specified in the CIF bylaws? (3) Are years of experience as an athletic director, having a certified athletic trainer, or having a team physician factors in the use of the CIF-recommended form? (4) Do demographics contribute to the use or non-use of the CIF-recommended form?

Efficacy of High School Pre-Participation Physical Evaluation

ABSTRACT

Background: The pre-participation physical examination is an annual medical clearance required for high school athletic participation, but lack of standardization jeopardizes the goals and efficacy of the examination.

Hypothesis: To determine whether the pre-participation physical examination process in California high schools is effective in ensuring the medical safety of student athletes.

Study Design: Descriptive Study

Methods: California high school athletic directors, with valid email addresses, were asked to complete a questionnaire. If their high school did not use the California Interscholastic Federation form, they were asked to fax or email the form they used. Forms were scored on a six-point scale, with ratings assigned as adequate (6-5), intermediate (4-3), or inadequate (2-1).

Results: No correlation was identified and no significant differences were discovered between years of experience as an athletic director, having a certified athletic trainer or a team physician, or using the California Interscholastic Federation recommended form. Of the 84 high schools that submitted their own forms, an analysis showed that 54% (46) of the forms were adequate, 19% (16) were intermediate, and 27% (23) were inadequate.

Conclusions: The pre-participation physical examination process will be most effective if athletic directors, certified athletic trainers, and coaches play a stronger role in keeping school boards aware of current guidelines and recommendations. Schools currently using

inadequate forms should be encouraged to use the Federation's recommended form in order to maximize the efficacy of the pre-participation physical examination.

Key Words: California high school athletics, pre-participation physical examination, pre-participation physical evaluation, sports physical.

INTRODUCTION

Participation in California high school athletics had increased to more than 700,000 in 2007.[7] The increased number of sports' participants has also increased the associated rate of injury and death.[1] Preventing injury and reducing mortality rates may be aided by a pre-participation examination (PPE) that identifies factors that predispose young athletes to injury.[15,19] However, the PPE process is not well defined. The PPE process requires parents and student-athletes to complete a medical history form, as well as medical personnel to review this health history and administer a focused physical examination. The timing and location of the PPE are essential complimentary aspects of the PPE process that are oftentimes overlooked.[16,17,19] Failure to screen potential athletes through an inadequate PPE process may hinder the overall healthcare of the individual. An effective PPE process will contribute to the safety of the athlete, as well as the prevention of injury.

The PPE is often confused with the Periodic Health Examination (PHE). The PPE has three primary goals: to "detect conditions that may predispose an athlete to injury/illness, to detect conditions that may be life-threatening or disabling, and to meet legal and insurance requirements."[25] The PPE form is a sports screening, not a health screening. The PPE should include a medical history that emphasizes the areas of

greatest concern for sports participation, a general screening physical examination, musculoskeletal evaluation, and cardiac evaluation.[18] The periodic health examination (PHE) has two primary goals: the prevention of specific diseases and the promotion of health. The goals are achieved through routine check-ups and immunizations. The routine check-up includes a 30-minute complete head-to-toe exam, diagnostic tests, and immunizations.[12] The PPE differs from the PHE because it is specific to athletic participation. PPE completion culminates with documentation of medical clearance, requiring a physician's signature, which permits athletes to participate in sporting activities.

The California Interscholastic Federation (CIF) is the athletic governing body for high school student-athletes in the State of California. In the CIF bylaws, the sports physical is a yearly examination conducted by a medical practitioner and reported on a school board approved form that includes a health history. The CIF strongly recommends that school districts use their PPE form that has been endorsed by six major medical societies: American Academy of Family Physicians (AAFP), American Academy of Pediatrics (AAP), American College of Sports Medicine (ACSM), American Medical Society for Sports Medicine (AMSSM), American Orthopedic Sports Medicine (AOSM) and the American Osteopathic Academy of Sports Medicine (AOASM). However, the CIF cannot force school districts to use their form and this lack of standardization has created non-uniformity among the PPE forms.

Although consensus supports the importance of the PPE to ensure the health of participating athletes, a standardized form has not been implemented.[15,19] Medical

societies suggest a national standardized form[15] or a state standardized form[1,19] should be required, while the National Federation of State High School Associations (NFHS) suggests that a PPE is needed, but do not recommend a standardized form.[23] The state and national athletic associations do not necessarily understand the intricacies and subtleties of certain informative questions or examinations in the PPE. They rely on the subjectivity of physicians to provide relevant information. Therefore, physicians assume all liability of athletic participation.[22]

The literature has been analyzed to evaluate the dilemma of the high school PPE and to examine the lack of standardization of the process, the randomness of the screening methods employed, and the poor adherence to the American Heart Association (AHA) guidelines for cardiac screening of student-athletes.[16,17,19] The importance of a PPE process in the health and safety of athletes, coupled with the non-uniformity of PPE forms and recommended information, prompted investigation into the use of PPE forms in California high schools. The purpose of this study was to analyze the PPE forms used in California high schools to better understand whether the PPE process provides sufficient precautions to ensure student athlete medical safety.

MATERIALS AND METHODS

Athletic directors with valid email addresses and employed by California high schools that were members of the CIF were requested to participate in the study (N = 1,221). The athletic directors' email addresses were obtained from the California Interscholastic Federation public address list available via the CIF website (www.cifstate.org), Clell Wade Coaches Directory 2007-2008,[14] the Northern Section

School Directory 2007-2008,[6] and the Southern Section School Directory 2007-2008.[11] According to the Southern Section School Directory 2007-2008, there were 1,445 California high schools in the CIF. Of the 1,445 high schools, 224 surveys were undelivered because of e-mail spam, incorrect, unavailable, or expired email addresses, and some athletic directors opted out of the survey. A total of 1,221 emails were delivered to California high school athletic directors, and 309 athletic directors responded partially or completely to the survey questions. The total number of surveys delivered by section were Northern Section (NS) (n=57), North Coast Section (NCS) (n=135), Sac-Joaquin Section (SJS) (n=160), Oakland (OAL) (n=5), San Francisco (SF) (n=12), Central Coast Section (CCS) (n=109), Central Section (CS) (n=83), Los Angeles (LA) (n=99), Southern Section (SS) (n=458), and San Diego (SD) (n=103). For statistical analysis, the sections were divided into North (NS, NCS, SJS, OAL, SF, CCS and CS) and South (LA, SS, and SD).

The questionnaire was based on two previous studies, one assessing the cardiovascular evaluation and the other assessing criteria used to clear a student-athlete for sports participation. The six-page questionnaire contained twenty-six questions separated into four sections: demographic information (4 questions), faculty/staff information (9 questions), PPE process (5 questions), and athletic director's attitude regarding the PPE (8 questions). The latter section focused on athletic directors' knowledge of the PPE process, and sought responses on whether there was enough information circulated about the PPE, whether there is a need for the PPE, whether the PPE should be standardized, whether the athletic director thought the PPE was a

substitute for the PHE, and whether the athletic director sought updated information about the PPE.

Schools that did not use the CIF-recommended form sent in a copy of the form they used. These forms were scored using criteria from the PPE form endorsed by the six medical societies AAFP, AAP, ACSM, AMSSM, AOSM, and AOASM. The form was scored adequate (6-5), intermediate (4-3), or inadequate (2-1). One point was given for each of the following six criteria: physician signature, comments line, sports-specific health history, general health history, musculoskeletal physical, and general physical.

In order to evaluate the survey, statistical analysis was performed using computer software SPSS (Windows 16.0 GP, Chicago, Illinois) and Windows Excel 2007. An analysis of variance (ANOVA) was used to assess total number of years as an AD and the Likert scale variables. Crosstabs were used to compare the number of team physicians, school size, school section, and school region to the Likert scale variables. Pearson correlation was used to compare ATC use of the CIF-recommended form and the Likert scale variables.

RESULTS

Of the 309 (25.3%) respondents, 166 (53.7%) high schools use the CIF-recommended PPE form, 107 (34.6%) do not use the CIF-recommended PPE form, and 36 (11.7%) are unknown because there was no response to this question. The Southern Section has the largest number of respondents (32.5%). Most of the high schools have a population size within the range 501 to 1,500 (29.6%); the majority of respondents are from public schools (75.2%); and the majority of schools are located in the city (51.4%).

Of the 309 respondents, 113 (36.6%) California high schools have a team physician, and 128 (41.4%) have an ATC. Of the 128 ATCs, 74 are part-time (23.9%), 40 are full-time (12.9%), 31 are teachers (10.0%), 8 are physical therapists (2.6%), 13 are from athletic training programs (4.2%), 26 are from physical therapy clinics (8.4%), and 13 are from hospitals (4.2%). Some discrepancies arise in the ATC numbers because some questions were not answered, and because in some cases the ATCs occupy dual roles.

A Pearson correlation indicates a minimal correlation between having an ATC or team physician, using the CIF-recommended PPE form, and the dependent variables. Use of the CIF-recommended PPE form and seeking information concerning the PPE have the highest correlation value (0.212). California high schools with an ATC and seeking information concerning the PPE have the lowest correlation value (0.002). An analysis of variance (ANOVA) ($p < .05$) finds no significant difference between years of experience as an AD and the Likert scale variables, as listed above.

Crosstabs were used to analyze high schools that use the CIF-recommended PPE form versus high schools that do not use it, and these were compared to questionnaire data on team physicians, ATCs, school size, school type, school section, and school region (see Table 1). The use of PPE forms compared to the demographic information obtained in the survey indicated that the city high schools use the CIF-recommended PPE form more often than the mountain, suburbs, and rural high schools.

Crosstabs were also used to analyze ATC, school size, and school section and the dependent variables. A comparison of the athletic director's attitude toward the PPE with

demographic information helped distinguish what factors influence the athletic director's perspective. All the ADs agreed there is a need for a standardized form.

Table 1
Analysis of CIF-Recommended and Non-Recommended PPE Forms

School Criteria	CIF-Recommended Form	Non-Recommended Form*
Team Physician		
YES	58 (36%)	44 (42%)
NO	103 (64%)	61 (58%)
ATC		
YES	66 (40%)	51 (48%)
NO	99 (60%)	55 (52%)
School Size		
<1500	87 (53%)	57 (54%)
>1500	78 (47%)	49 (46%)
School Type		
Public	126 (77%)	81 (77%)
Private	37 (23%)	24 (23%)
School Section		
North	70 (43%)	50 (47%)
South	91 (57%)	57 (57%)
School Region		
City	88 (53%)	53 (49.5%)
Other	77 (47%)	54 (50.5%)

*Use CIF-recommended form (n = 166); use non-recommended form (n = 107); no response (n = 36). Numbers are inconsistent because information was incomplete on returned questionnaire.

ADs from the North agreed with the questionnaire statements that they have enough information about the PPE, while those from the South were neutral. ADs who have team physicians or ATCs agreed that ATCs or MDs are responsible for medical

issues. ADs who do not have team physicians or ATCs disagreed with the statement that ATCs or MDs are responsible for medical issues.

Table 2
Analysis of Non-Recommended PPE Forms

	Adequate (6-5)	Intermediate (4-3)	Inadequate (2-1)
NS	0	1	1
NCS	6	4	5
SAC-Joaquin	11	2	6
OAL	0	0	0
SF	0	0	1
CCS	6	3	5
CS	3	2	1
LA	1	0	0
SS	16	3	4
SD	2	1	0
Total	45	16	23

Copies of non-recommended PPE forms were obtained from 84 out of 107 high schools (78.5%) via fax, email, or the school's Web site. These high schools' PPE forms were analyzed for adequacy compared to the CIF-recommended PPE form. Of the 84 PPE forms, 54% were adequate, 19% were intermediate, and 27% were inadequate (see Table 2).

DISCUSSION

The PPE offers an opportunity to screen high school athletes for underlying pathologic conditions, to develop a framework for medical treatment during the sports season, and to develop preventive strategies before the competitive season. There were low correlations between the athletic directors' attitudes concerning the PPE process, having an ATC or team physician, and using the CIF-recommended PPE form.

However, significant practical information was identified. Administrators in California high schools that are able to employ an ATC to service their student-athletes during practice and competition may not have any influence regarding the recommendation or creation of the PPE form. That responsibility lies solely with the school boards. However, the health interests of student-athletes may not be met if a disconnect exists between the ATC and the school board. The ATC must have adequate information in order to effectively assist in the proper care of the athlete. The school board may not necessarily understand the intricacies and subtlety of informative questions or specific medical examinations in the PPE, and, therefore, may approve forms that lack relevant information.[26] Likewise, a school board may not understand the necessity for continuity of care as it pertains to a PPE. There are situations when a standardized form with consistent continuity of care is advantageous, specifically in the case of family insurance plans. For example, it is helpful for an ATC to know whether a student-athlete has no health insurance coverage or has high co-payments for an office visit. In such circumstances, the student-athlete may decide not to seek care. Moreover, a standardized form would assist an ATC in discussions with parents/guardians about where to take their children to be examined.

Consistent PPE administration in California high schools appears to be lacking.[12] Most high school student-athletes are examined by their family physician and the examination is reported on the PPE form provided by the school board. Although the family physician has knowledge of the athlete's health history, the physician may be unaware of risks associated with a certain sport or special musculoskeletal examination

techniques. If family physicians overlook such techniques, student-athletes may be allowed to participate with pre-existing injuries that, left untreated or unrecognized, can impede future participation.[17,20] The separation between family-physician information and information provided to coaches and/or ATCs can lead to unreliable and incomplete information, ultimately resulting in inconsistent and, perhaps, inappropriate continual care of a condition or injury.

Nationally, participation in high school athletics resulted in an estimated 1.4 million injuries at a rate of 2.4 injuries per 1,000 athlete exposures (i.e., practices or competitions) in 2006.[6] The most frequently injured body site was the ankle.[22] Research suggests that an athlete is more likely to re-injure a joint that has not been strengthened and/or reconditioned properly.[2] Since the probability of re-injury is a significant concern, past medical history is imperative for both baseline information and proper rehabilitation referrals. The majority of the non-recommended PPE forms do not provide a specific orthopedic history component where specific joints are identified, although they do provide a general history that relates to the entire student body population (physical education students, classroom health safety, and student-athletes).

An inadequate form (see Figure 1) is one that includes a physician signature and two or three lines for comments of relevant medical information. In those cases, the school boards allow physicians to determine relevant medical information. The physician's decision to include relevant information is subjective. There is no standard format for physicians to list or identify sports-related injuries so that ADs, ATCs, and coaches are aware of potential problems. Checks and balances are not in place to ensure

that a proper history is recorded, or that an appropriate physical examination is administered. While it is important to have the physician verify that the student-athlete has seen a healthcare professional, the signatures of the parent/guardian and student-athlete help validate that the information submitted to the physician is correct and accurate. All of the non-recommended PPE forms require a physician signature, but they do not require parent/guardian and student-athlete signatures to verify that the information provided to the physician is correct and accurate.

Student's Name_____
(LAST) (FIRST) (INITIAL)

I hereby certify that the above named student is physically fit to engage in sports.

_____ _____
(PHYSICIAN'S SIGNATURE) (DATE)

_____ _____
(TITLE) (STATE LICENSE)

Has the student had any injury or physical condition that should be watched? _____
If yes, please list: _____

PARENT/GUARDIAN TO COMPLETE:
If the student has health or accident insurance, list company name, policy number, and local claims address:

_____ _____
(COMPANY NAME) (POLICY NUMBER)

_____
(CLAIMS' OFFICE ADDRESS)

I hereby give my consent for the above-named student to compete in sports. I authorize the student to go with and be supervised by a representative of the school on any trips. In case this student becomes ill or is injured, you are authorized to have the student treated and I authorize the medical agency to render treatment.

_____ _____
(DATE) (SIGNATURE OF PARENT OR GUARDIAN)

Figure 1: Inadequate PPE Form

PART 1 (TO BE COMPLETED BY STUDENT AND PARENT(S OR GUARDIAN)

LAST NAME		FIRST NAME		GRADE
BIRTHDATE	FALL SPORT	WINTER SPORT	SPRING SPORT	**STUDENT ID NUMBER**

HEALTH HISTORY (Must be completed prior to the examination)

	Yes	No	Has this student had any:
1.	☐	☐	Chronic or recurrent illness?
2.	☐	☐	Illness lasting over 1 week?
3.	☐	☐	Hospitalizations?
4.	☐	☐	Surgery other than removal of tonsils?
5.	☐	☐	Missing organs (eye, kidney, testicle)?
6.	☐	☐	Allergies (medicines, insect bites, food)?
7.	☐	☐	Problems with heart or blood pressure?
8.	☐	☐	Chest pain or severe shortness of breath with exercise?
9.	☐	☐	Dizziness or fainting with exercise?
10.	☐	☐	Fainting, bad headaches or convulsions?
11.	☐	☐	Concussion or loss of consciousness?
12.	☐	☐	Heat exhaustion, heatstroke, or other problems with heat?
13.	☐	☐	Racing heart, skipped, irregular heartbeats, or heart murmur?
14.	☐	☐	Seizures?
15.	☐	☐	Muscle cramps?

Explanation of all "YES" answers:

	Yes	No	Does this student:
16.	☐	☐	Wear eyeglasses or contact lenses?
17.	☐	☐	Wear dental bridges, braces or plates?
18.	☐	☐	Take any medications? Please list: _____

	Yes	No	Is there any history of:
19.	☐	☐	Injuries requiring physical treatment?
20.	☐	☐	Neck or back injury?
21.	☐	☐	Knee injury?
22.	☐	☐	Shoulder or elbow injury?
23.	☐	☐	Ankle injury?
24.	☐	☐	Other serious joint injury?
25.	☐	☐	Broken bones (fractures)?

	Yes	No	Further history:
26.	☐	☐	Is there any reason why this student should not participate in sports?
27.	☐	☐	Has any family member died suddenly at less than 40 years of age of causes other than an accident?
28.	☐	☐	Has any family member had a heart attack at less than 55 years of age?

Date of last known tetanus (lockjaw) shot: _____

PARENT(S) OR GUARDIAN'S ACKNOWLEDGEMENT AND PERMISSION: I have reviewed and agree with the above information. I know of no reason why the above named student may not participate and represent his or her school in supervised athletic activities and I authorize a physician to perform this screening examination. Therefore, I give my permission for this student to participate in athletics and guarantee that he/she has sufficient medical insurance. **I will contact the athletic director if my student does not have medical insurance so I can purchase alternative insurance.**

PRINT NAME OF PARENT OR GUARDIAN		**SIGNATURE OF PARENT OR GUARDIAN**	
ADDRESS	WORK PHONE	HOME PHONE	DATE

PHYSICIAN'S NAME	OFFICE PHONE	**MEDICAL INSURANCE COMPANY & POLICY NUMBER**

Figure 2a: Adequate PPE Form – Part 1

PART 11 (TO BE COMPLETED BY THE EXAMINING PHYSICIAN)			
	NORMAL	ABNORMAL (Describe)	
Eyes/Ears/Nose/Throat			Height:
Skin			Weight:
Heart			Pulse: After Ex:
Abdomen			BP:
Genitalia/hernia (males)			***Recommendation:*** ☐ Unlimited participation ☐ Participation limited to specific sports ☐ Clearance withheld pending further evaluation ☐ No athletic participation
Musculoskeletal:			
a. Neck			
b. Spine			
c. Shoulders			
d. Arms/Hands			
e. Hips			***One of the above MUST be checked.***
f. Thighs			
g. Knees			
h. Ankles			
i. Feet			
Comments:			

PRINT NAME OF PHYSICIAN	PHYSICIAN'S SIGNATURE	DATE

NOTICE: THIS EXAMINATION DOES NOT CONSTITUTE A COMPLETE PHYSICAL EXAMINATION. It does, on this date, based on the observations of the physician, meet the requirements for the herein named student to participate in school sports activities. If you have any health concerns related to your student, be sure to bring those concerns specifically to the attention of your own physician. **The required physical needs to be renewed annually after June 1.**

Figure 2b: Adequate PPE Form – Part 2

The adequate PPE form is in two parts (see Figures 2a and 2b) and is used most often. The information is similar to the CIF-recommended PPE form, and includes a general history, orthopedic history, family history, physical examination, parent signature, and physician signature, although the format varies slightly. The intermediate PPE form (see Figure 3) is used the least. The intermediate form usually consists of a preventive health evaluation (PHE) and is not sports-specific. This information is significant because, although the majority of athletic directors do not think the PPE form is a substitution for a PHE, high schools still use this type of PPE form. Nonetheless, some high schools do not use the school board approved PPE form, but a version of an

adequate PPE form indicating, once again, a lack of understanding regarding the specifics and use of the PPE form at the school board level.

Interestingly, the majority of AD's said they know enough information about the PPE and do not need to seek additional information. However, some AD's are not aware they are using the CIF-recommended PPE form and identify that they are not using it. This is consistent with the AD's who responded that they do not know the PPE process. These results suggest that for many ADs an understanding of the need, scope, and application of the PPE process is elusive, and calls into question the administration and benefits of the process at individual high schools.

Part I (To be completed by the parent or guardian)

Appointment Time: _____ Student Name: _____
Name of Insurance Carrier: _____
Address: _____
Policy Number: _____
Parent Signature:
Yes, I give my child permission to receive this physical.
Signature: _____ Date: _____

Part II (To be completed by the doctor)

Weight: _____ Height: _____
Blood Pressure: _____
Lungs: _____ Comments: _____
Heart: _____ _____
Abdomen: _____ _____
Extremities _____ _____
Doctor's Signature: _____ Date: _____

Figure 3: Intermediate PPE Form

More than half of the high schools surveyed do not have an ATC on staff. The ADs without ATCs who were surveyed indicate that they and their coaches are responsible for the care of all sports-related injuries and ailments during practice and

competition, excluding varsity football. Varsity football is the only sport where the home team is required to have medical personnel (a physician, ATC or EMT) present at games. Respondents assert that coaches have CPR or first aid certification. Interestingly, a larger number of high schools without an ATC and/or team physician use the CIF-recommended PPE form. The use of an adequate PPE form may balance the lack of an ATC and/or team physician by giving the ADs and coaches additional information regarding the student-athlete.

The majority of athletic directors, with or without ATCs or team physicians, and for all school population sizes and sections, assert that there should be a standard PPE form. However, athletic association boards and school district boards that make all the decisions concerning the PPE, look at the form from a liability perspective.[12,21] The physician that clears the student-athlete for athletic participation is now liable if something medically were to happen to the student-athlete.

CONCLUSION

The PPE is intended to support safe athletic participation.[21] Variations in the PPE form can easily undermine its merit.[19] California high schools should adhere to current research and practices to meet the objectives of the PPE, including screening athletes for predisposed injuries or conditions. Other factors, such as health insurance, school district funding for ATCs, and ATC staff position stability at the high school (part-time, contract, dual role, student athletic trainer), explain why some California high schools are not compliant with CIF PPE guidelines, despite increased public awareness and access to statistical analysis. Other issues, such as the disconnect between the PPE process, the

physician, and the certified athletic trainer, should be addressed. Further research should be conducted to address the unified school boards' criteria for the PPE form used at different California high schools, to determine why different PPE forms are in use, and to promote ways in which the athlete could be assisted through the use of standardized forms.

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Chapter 3

Extended Support Materials

Introduction

Sports participation has grown from an estimated 4 million participants during the 1971-1972 school years to an estimated 7.2 million in 2005-2006. The increased number of sports participants has also increased the rate of injury and death. Participation in high school sports resulted in an estimated 1.4 million injuries at a rate of 2.4 injuries per 1,000 athlete exposures (i.e., practices or competitions) (Centers for Disease Control and Prevention, 2006). Many athletic injuries and deaths are thought to be preventable. Therefore, attention to identifying factors that predispose young athletes to injury through a pre-participation examination is essential (Linder, Durant, Seklecki, & Strong, 1981; Smith & Laskowski, 1998). The pre-participation physical examination (PPE) is an annual medical examination provided to athletes participating in sports to identify conditions that may predispose the athlete to injury or death (Lombardo & Badolato, 2001). Failure to appropriately screen potential athletes through a pre-participation examination may hinder the overall healthcare of the individual.

The California Interscholastic Federation (CIF) is the athletic governing body for high school student-athletes in the state of California, which requires athletes to take a medical examination before participating in sports activities. The CIF also recommends the use of the PPE monograph form, endorsed by the following six medical organizations: the American Academy of Family Physicians (AAFP), the American Academy of Pediatrics (AAP), the American College of Sports Medicine (ACSM), the

American Medical Society for Sports Medicine (AMSSM), the American Orthopedic Society for Sports Medicine (AOSSM), and the American Osteopathic Academy of Sports Medicine (AOASM) (Glover, Maron, & Matheson, 1999). Each high school's board, however, has the final decision regarding the structure of the form (California Interscholastic Federation, 2002) and this has created non-uniformity in the PPE. The lack of uniformity leads to various PPE forms that may contain some, but not all, of the recommended information (Glover & Maron, 1998; Gomez, Lantry & Saathoff, 1999; Koester & Amundson, 2003), thereby jeopardizing the goals and efficacy of the PPE.

Although consensus exists that the PPE is important to ensure the health of participating athletes, a standardized form has not been implemented (Glover & Maron, 1998, Koester & Amundson, 2003). The medical associations suggest a national standardized form (Glover & Maron, 1998) or a state standardized form (American Medical Association Group on Science and Technology, 1994; Koester & Amundson, 2003) while the National Federation of State High School Associations (NFHS) purports that a PPE is needed but does not recommend a standardized form (National Federation of State High School Associations, 1998).

Three studies in high school settings analyze the current state of the PPE and their results emphasize a lack of standardization in the process, randomness of the screening methods employed, and poor adherence to the American Heart Association (AHA) guidelines for cardiac screening of student-athletes (Gomez et al., 1999; Koester & Amundson, 2003; Glover et al., 1999). Thus, the importance of the PPE in the health and safety of athletes coupled with the non-uniformity of PPE forms and recommended

information prompts investigation into the use of PPE in the high school setting. The purpose of this study was to analyze the PPE process in California high schools to better understand precautions to ensure athlete medical safety. In addition, PPEs were assessed for congruency with the CIF-recommended form.

Statement of the problem. The PPE is an important tool used in an attempt to prevent and/or protect an athlete from undue harm (Centers for Disease Control and Prevention, 2006). The use of various PPE forms within the CIF may cause non-compliance with required and recommended procedures in the PPE process of California high school athletes and may be ineffective in reducing injury and protecting the athlete.

The CIF requires that each student-athlete receive an annual medical examination by a medical practitioner, but it is only in the last eight years that the CIF has had a recommended form available. The CIF does not provide examples of acceptable medical practitioners or define the required background of the medical practitioner. Since the PPE form is important for the student-athlete, certified athletic trainer, coach, and physician, a baseline for the health of the athlete should be established and documented for current and future evaluation. A medical practitioner's signature is a legal precaution used to show that the athlete has seen a recognized healthcare professional, that the information concerning all past and present medical history is accurate and complete, and that the student-athlete has been cleared or not cleared to participate. A form identifies any past and present health problems. The PPE is a preventive service that attempts to identify health conditions or illnesses specific to athletic participation prior to participation.

Statement of the purpose. The purpose of this study was to analyze the PPE process in California high schools to better understand precautions to ensure athlete medical safety. In addition, PPEs were assessed for congruency with the CIF-recommended form.

Delimitations. Twelve hundred and twenty-one athletic directors from California high schools, who are members of the CIF, were included in this study. The high schools were of varying sizes, covered a range of socio-economic levels, and were ethnically diverse.

Limitations.

1. Athletic directors may not want to admit that their school did not use the CIF-recommended PPE form, and therefore may decide not to respond to the survey.
2. The California sample may not be an adequate representation of high schools across the country.
3. Athletic directors may not respond to the questionnaires truthfully or may omit information.
4. Not all high school athletic directors in California were notified of the survey because of unknown or invalid email addresses, or spam.

Definitions.

Athletic Director: A person who oversees the work of certified athletic trainers, coaches, and related staff involved in athletic programs.

High School: High schools consist of grades 9, 10, 11, and 12, although the inclusion of grade 9 varies by school district.

Pre-Participation Physical Examination (PPE): A medical evaluation specifically designed for student-athletes to address health issues related/relating to athletic participation.

Preventive Health Examination (PHE): A medical evaluation that identifies preventable conditions of importance to each age group and gender.

Recommended: The CIF has a PPE form that it recommends and that is endorsed by six medical organizations. However, it is not mandatory for high schools to adopt this form.

Required: CIF bylaws state that certain procedures must be followed in order for a high school student to participate in sports.

Student-Athlete: Any person attending classes in school and who actively participates in sports.

Summary. The number of adolescent participants in athletics has grown to three million in the past 30 years (Centers for Disease Control and Prevention, 2006). Along with the increase in the number of participants, injuries associated with participation have increased. In order to mitigate athletic injuries, six medical organizations have issued a PPE monograph in an attempt to ensure the health and safety of those participating. The PPE monograph form includes a medical history, a general physical examination, a musculoskeletal examination, and a cardiac evaluation (Kibler, Krowchuk, Rice, & O'Connor, 2001). The PPE monograph form has become the standard of care for athletic participation, but the lack of standardized evaluation criteria creates difficulty in measuring the efficacy of the monograph. California ranks second highest amongst all states in the number of participants in high school interscholastic athletics, yet, the PPE in

California varies, dependant on school district and/or individual high school requirements. Thus, the purpose of this study was to analyze the PPE process in California high schools to better understand whether the PPE process offers sufficient precautions to ensure athlete medical safety. In addition, PPEs were assessed for congruency with the CIF-recommended form.

Review of Literature

Guidelines for student-athlete participation were first created in 1966, and since then, many studies and evaluations have been conducted on the need and effectiveness of a physical examination and the standardization of forms. For the following review, the literature is divided into four sections: (a) Pre-Participation Physical Examination versus Periodic Health Examination, (b) Evolution, (c) Efficacy and (d) Standardization.

Pre-participation physical examination versus periodic health examination. The PPE has three primary goals: Detect conditions that may predispose to injury/illness, detect conditions that may be life-threatening or disabling, and meet legal and insurance requirements (Smith, Lombardo, & Robinson, 1991). The PPE is a sports screening that includes a medical history. Emphasis on the areas of greatest concern for sports participation are in the medical history and include a general screening physical examination, a musculoskeletal evaluation, and a cardiac evaluation (Kibler et al,, 2001). The periodic health examination (PHE) has two primary goals: the prevention of specific disease and the promotion of health. The objectives to achieve those goals are the "routine check-up" and immunizations. The routine check-up includes a 30-minute complete head-to-toe exam and diagnostic tests including urinalysis, blood count, etc.

(Canadian Task Force on the Periodic Health Examination, 1979). The PPE differs from the PHE because a PPE is specific to student athletic participation.

The medical history is the cornerstone of the PPE because medical history reveals conditions which could prohibit or alter sports participation. The history includes general questions about athletes' health, cardiovascular health, neurological health, pulmonary health, musculoskeletal health, heat illness, nutritional health, female health, and other health problems (Myers & Sickles, 1998). The physical examination is utilized after review of the history to focus on areas of greatest concern and review the systems of the body.

The musculoskeletal examination is another important section of the physical examination because the most common cause of athletic disqualification is a musculoskeletal injury. The greatest risk factor for injury is a prior history of injury (Grafe, Paul, & Foster, 1997). The 90-second to 120-second orthopedic screening examination consists of 14 maneuvers and positions for evaluating the major components of the neuro-musculoskeletal system. The purpose of the examination is to provide the opportunity to discover treatable conditions that might interfere with, or become aggravated through, athletic participation. The musculoskeletal evaluation might aid in predicting/preventing future injuries, and is appropriate for all sports (Garrick, 2004).

The cardiac evaluation has been the research focus of much of the literature in the sports medicine arena. It is a necessary component of the PPE because of the possibility of discovering a potentially serious cardiovascular abnormality, which could be fatal if athletic participation continues. The American Heart Association established

recommendations for cardiovascular screening due to the recent visibility of sudden cardiac death affecting adolescents and young adults. Three elements of the cardiac screening are a history of symptoms with exercise, a history of heart murmur or hypertension, and a family history of early cardiac death (Metzl, 2000).

The components of the PPE have been addressed, but for the efficacy of the PPE process, the timing, location, and administrators of the PPE must also be discussed. The PPE should take place four to eight weeks prior to the sports season because this timing allows sufficient period to address problems discovered during the PPE (Kibler et al., 2001; Lombardo & Badolato, 2001; Metzl, 2000; Myers & Sickles, 1998). It is recommended the PPE should be administered by healthcare professionals who are licensed doctors of medicine (MD) or doctors of osteopathy (DO) (American Medical Association Group on Science and Technology, 1994; Lombardo & Badolato, 2001). Within the last few years, registered nurse practitioners, physician assistants under the supervision of a physician, and healthcare professionals (for example naturopathic clinicians and doctor of chiropractic (DC) who have formal education consistent with the American Medical Association) are also recognized to perform a PPE (AAFP, AAP, ACSM, AMSSM, AOSSM, & AOASM, 2005).

PPEs are conducted through several viable methods including physician's office, sports stations, and locker rooms. In the office examination, the athlete goes to his/her primary care physician's office. The advantage of an office examination is that the physician usually has knowledge of the athlete's health history. A disadvantage is that the physician may be unaware of the risks associated with certain sports or special

musculoskeletal examination techniques. This lack of knowledge may allow student-athletes to participate with pre-existing injuries which, left untreated or unrecognized, can impede future participation (Lombardo & Badolato, 2001; Myers & Sickles, 1998).

In the station examination, an entire team of athletes is examined in a single setting by several examiners. The advantages are that this examination is sport oriented and examiners are familiar with the risk of athletic participation. However, stations do not provide for continuity of care because follow-ups on medical problems are difficult, since the examiners are not the athletes' primary care physician (Lombardo & Badolato, 2001; Myers & Sickles, 1998). In locker room examinations, a group of athletes line up and are examined individually by the team physician or volunteer physician. The locker room examination tends to emphasize physical examination over medical history. This method allows the physician to evaluate the greatest number of individuals in the shortest period of time. However, the physician may not have time to give personalized attention to the athlete's special problems and cannot offer continuity of care (Durant, Seymore, Linder, & Jay, 1985; Grafe et al., 1997). The PPE is designed to screen for conditions that might interfere with sports participation and does not serve as the recommended yearly routine check-up.

The yearly routine check-up has been replaced with a periodic health examination (PHE) that aims to identify preventable conditions of importance to each age group and gender (Canadian Task Force, 1979). The frequency of the PHE depends on the patient's age, gender, and risk factors for disease (American College of Physicians Medical Practice Committee, 1981). Major women's health issues include pregnancy, ovarian

cancer, and breast cancer (American Academy of Family Physicians, 2006a). Major men's health issues include prostate cancer, hypertension, and heart disease (American Academy of Family Physicians, 2006b). Major concerns for high risk patients include multiple sexual partners, work environment, and family history of disease (American Academy of Family Physicians, 2006c).

Unfortunately, the PHE does not specifically include the adolescent population. In order to combat this omission, the American Medical Association (1997) produced the *Guidelines for Adolescent Preventive Services* (GAPS) as a clinical service tool and model in response to a major unaddressed public health problem with adolescent healthcare. GAPS cover adolescents from ages 11 to 21 with recommended stages for procedures in five categories: health guidance, screening history, physical assessment, tests, and immunization.

A comparison of the components of the traditional physical examination with the pre-participation physical examination shows that the features are identical for reviewing the systems of the body. What sets them apart is that the traditional physical examination focuses on general health conditions and the PPE focuses on sports-specific conditions that could be exacerbated through physical activity. With the current changes to the structure of the PHE and the GAPS, one hopes it will become easier for athletic administrators to speak of GAPS and PPE as different entities of a legitimate health screening. Understanding the differences between the PPE and the PHE will assist parents, athletes, coaches, medical personnel, and administrators. Such understanding

will highlight the importance of these medical examinations and will explain when they should be used.

Evolution of the PPE. The PPE has evolved, has been revisited, and has been redefined several times since 1966. Historically, the first generation PPE was characterized as "triple H": How are you doing?, Heart, and Hernia. In some instances, athletic seasons were lost because of unnecessary disqualification since some athletes had functional heart murmurs and asymptomatic hernias (Glover et al., 1999). The American Medical Association's, *Medical Evaluation of the Athlete: A Guide*, is the earliest documented guide for athletic participation and health safety. The publication was prepared in 1966, revised in 1973, 1974, and 1976, and reprinted without revision in 1984. The *Guid*e addressed fitness and medical care of persons who participated in organized athletics. A model health questionnaire and a health examination form were included, as well as a set of recommendations for conditions that disqualified athletes from participating in sports (American Medical Association Group on Science and Technology, 1994). The first generation PPE, which operated from 1966 to approximately 1984, was beneficial because it established guidelines and forms to promote the health and safety of athletes. Revisions were needed because the guidelines became overly restrictive and disqualified athletes unnecessarily (American Academy of Pediatrics Committee on Sports Medicine, 2001).

Over the period 1985 to 1992, the second generation PPE was in operation. It was developed to establish legal responsibility, construct a more extensive evaluation history, and identify diagnostic tests to detect injury/illness extending from the first

generation. A PPE additional question was added: Have you experienced significant past medical problems? This addition was necessary to evaluate past injuries and to help prevent re-injury. Additional exam components listed on the typical 5-by-7 inch card included a limited physical examination, a sports-clearance statement for the physician to sign, and a urinalysis (Glover et al., 1999). Also safety equipment (e.g., eyeguard, facemask, mouthguard, and ankle brace) and society's attitude toward the rights of athletes to compete despite a medical condition (American Medical Association Group on Science and Technology, 1994) had evolved over time.

Clearance determination was a noteworthy change from the first generation. Clearance is divided into four categories: unrestricted clearance, clearance after further evaluation or therapy, limited clearance for certain sports, and not cleared. For limited clearance of certain sports, guidelines have been established to help determine clearance. The American Academy of Pediatrics categorizes sports by contact and strenuousness. Sports are categorized by their probability for collision or contact. This includes athletes who purposely hit or collide with each other or inanimate objects, athletes who routinely make contact with each other or inanimate objects, and athletes who make no contact with others or inanimate objects. The strenuousness of a sport is an additional characteristic relevant to athletes with cardiovascular or pulmonary disease. The classification of strenuousness defines a sport based on levels of dynamic and static demand. Dynamic exercise causes a volume load, whereas static exercise causes a pressure load on the left ventricle of the heart. For example, an athlete can be cleared for full contact but static demand (rodeo), full contact but dynamic demand (field hockey),

full contact but dynamic and static demand (football), non-contact but dynamic and static demand (cycling), non-contact but dynamic demand (swimming), non-contact but static demand (archery), limited contact but dynamic demand (basketball), limited contact but static demand (gymnastics), and limited contact but both dynamic and static demand (cross country skiing). Also, another useful guide is the *Medical Conditions and Sports Participation List* prepared by the American Academy of Pediatrics. The list was established to help determine if participation creates an increased risk of injury or adversely affects the medical condition. The list is useful if an athlete has one of the mentioned conditions.

Prior to 1985, no formal guidelines were available to assess eligibility recommendations for athletes with cardiovascular abnormalities. The goal of the 16th Bethesda Conference held in 1985 was to try to determine which cardiovascular abnormalities (as well as severity) would place the athlete at risk for sudden death, life-threatening cardiovascular alterations, or disease progression (Mitchell, Maron, & Epstein, 1985). The second generation of the PPE was beneficial because of an added requirement of a physician's signature to verify a proper PPE and the updated list of sports categories and participation qualifications to limit unwarranted disqualification of athletes. Revisions were needed to the second generation PPE to increase public awareness of sudden death syndrome in young athletes, as well as to develop a unified approach to establishing a standard PPE form and process.

The third generation PPE began in 1992 when five medical organizations (AAFP, AAP, AMSSM, AOSSM, and AOASM) endorsed the *Preparticipation Physical*

Evaluation monograph (Glover et al., 1999). The monograph covered the goals of the PPE and provided detailed instructions on how to obtain a pre-participation history and perform a physical examination. It also gave information on determining clearance for participation, medicolegal precautions, and included a standard form that physicians could copy and use for each examination. The monograph established the minimum content for PPEs and provided an outline for primary care physicians regarding appropriate steps in the PPE (Lyznicki, Nielsen, & Schneider, 2000). The 1992 monograph was the first written documentation to standardize the PPE and gave administering physicians an endorsed reference for efficacy and legal relevance. The monograph, in its second edition, included guidelines to formulate recommendations for continued participation or disqualification of athletes who have cardiovascular abnormalities (Maron & Mitchell, 1994). The monograph included the AHA recommendations which served as a critique of current and past cardiovascular screening practices, including the content of history and physical examination questionnaire, and the nature and qualifications of designated examiners (Maron et al., 1996). At the 26th Bethesda Conference held in 1994 (Maron & Mitchell, 1994), revisions were made to the 16th Bethesda Conference recommendations (Mitchell et al., 1985) for competitive athletes with cardiovascular abnormalities. Advances had been made in diagnosis, treatment, and understanding of cardiovascular diseases. Interest in sudden cardiac death in competitive athletes had intensified and become highly visible because of catastrophes involving adolescent athletes. Previous recommendations were read largely by cardiologists, not necessarily by physicians who routinely assess competitive athletes

(Maron & Mitchell, 1994). The third generation PPE was important because it attempted to standardize the PPE with endorsements by medical organizations (AAFP, AAP, ACSM, AMSSM, AOSSM, AOASM) as well as including revisions conducive to medical issues of concern to the athletic community. The American Heart Association (AHA) & American College of Cardiology (ACC) addressed the public concern about sudden death of young athletes. The monograph was revised in 2004 and recommended a detailed medical history (consisting of a 16-point questionnaire incorporating AHA recommendations for cardiovascular screening), a limited medical exam, and a detailed musculoskeletal exam evaluating strength, flexibility, and stability of major joints (Hulkower, Fagan, & Watts, 2005). The 36th Bethesda Conference revisions (Maron & Zipes, 2005) occurred because of substantial advances in the diagnosis and management of a variety of genetic and acquired cardiovascular diseases, additional understanding of the causes of athletic field deaths, and changes in ethical and legal issues that impact medical decision making. Also, sudden cardiac death in competitive athletes continued as a highly visible, compelling, and emotional event with significant liability considerations (Maron & Zipes, 2005).

Some current research continues to demonstrate that the PPE has a minimal effect on the overall morbidity and mortality of the athletes (Best, 2004; Carek & Hunter, 2001). However, the PPE is a preventive measure and as such is an important aspect of athletic pre-participation to ensure the health and safety of all athletic participants. A recent review recommended the completion of a Web-based questionnaire to study trends, risk factors, results of intervention, and to improve health maintenance for athletes

(Wingfield, Matheson, & Meeuwisse, 2004). Some colleges use this system and it was proposed for high schools. Although high school athletes are required to have a PPE prior to participation, the information gathered from the PPE is not always reviewed or analyzed for continuity of care (Reed, 2004). The PPE process contributes important facts, but if the information is not utilized, the full benefit of the PPE cannot be met. Pertinent information from the PPE should be available in a condensed form to athletic trainers or coaches with clinical backgrounds to target weaknesses found from the PPE (Reed, 2004). The PPE has changed during its existence. Technology and research continue to be used to strive for better ways to improve and validate the usage of the PPE by reviewing expert opinion, developing position statements, and making evidence-based recommendations (Cardone, 2007).

PPE efficacy. The ultimate goal of the PPE is to ensure safe participation that is not limited by pre-existing medical conditions. The effectiveness of the PPE in detecting physical abnormalities serious enough to limit athletic participation has been demonstrated (Tennant, Sorenson, & Day, 1981). Thus, the PPE is an important prerequisite to the pre-participation of athletes for safe participation in sports or physically strenuous activities. Objectives of the PPE include the discovery of conditions that may be life-threatening or disabling, limit participation or predispose to injury (Myers & Sickles, 1998). These objectives can be accomplished by conducting a thorough history, a physical examination, and ancillary tests when warranted (Lombardo & Badolato, 2001).

For approximately 50% of adolescents, the PPE marks the sole interaction with the medical system during the teen years (Myers & Sickles, 1998). The PPE is a rare opportunity for otherwise healthy adolescents to interact with the medical system. Although the exam yield, as measured by disqualification status, is slight, the PPE offers an opportunity to screen for underlying pathologic conditions, to develop a framework for medical treatment during the sports season, and to develop preventive strategies for injury reduction before the competitive season (Metzl, 2000).

Since the medical history is the cornerstone of the PPE (Lombardo & Badolato, 2001), studies indicate that the PPE reveals approximately 75% of the conditions that could prohibit or alter sports participation (Fields & Delaney, 1990; Kurowski & Chandran, 2000; Lombardo & Badolato, 2001; Runyan, 1983). The medical history and review of the systems of the body are more important than the physical examination in identifying problems that may prevent an athlete's participation (American Medical Association Group on Science and Technology, 1994). Whether performed by an athlete's primary care physician, a team physician, or a group of physicians, the detailed history, submitted by the athlete and family before the examination, provides the greatest yield for identifying injury/illness. All aspects of the physical examination must be directed at confirming the accuracy of the history and determining the presence of abnormalities, which may require more historical information (Reed, 2004).

The physical examination is a screening procedure that evaluates the areas of greatest concern and the areas identified as problems in the medical history (Lombardo & Badolato, 2001). A previous musculoskeletal injury is a major risk factor for re-injury,

especially if the original injury was not rehabilitated. In such cases, a weakness could arise and therefore, a previous injury could alert the physician to the need for caution or continuity of care. In a recent study, a 2-minute (12 step) orthopedic screening examination was found to have a sensitivity of 50.8% and a specificity of 97.5% in identifying problems through an orthopedic history (Lombardo & Badolato, 2001). In other words, an athlete's history of injury and the degree of rehabilitation are probably the best predictors of future orthopedic problems (American Medical Association Group on Science and Technology, 1994).

Currently, ancillary tests such as urinalysis, blood count, chemistry profile, lipid profile, ferritin level, spirometry, and cardiovascular diagnostic tools are not required in the absence of symptoms or a significant history of risk factors (Carek & Mainous, 2003; Kurowski & Chandran, 2000; Smith, Lombardo, & Robinson, 1991). Urinalysis is a laboratory test used to screen for proteinuria, which identifies genitourinary or kidney disease. In current research, the laboratory test is found to be unwarranted. Proteinuria is extremely common in young athletes and therefore, an abnormal urinalysis result is often not significant and highlights the fact that the test lacks specificity in detecting illness (Fields & Delaney, 1990; Lombardo & Badolato, 2001). The cardiovascular diagnostic tools can enhance the diagnostic power of the standard history and physical examination, but diagnostic tests (including EKG or ECHO) are not recommended for cardiovascular PPE screening because the diagnostic tests are not cost-effective, nor can they consistently identify athletes at risk (Maron et al., 1996). All the diagnostic tests in the

athletic populations are impractical and could result in false-positive tests that could exceed the number of true-positive results (Lyznicki et al., 2000).

The PPE provides a medical history, physical examination, and ancillary test if warranted. Those components are important, but it is also important to be aware of prevalent injuries and dysfunctions that lead to disqualification in athletes. The most common abnormalities leading to disqualification from athletic participation are musculoskeletal conditions, ophthalmologic conditions, and cardiac problems due to rhythm and conduction abnormalities (Carek & Mainous, 2003; Kurowski & Chandran, 2000; Smith & Laskowski, 1998, Rifat, Ruffin, & Gorenflo, 1995). When screening athletes, it is important for the physician to focus on relevant information dealing with athletic participation rather than on general information. The efficacy of the PPE consists of identifying risks prevalent in the athletic population and using the tools available to assist in preventive care. The medical history is the most important aspect of the PPE. The next step is requiring a standardized form that can be used as a baseline to measure the efficacy of the PPE more accurately.

Standardization. Little is known about best practices for the PPE even though the PPE is the standard of care for sports participation (Wingfield et al., 2004). The wide variations in the PPE undermine the merit of the adolescent PPE nationwide (Metzl, 2000). A national format would benefit researchers who currently cannot adequately measure the efficacy of the PPE without form consistency. The development of a recommended national standard for PPE has been endorsed by the medical community (American Medical Association Group on Science and Technology, 1994; Glover et al.,

1999; Metzl, 2000). The National Federation of State High School Associations states that the PPE is necessary and desirable, but does not recommend a standard form (National Federation of State High School Associations, 1998). The California Interscholastic Federation strongly recommends that districts use the PPE monograph, but does not require it (California Interscholastic Federation, 2002). School boards and school officials create PPE forms which vary from state to state, county to county, and district to district. The quality of the PPE (e.g., standardization, specificity, and validity) is not of specific concern to the organizations (states, universities, athletic governing bodies, and professional sports) that mandate it. The quality of the PPE lies squarely with the medical providers administering the PPE (Wingfield et al., 2004). Because administrators and medical providers view the PPE from different perspectives, the PPE continues to have limited effectiveness. Recommendations still give the ultimate authority to school administrators and not to experts in the field of sports medicine.

Establishing validity of the PPE is likely to include standards of practice based on consensus statements that follow a formal development approach (Wingfield et al., 2004). Adherence to a uniform form would have an impact on the health of student-athletes by enhancing the safety of athletic activities (Maron et al., 1996). Current research shows that the PPE form should conform to the current AHA guidelines for cardiovascular screening to be considered adequate and up-to-date (Wingfield et al., 2004; Koester & Amundson, 2003; Glover & Maron, 1998).

Unfortunately, the consensus statements by the leading medical organizations (AAFP, AAP, AMSSM, AOSSM, AOASM, AHA, and ACC) are referred to as industry

standards or type III evidence: collective expert opinion, panels of internists, orthopedists, cardiologists, and lawyers. The medical organizations have not shown value and content validity with evidence-based research to combat their optimism of the usefulness of the PPE in identifying predisposed injuries/illnesses (Wingfield et al., 2004).

Summary. The PPE is an important screening tool that attempts to ensure the health and safety of an athlete (Tennant et al., 1981). Healthy adolescent student-athletes are not likely to have an annual preventive health examination outside of the PPE requirement. The PPE may be the only encounter adolescents have with a physician (Lombardo & Badolato, 2001; Metzl, 2000; Myers & Sickles, 1998). Because the PPE can play an integral role in the athletes' lives, it is imperative that athletes seek healthcare professionals who are trained to adequately assess certain conditions. The past and present medical history is the essence of the PPE. Without accurate information, the screening can be misdirected and lack benefit. In all the various evolutionary phases of the PPE, its sole purpose remains to protect the athlete from undue harm. As technology advances, so does the PPE process. Some recent advances include diagnostic tools for prevention, more information about injuries and rehabilitation, as well as dealing with a larger number of non-traditional athletes (diabetic athlete, physically disabled athlete, mentally disabled athlete). Standardization is the only aspect of the PPE that has not been updated. Most athletic governing bodies, organizations, and associations require some variation of a PPE, but no consensus exists regarding the form or data that should

be collected and assessed. Because of this, it is difficult to evaluate the efficacy of the PPE.

High school athletes are an underserved medical community. Certified athletic trainers who work in a high school setting should feel a responsibility to provide information concerning the annual physical examination (PPE). Not all high schools use the recommended PPE form. At one high school, the only information given to the student-athlete was an emergency card that included physician's signature and a line for additional information, as well as student-athlete signature, parent signature, and emergency information. It could be very difficult to provide appropriate care to a student-athlete if insufficient medical information is available prior to sports participation.

Methods

The purpose of this study was to analyze the PPE process in California high schools to better understand precautions to ensure athlete medical safety. In addition, PPEs are assessed for congruency with the CIF-recommended form. The goal of this research was to reach out to the high school community and to educate athletic directors who will then be able to explain the background and importance of the PPE to coaches, parents, and athletes. This study posed the questions: (1) How many high schools in California use the CIF-recommended PPE form or a modified version? (2) How many high schools in California use a PPE form that does not include the recommended information specified in the CIF bylaws? (3) Are years of experience as an athletic director, having a certified athletic trainer, or having a team physician factors in the use

of the CIF-recommended form? (4) Do demographics contribute to the use or non-use of the CIF-recommended form?

This chapter describes the procedures that were used in conducting the study. Athletic directors were chosen as the survey subjects because they supervise and oversee all aspects of student-athlete participation and eligibility. Athletic trainers were not surveyed because not all high schools can afford an athletic trainer. The chapter begins with a description of the survey process and it includes a discussion on PPE forms used in some high schools, but which are not strongly recommended by the CIF. The chapter concludes with an analysis of the data.

Subjects. Athletic directors with valid email addresses and employed by California high schools that were members of the CIF were requested to participate in the study (N=1,221). Participants were obtained from the California Interscholastic Federation online school directory at www.cifstate.org, the Los Angeles Section Athletic Director Commissioner 2007, Clell Wade-Coaches Directory 2007-2008, the Northern Section School Directory 2007-2008, and the Southern Section School Directory 2007-2008.

Instrument development. Prior to 1998, California was one of eight states that did not have a recommended PPE form available for participating student-athletes. Glover and Maron's (1998) and Koester and Amundson's (2003) studies were used as a basis for instrument development in the current study. Glover and Maron obtained data from 50 high school state associations. Koester and Amundson obtained data from individual high schools in Oregon.

The six-page survey construct for the current study (see Appendix C) contained twenty-six questions separated into four sections: (1) Demographic information, four questions (2) Faculty/Staff information, nine questions (3) the PPE process, five questions (4) Athletic director's attitude regarding the PPE, eight questions. Specific concepts were extracted from Glover and Maron (1998) concerning detailed information regarding administration of the screening process. Specific questions were adopted from Koester and Amundson's (2003) study relating to the use or non-use of a state association recommended PPE form, as well as which healthcare professionals were authorized to administer the PPE. The additional survey questions were developed to obtain data about a high school's athletic program and the PPE process. The survey factors include demographics, sports medicine resources, and the attitude of the athletic administrator.

Pilot study procedures. A two-part pilot study was conducted. The first trial consisted of asking three entities of the sports medicine team to review the questionnaire. A California high school athletic director (AD), a sports medicine physician who has administered PPEs, and a California high school certified athletic trainer who has assisted in the PPE process were the reviewers. It was important to include an AD because s/he is the head athletic administrator/advocate for athletes and was the one targeted to complete the questionnaire. The physician was important because s/he administers the examination, and the certified athletic trainer was important because s/he is responsible for the care of the athlete once the PPE has been completed. Each colleague provided valuable critiques about the questionnaire format, content, expression, and the importance of items, and offered suggestions whether questions should be added or deleted (Thomas,

Nelson, & Silverman, 2005) based on their experiences in their respective fields. The data from the first trial were analyzed to establish face validity. Revisions were made prior to distributing the survey to the intended population for the second trial. Approval from the Human Subjects Institutional Review Board at San Jose State University was obtained prior to beginning the Pilot Study (see Appendix D). Four athletic directors (two from public high schools and two from private schools) were asked to complete the survey. The athletic directors were selected based upon proximity in the Bay Area and were removed from the final respondent pool. The athletic directors gave feedback about the content and comprehension of the survey.

Main study procedures. The questionnaire was distributed throughout Californian school sections, with the number of schools as follows: Northern Section (NS) (n=57), North Coast Section (NCS) (n=135), Sac-Joaquin Section (SJS) (n=179), Oakland (OAL) (n=5), San Francisco (SF) (n=12), Central Coast Section (CCS) (n=101), Central Section (CS) (n=83), Los Angeles (LA) (n=99), Southern Section (SS) (n=458), and San Diego (SD) (n=103) for a total of 1221.

The survey packet included a cover letter (see Appendix A) and a questionnaire (see Appendix B), which was emailed to each athletic director in the CIF. The cover letter was instrumental in obtaining the AD's attention and consent to assist in the study. The cover letter included my name, credentials, and how the ADs can add to the body of research for adolescent health and safety concerning the PPE. A concise questionnaire was created because shorter questionnaires have higher response rates and more validity than longer ones (Thomas et al., 2005). E-mail was utilized because of convenience,

timing, and budget. Studies have shown that the return rate for e-mail surveys is equal and, in some cases, superior to that of mailed surveys (Dillman, 2006; Thomas et al., 2005). Fourteen days after the initial e-mail, a reminder e-mail was sent to all non-respondent athletic directors stressing the importance of their participation. The athletic directors gave implied consent when they filled out the questionnaire.

Data analysis. The data collected were analyzed using concepts developed from Koester and Amundson (2003) and Glover and Maron (1998). Using percentages, Koester and Amundson "evaluated each PPE form by determining which of the 13 specific areas recommended by the AHA consensus panel were addressed (p36)." Koester and Amundson's evaluation was based on criteria developed by Glover and Maron, who classified forms as adequate, intermediate, or inadequate for cardiovascular evaluation. Forms were considered adequate if they addressed nine or more of the thirteen AHA-recommended items and inadequate if they contained four or fewer.

In this study, a similar scoring technique was used to determine whether CIF-recommended PPE forms were comparable to non-recommended PPE forms. Each item was scored as one point. The items are physician signature, comments line, sports-specific health history, general health history, musculoskeletal physical, and general physical screening. The maximum score that a high school could obtain is six points. The six-point scale scores six or five points adequate, four or three points intermediate, two to zero points inadequate. An analysis of variance (ANOVA) was used to assess the significance of PPE scores and years of experience as an AD and the presence of a certified athletic trainer in the PPE process. Crosstabs were used to compare all other

variables, including school section, school size, school type, school region, use of CIF-recommended form, and number of team physicians).

In this questionnaire, Sections 1, 2 and 3 were analyzed by descriptive statistics, including mean, standard deviation, and percentages. Pearson correlation is used to assess the relationship between section 4 questions and the CIF-recommended PPE form, years of experience as an athletic director, presence of a certified athletic trainers, and presence of a team physician.

Koester and Amundson (2003) also analyzed the history and physical examination questions that were pertinent to musculoskeletal injuries and head injuries. The musculoskeletal system is the system at highest risk for injury during athletic competition (Smith & Laskowski, 1998), which makes it an important factor in the analysis of the PPE form used.

Summary. The purpose of this study was to analyze the PPE process in California high schools to better understand precautions to ensure athlete medical safety. In addition, PPEs were assessed for congruency with the CIF-recommended form. Subjects were limited to athletic directors in the CIF who were requested to fax a copy of their PPE form, if applicable, and complete a 15-minute survey. Two pilot studies were conducted. Face validity was determined by allowing three colleagues to view the questionnaire and determine the appropriateness of the concepts included in the instrument. Item analysis was measured allowing four athletic directors to view the survey. Based on recommendations provided by the colleagues and data from athletic

directors, revisions were made accordingly. Data were analyzed referencing Koester and Amundson (2003) and Maron and Glover (1999) studies.

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Appendix A

Cover Letter

The email message: My name is Crystal Miles-Threatt and I am an athletic training graduate student at San Jose State University. I am conducting a survey concerning the pre-participation physical examination form and process, and would greatly appreciate your participation.

This survey is to be filled out by an athletic director, if you have received this email in error please disregard.

Here is a link to the survey:
https://www.surveymonkey.com/s.aspx

This link is uniquely tied to this survey and your email address, please do not forward this message.

Thank you!

Please note: If you do not wish to receive further emails from us, please click the link below, and you will be automatically removed from our mailing list.
https://www.surveymonkey.com/optout.aspx

The message on the survey: Thank you for taking time out of your busy fall schedule to complete this survey. Your participation in this survey is important to the body of knowledge concerning the PPE form. Participation in this survey is completely voluntary, and all answers will remain anonymous. Return of this survey constitutes consent. Thank you again.

Appendix B

Athletic Director Questionnaire

Please answer each question to the best of your ability.

Please fill-out the following demographic information:

1. CALIFORNIA SECTION

☐ Northern Section
☐ North Coast Section
☐ Sac-Joaquin Section
☐ Oakland Section
☐ Central Coast Section
☐ Central Section
☐ Los Angeles City Section
☐ Southern Section
☐ San Diego Section

2. SCHOOL SIZE

☐ 5,501 and up
☐ 4,501-5,500
☐ 3,501-4,500
☐ 2,501-3,500
☐ 1,501-2,500
☐ 501-1,500
☐ 0-500

3. HIGH SCHOOL

☐ Public
☐ Private

4. HIGH SCHOOL REGION

☐ City
☐ Rural
☐ Suburban
☐ Mountain

Please fill-out the following school faculty/staff information:

5. Total # of years employed as an athletic director at all schools and levels

6. Is there a certified athletic trainer at the high school?

   - ❑ Yes
   - ❑ No

7. Gender

   - ❑ Male
   - ❑ Female

8. Is there a certified athletic trainer at your high school? (if you answer is No, please proceed to question 9)

   - ❑ Yes
   - ❑ No

9. Is your athletic trainer on campus for

   - ❑ Practices
   - ❑ Games
   - ❑ Both

10. Is the athletic trainer

    - ❑ Full-Time ATC
    - ❑ Part-Time
    - ❑ ATC/Teacher
    - ❑ ATC/Physical Therapist
    - ❑ contract ATC from Physical Therapy clinic
    - ❑ contract ATC from University Accredited Athletic Training Program
    - ❑ contract ATC from hospital/medical clinic
    - ❑ other _____

11. Who covers your high school athletic events if not a certified athletic trainer?

12. Do you have a team physician? (if your answer is No, proceed to question 14)

- ❑ Yes
- ❑ No

13. Is your team physician a

- ❑ Licensed physician (M.D. or D.O.)
- ❑ Physician Assistant
- ❑ Nurse Practitioner
- ❑ Chiropractor
- ❑ Other _____

Please fill-out the pre-participation physical examination process information:

14. Do you use the CIF recommended physical examination form?

- ❑ Yes
- ❑ No

15. How often is the physical examination given?

- ❑ Freshman
- ❑ Sophomore
- ❑ Junior
- ❑ Senior
- ❑ Other _____

16. What information from the PPE is required for participation?

- ❑ Physical Examination form
- ❑ History form
- ❑ Parent signature
- ❑ Student-Athlete Signature
- ❑ Other _____

17. Which healthcare professionals are allowed to administer the PPE

- ❑ Licensed physician (MD or DO)
- ❑ Physician Assistant
- ❑ Licensed Registered Nurse Practitioner
- ❑ Licensed Chiropractor
- ❑ Chiropractor
- ❑ Other _____

18. Where is the pre-participation physical examination performed:

- ❑ Office visit (athlete goes to his/her own primary physician)
- ❑ At the High School (large group of athletes examined by a team physician or volunteer physician)
- ❑ At the High School (large group of athletes examined by several examiners "sports medicine doctor, pediatrician, nurses" at different stations within a single setting)

Rate your attitude regarding the following PPE process statements:
1=strongly agree; 2=agree; 3=neutral; 4=disagree; 5=strongly disagree;

19. I did not know there was a PPE process	1	2	3	4	5
20. There is not enough information circulating about the importance and benefit of the PPE	1	2	3	4	5
21. There is no need for an annual sports physical examination	1	2	3	4	5
22. There should be a standardized format to implement the PPE form	1	2	3	4	5
23. Pre-participation Physical Examination is a substitute for a general routine check-up	1	2	3	4	5
24. I am familiar with the CIF bylaws concerning the required physical examination	1	2	3	4	5
25. I will seek further information regarding the PPE and change to the recommended form	1	2	3	4	5
26. The certified athletic trainer and/or team physician is responsible for all sports related medical issues	1	2	3	4	5