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Preparticipation Cardiovascular Screenings in Athletics

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INTRODUCTION

Each year 1 in 44,000 National Collegiate Athletic Association athletes die from sudden cardiac death (*American Heart Association*, 2011). Due to the increasing prevalence of sudden cardiac death among young, seemingly healthy athletes many have been questioning the efficacy of our current cardiovascular screening practices.

While there are research studies that have been conducted regarding preparticipation cardiovascular screenings in athletics, many of these studies focus on the use of universal electrocardiography (ECG) screenings to help identify disqualifying cardiovascular conditions (Hevia, *Brit J Sport Med*, 2011). Other studies focus on the efficacy of medical history questionnaires and physical examination to identify such conditions (Wilson, *Brit J Sport Med*, 2008). We found a gap in the research between the theoretical recommendations of cardiovascular screenings and the actual clinical practices taking place today.

PURPOSE

The primary purpose of this study was to describe the current cardiovascular screening practices of clinicians in high school, collegiate, and professional athletic settings. The secondary purpose was to evaluate whether or not current cardiovascular screening practices align with the current, evidence-based recommendations regarding cardiovascular screening practices.

METHODS

Subjects

The subjects of our research were certified athletic trainers who performed preparticipation cardiovascular screenings on athletes in the high school, collegiate, and professional settings. The subjects were selected by convenience sampling. The survey was sent to 244 email addresses, but 13 emails failed to send due to an invalid email address. The survey was open for 8 days. A reminder email was sent the morning of the final day to prompt potential subjects to complete the survey before it closed. Before participating in the study, all subjects read and signed an informed consent form approved by the University's Institutional Review Board for the Protection of Human Subjects.

Instrumentation

The Survey Monkey service was used to create the online survey, send the survey, and collect all of our survey data. The first types of questions were demographic questions about highest degree received, age, years of professional experience, job setting, state of practice, gender, and ethnicity.

The second types of questions were 14 questions regarding current cardiovascular screening methods with were adapted from American Heart Association's (AHA) 12-Element Recommendations for Preparticipation Cardiovascular Screening of Competitive Athletes *(American Heart Association*, 2007). Respondents were asked to indicate what percentage of the time they ask a specific question or perform a specific test when evaluating an athlete during a preparticipation physical examination using the following scale: 0 (never); 25% of the time; 50% of the time; 75% of the time; 100% of the time; Prefer not to respond.

The third types of questions were questions regarding the subject's experience with either disqualifying an athlete due to a cardiovascular condition or having an athlete experience a cardiovascular event. The answer options for these questions were Yes, No, and Prefer not to respond.

Procedures

An invitation to participate in the research study was sent to potential subjects by email. By clicking the link to the survey subjects accepted the terms of the informed consent. After completing the survey, subjects clicked the button labeled "Done" on the last page of the survey. Subjects were allowed to access the survey and change their answers at any point until the survey officially closed.

STATISTICAL ANALYSIS

Descriptive statistics (frequencies, percentages) were calculated for each of the survey questions. Three one-way ANOVAs were calculated. A one-way ANOVA was calculated using the highest degree of a clinician as the independent variable and the last time they made a change to their cardiovascular screening as the dependent variable. A one-way ANOVA was also calculated using the job setting of a clinician as the independent variable and the last time they made a change to their cardiovascular screening as the dependent variable. Finally, one-way ANOVA's were used to determine the effect of job setting of a clinician on their responses for the 14 preparticipation screening practices. IBM SPSS version 21 was used for the statistical tests. A priori alpha level was set at $p < 0.05$.

RESULTS

Demographics

All 17 respondents reported being white in ethnicity, with 9 reporting being female and 8 reporting being male. Of the 17 respondents, 2 reported that they had received a Bachelor's degree, 10 reported that they had received a Master's degree, and 5 reported that they had received a Doctorate degree. Additional demographic information about the subjects is summarized in Figures 1, 2, and 3.

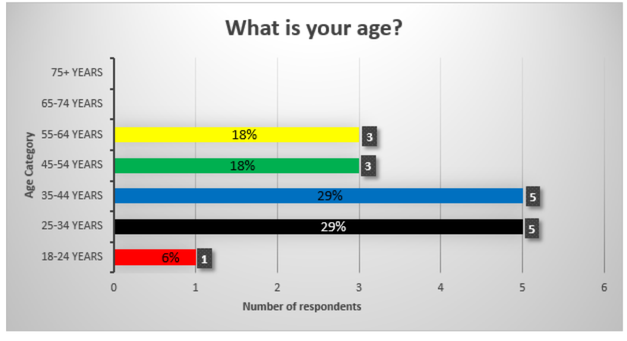

Figure 1 –Age

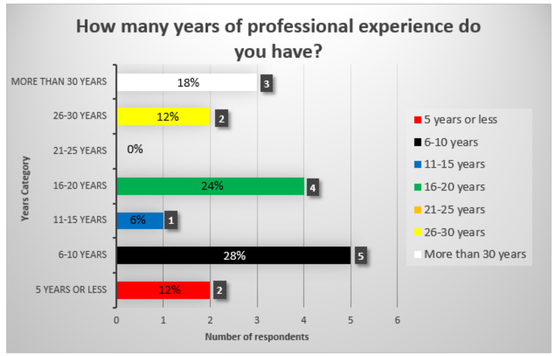

Figure 2 - Years of Professional Experience

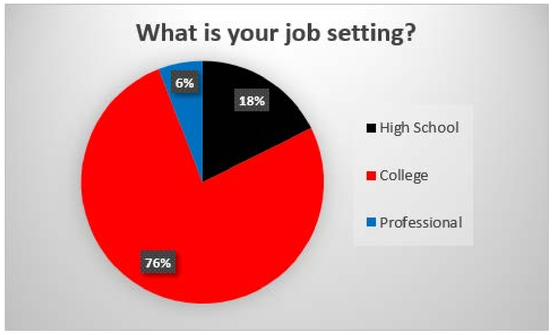

Figure 3 – Job Setting

Specific Preparticipation Cardiovascular Screening Questions

Table 1 shows the number of respondents and percentage of respondents who reported asking a specific question or performing a specific test a certain percentage of the time when they conduct preparticipation cardiovascular screenings.

Question or Test	0% of the time	25% of the time	50% of the time	75% of the time	100% of the time	Prefer not to respond
Specifically inquire about chest pain with exertion	0/17 (0%)	0/17 (0%)	0/17 (0%)	0/17 (0%)	17/17 (100%)	0/17 (0%)
Specifically inquire about unexplained episodes of passing out or fainting	0/17 (0%)	0/17 (0%)	0/17 (0%)	0/17 (0%)	17/17 (100%)	0/17 (0%)
Specifically inquire about excessive shortness of breath AND fatigue with exercise	0/17 (0%)	0/17 (0%)	0/17 (0%)	3/17 (18%)	14/17 (82%)	0/17 (0%)
Specifically inquire about a history of a heart murmur	0/17 (0%)	0/17 (0%)	0/17 (0%)	0/17 (0%)	17/17 (100%)	0/17 (0%)
Specifically inquire about a history of high blood pressure	0/17 (0%)	0/17 (0%)	0/17 (0%)	0/17 (0%)	17/17 (100%)	0/17 (0%)
Specifically inquire about sudden and unexpected death of a close relative before the age of 50 due to heart disease	1/17 (6%)	0/17 (0%)	0/17 (0%)	0/17 (0%)	16/17 (94%)	0/17 (0%)
Specifically inquire about disability of a close relative before the age of 50 due to heart disease	1/17 (6%)	1/17 (6%)	1/17 (6%)	0/17 (0%)	14/17 (82%)	0/17 (0%)
Specifically inquire about knowledge of certain cardiac conditions in family members (such as hypertrophic or dilated cardiomyopathy, Marfan syndrome, long-QT syndrome, or clinically important arrhythmias	1/17 (6%)	0/17 (0%)	0/17 (0%)	1/17 (6%)	15/17 (88%)	0/17 (0%)
Require parental verification of the past medical and family history	10/17 (59%)	1/17 (6%)	1/17 (6%)	0/17 (0%)	5/17 (29%)	0/17 (0%)
Auscultate for the presence of a heart murmur or arrhythmia	1/17 (6%)	0/17 (0%)	1/17 (6%)	0/17 (0%)	13/17 (76%)	2/17 (12%)
Palpate peripheral pulses	2/17 (12%)	0/17 (0%)	5/17 (29%)	0/17 (0%)	6/17 (35%)	4/17 (24%)
Assess for physical signs of Marfan syndrome	2/17 (12%)	1/17 (6%)	3/17 (18%)	0/17 (0%)	10/17 (58%)	1/17 (6%)
Measure blood pressure in one arm	0/17 (0%)	0/17 (0%)	0/17 (0%)	1/17 (6%)	15/17 (88%)	1/17 (6%)
Measure blood pressure in both arms	11/17 (65%)	2/17 (12%)	0/17 (0%)	0/17 (0%)	1/17 (6%)	3/17 (17%)

Table 1 : Percentage of time that respondents ask specific questions or perform specific tests

One-Way ANOVAs

A one-way ANOVA comparing level of education and last update to the clinician's screening showed no significant differences between the groups ($p = 0.572$).

A one-way ANOVA comparing job setting and last update to the clinician's screening showed a significant difference between the collegiate setting compared to the high school and professional settings ($p = 0.023$).

A one-way ANOVA comparing job setting and the 14 preparticipation screening questions/tests showed no significant differences for 12 of the 14 screening questions/tests. The only findings that were significantly different between job settings were the questions inquiring about shortness of breath AND fatigue with exercise ($p = 0.046$) and requiring parental verification of past medical and family history ($p = 0.009$).

DISCUSSION

Demographics

The level of education, age, professional years of experience, and gender of our respondents were varied. Our respondents were more homogenized that we anticipated in the areas of ethnicity, job setting, and state of practice.

Specific Preparticipation Cardiovascular Screening Questions

None of our respondents followed all of the AHA's recommendations 100% of the time. These findings show that there is debate about what constitutes the most effective preparticipation cardiovascular screening. These findings also show that the medical history section of a PPE is more concrete, that is most specific questions were asked "100% of the time" or "0% of the time," with a few exceptions. We thought it was interesting some special tests were performed only a portion of the time. If a test is part of the screening policy it should be performed during every examination.

One-Way ANOVAs

While our results of the one-way ANOVA comparing job setting and last update to the clinician's screening showed that clinicians in collegiate settings were more likely to update their screening, this could be due to the academic nature of the collegiate setting or the high level of compliance among the high school and professional settings.

The difference between the professional setting compared to the high school and collegiate settings in terms of inquiring about shortness of breath and fatigue with exercise is due to our 1 respondent from a professional setting reporting inquiring about this 75% of the time. The difference in terms of requiring parental verification about medical history is due to this only being necessary when dealing with minors.

CONCLUSION

- Current clinical practices of preparticipation cardiovascular screenings in high school, collegiate, and professional athletic settings are not completely compliant with the current, evidence-based recommendations.
- Mainly this noncompliance is due to the inconsistent performance of special testing during the physical examination portion of the preparticipation cardiovascular screening.
- These results indicate that clinicians need to update their preparticipation cardiovascular screening to meet the current recommendations and follow their updated screening requirements without omitting steps.