Current Use of Adequate Preparticipation History Forms for Heart Disease Screening of High School Athletes

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Objective: To determine the proportion of US high schools using sports preparticipation evaluation (PPE) forms containing the 3 elements of the medical history currently recommended for screening young athletes for heart disease, including questions about exercise-related symptoms, previous diagnosis of heart murmur or high blood pressure, and family history of early myocardial infarction or sudden death.

Design: A random, population-based mail survey was conducted of 500 US high schools. The survey was mailed to the athletic trainer at each school. Each trainer was asked to complete and return a brief survey along with a copy of the PPE form used at that school.

Participants: High schools employing an athletic trainer who is a member of the National Athletic Trainers Association.

Main Outcome Measure: The proportion of PPE forms containing all 3 components of the recommended cardiac screening history.

Results: Of the 500 high schools surveyed, 254 (50.8%) responded. Of the PPE forms received, 47 (25.3%) included questions about exercise-related symptoms, 97 (52.2%) included questions about a previous diagnosis of heart murmur or high blood pressure, and 57 (30.7%) had questions about a family history of early myocardial infarction or sudden death. Only 32 (17.2%) of the PPE forms received contained all 3 components of the recommended cardiac screening history.

Conclusions: Only 17.2% of high schools in this nationwide survey use PPE forms that contain all the elements of the cardiac history recommended by the American Academy of Pediatrics for identifying young athletes at risk for sudden death.

PARTICIPANTS AND METHODS

SAMPLING

A random, population-based mail survey was performed of 500 high schools in all 50 of the United States and the District of Columbia. The database used for this survey consisted of approximately 2300 high school athletic trainers who are members of the National Athletic Trainers Association (NATA). A mailing list of these athletic trainers was obtained with permission from NATA specifically for use in this survey. The NATA database was chosen primarily because athletic trainers tend to be more professionally invested in the medical care of athletes than coaches or athletic directors are, and would thus be more likely to respond to this survey. The study protocol was approved by the institutional review board of The University of Texas Health Science Center at San Antonio.

SURVEY INSTRUMENT

The survey instrument consisted of a cover letter and brief questionnaire. The cover letter explained that the purpose of the survey was to gather a representative sample of PPE forms from around the country. The letter did not mention that the study was being performed primarily to determine the percentage of PPE forms containing questions to screen for causes of sudden death. This omission was intentional. We anticipated that some trainers might not respond if they felt that their schools’ PPE forms were inadequate in this regard.

The questionnaire was focused on factors that might be related to the adequacy of the PPE form, such as whether the school had the regular services of a team physician. We hypothesized that schools with a regular team physician would be more likely to have adequate PPE forms than schools without a regular team physician. The brief questionnaire also included questions about the number of students enrolled in the school’s athletic programs, whether the school was public or private, whether the school was located in an inner-city, urban, suburban, or rural areas, and whether the school’s population was predominantly white, equally white and black, mostly black, or of some other ethnic composition. Our interest in the ethnic composition of schools arises from the finding that black athletes are over-represented among young athletes dying of hypertrophic cardiomyopathy.6 It would thus be important to know whether black athletes tend to be screened in the same manner as athletes from other ethnic groups.

The cover letter asked the athletic trainer to return by fax or mail a copy of the complete medical history and physical examination form used for PPEs at their high school, along with the brief questionnaire. Athletic trainers not responding to the first survey were mailed a second survey. A self-addressed stamped envelope was provided. Missing data were obtained by telephone contact with the respective trainer. Trainers did not receive compensation for responding to the survey. However, trainers who responded were mailed a report on the adequacy of their school’s PPE form (if one was sent), a letter briefly explaining the findings of this study, and a copy of the recommended PPE form.12

FORM EVALUATION

Each PPE form was evaluated to determine whether it contained questions addressing each of the cardiac history findings addressed by the standard form endorsed by the American Academy of Pediatrics12 (Table 1), including questions about symptoms with exercise (including chest pain, syncope or presyncope, exercise intolerance or shortness of breath, and palpitations), a previous diagnosis of a heart murmur or high blood pressure, and a family history of sudden death or myocardial infarction occurring in a relative before age 50 years. Each of the investigators evaluated all of the PPE forms, using a standard evaluation procedure, and any inconsistencies in the evaluation of a particular form were resolved by discussion among the investigators. Questions were deemed acceptable if they were more inclusive than exclusive. For example, a question about chest pain was considered acceptable even if it did not ask specifically whether the chest pain occurred with exercise. Similarly, a question about heart attack in a relative was considered acceptable even if the question did not specify an age limit. Each component of the history (symptoms, previous diagnosis, family history) was considered adequate if it contained all the currently recommended cardiac screening questions.12 Preparticipation evaluation forms were considered adequate if they contained all 3 components of the screening cardiac history.

STATISTICAL ANALYSIS

Descriptive statistics were generated using commercial statistical software. Comparisons of proportions between groups were performed using the $\chi^2$ test or Fisher exact test.
of the actual medical history obtained during the PPE. The purpose of this study was to determine the percentage of US high schools in a random, population-based sample that use medical history forms containing all the recommended components of the screening cardiac history.

RESULTS

RESPONSE

A total of 254 trainers (50.8%) responded to the survey. Of those responding, 193 sent a copy of the PPE form used at their high school. Sixty-one trainers returned only the brief questionnaire. A telephone survey of these 61 trainers revealed that most of them did not send a form because their high school did not use a standard form. Seven of the 193 PPE forms received did not contain any medical history or physical examination questions; rather, they consisted merely of a certificate to be signed by the examining physician attesting that the athlete was fit for sports participation. These forms were not analyzed because no assumptions could be made about the content of the medical history taken by the practitioners using these forms. The results that follow pertain to the 186 PPE forms that contained medical history questions.

CHARACTERISTICS OF REPORTING SCHOOLS

Preparticipation evaluation forms were obtained from 46 of the 50 states. Of the forms received, 39 (21.0%) represented schools in metropolitan areas with populations greater than 500,000, while 147 (79.0%) represented schools in less densely populated areas. Of the forms received, 20 (10.8%) were from inner-city high schools, 40 (21.5%) were from urban high schools, 88 (47.3%) were from suburban high schools, and 38 (20.4%) were from rural high schools.

ADEQUACY OF PPE FORMS

Only 47 (25.3%) of the 186 PPE forms had questions about whether the athlete had ever had syncope or near-syncope, chest pain, exercise intolerance or shortness of breath with exercise, or palpitations (Table 2). Even fewer (19.9%) asked specifically whether the chest pain or syncope occurred during exercise. Ninety-seven forms (52.2%) had questions pertaining to a previous diagnosis of a heart murmur or high blood pressure. Fifty-seven forms (30.7%) had questions pertaining to a family history of sudden death or myocardial infarction occurring in a relative before age 50 years. Only 32 forms (17.2%) had questions encompassing all 3 areas of the recommended cardiac screening history.

ASSOCIATED FACTORS

There was no significant difference in the proportion of adequate PPE forms from schools having the services of a regular team physician (25/156) vs schools without a team physician (7/30). Of the schools whose PPE forms were received, 128 (68.8%) were predominantly white, 11 (5.9%) had equal numbers of white and black students, 23 (12.4%) were predominantly black, and 24 (12.9%) had some other ethnic composition. The proportion of adequate PPE forms from schools with either equal numbers of white and black students or mostly black students (5/74) was not significantly different from the proportion of adequate forms from schools with mostly white or other ethnic students (24/152). There was no difference in the proportions of adequate PPE forms from schools in inner-city, urban, suburban, or rural areas. The proportion of adequate PPE forms was not significantly different between schools with small vs large numbers of athletes, or between public vs private schools. Only 17.4% of the 96,493 student athletes in the 186 schools whose forms were evaluated attended a school that used an adequate PPE form.

COMMENT

Although not all the trainers who responded to the survey returned PPE forms, the schools whose forms were obtained represent a variety of urban and rural areas, large and small schools, public and private schools, and schools with different ethnic compositions. Most PPE forms were received from schools in suburban areas. The distribution of reporting schools among inner-city, urban, suburban, and rural areas probably mirrors the distribution of athletic trainers in US high schools. We conclude that the study sample is representative of the target population; ie, all US high schools with a NATA member trainer. The type of form used for the sports PPE varies from school to school, even in states where the scholastic sports governing body endorses the use of a standard form. By randomly sampling high schools from the NATA database, we were more likely to obtain a true representation of the proportion of US high schools that use an adequate form for cardiac screening than that obtained by Glover and Maron, who instead evaluated the forms supplied to them by the state high school athletic associations. However, the results of the our study are very similar to the results obtained by Glover and Maron. They found that the scholastic sports governing bodies in 8 of the 51 states (in-

Table 1. Screening Cardiovascular History*

<table>
<thead>
<tr>
<th>Symptom</th>
<th>No. of Forms With Questions</th>
<th>Adequate</th>
<th>Inadequate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has anyone in your family died of heart problems or a sudden death before age 50 years?</td>
<td>139</td>
<td>97</td>
<td>57</td>
</tr>
<tr>
<td>Have you ever passed out during or after exercise?</td>
<td>139</td>
<td>97</td>
<td>57</td>
</tr>
<tr>
<td>Have you ever been dizzy during or after exercise?</td>
<td>139</td>
<td>97</td>
<td>57</td>
</tr>
<tr>
<td>Have you ever had chest pain during or after exercise?</td>
<td>139</td>
<td>97</td>
<td>57</td>
</tr>
<tr>
<td>Do you tire more quickly than your friends during exercise?</td>
<td>139</td>
<td>97</td>
<td>57</td>
</tr>
<tr>
<td>Have you ever had racing of your heart or skipped heartbeats?</td>
<td>139</td>
<td>97</td>
<td>57</td>
</tr>
<tr>
<td>Have you ever had high blood pressure?</td>
<td>139</td>
<td>97</td>
<td>57</td>
</tr>
<tr>
<td>Have you ever been told that you have a heart murmur?</td>
<td>139</td>
<td>97</td>
<td>57</td>
</tr>
<tr>
<td>Has anyone in your family died of heart problems or a sudden death before age 50 years?</td>
<td>139</td>
<td>97</td>
<td>57</td>
</tr>
</tbody>
</table>

*From The Preparticipation Physical Evaluation.12

Table 2. Adequacy of Preparticipation Forms

<table>
<thead>
<tr>
<th>Exercise Symptoms</th>
<th>Previous Diagnosis</th>
<th>Family History</th>
<th>All 3 Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adequate</td>
<td>47</td>
<td>97</td>
<td>57</td>
</tr>
<tr>
<td>Inadequate</td>
<td>139</td>
<td>89</td>
<td>129</td>
</tr>
</tbody>
</table>

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The findings of this study, together with the findings of the study by Glover and Maron, provide strong support for the development of a national standard PPE form. Development of a standard PPE form by the various medical academies listed earlier is an important first step toward this goal. A preparticipation history designed to elicit symptoms with exercise and a family cardiac history may increase the proportion of young athletes at risk for sudden death who are identified early. However, until a great many more high school athletes are screened for occult cardiac disease by history and physical examination in a standard manner, it will not be possible to assess the sensitivity, specificity, or predictive value of this screening method. It is possible that some lives could be saved by making this inexpensive and practical screening procedure a standard part of the routine PPE.

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REFERENCES