Cardiovascular Screening Practices in Collegiate Student-Athletes

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Objective: To evaluate screening practices and preparticipation evaluation (PPE) forms used to identify, or raise suspicion of, cardiovascular abnormalities in collegiate student-athletes.

Design: Phone and e-mail survey.

Setting: National Collegiate Athletic Association (NCAA) Division I universities.

Participants: All 347 NCAA Division I universities were invited to participate in 2010-2011; 257 universities (74%) elected to participate.

Main Outcome Measures: Information about the preparticipation screening process was obtained from team physicians and/or certified athletic trainers. PPE forms were evaluated for the inclusion of the 12 specific American Heart Association (AHA) recommendations for cardiovascular screening of competitive athletes from the 2007 AHA Council on Nutrition, Physical Activity, and Metabolism consensus panel endorsed by the American College of Cardiology Foundation.

Results: All 257 participating universities (100%) required preparticipation screening for freshman and transfer athletes, and 83 universities (32%) required an annual PPE for returning athletes. The PPE was performed on campus at 85% of the universities, whereas 15% of universities allowed the PPE to be completed by the athlete's choice of physician before he or she arrived on campus. Eleven universities (4%) used the recently updated American College of Sports Medicine 4th edition PPE. Sixteen universities (6%) used the American College of Sports Medicine 3rd edition PPE. The remaining 260 universities (90%) did not use either of these forms. Of the 257 Division I universities, only 21 universities (8%) met the AHA recommendations by including all 12 cardiovascular screening items on their PPE forms.

Conclusion: The majority (92%) of NCAA Division I universities do not use PPE forms that meet the AHA recommendations for cardiovascular screening; therefore, they may not be effectively screening collegiate student-athletes for cardiovascular abnormalities that could lead to sudden cardiac death.

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INTRODUCTION

Collegiate student-athletes are thought to be the epitome of health, yet they remain at risk for sudden cardiac death (SCD). Among National Collegiate Athletic Association (NCAA) student-athletes, SCD is the leading medical cause of death and is responsible for 75% of deaths during exertion [1]. It is estimated that 1 in 3126 NCAA Division I male basketball players will die because of SCD [1]. The preparticipation evaluation (PPE) is the first step in detecting, or raising suspicion of, cardiovascular abnormalities that could lead to SCD. In 1996 the American Heart Association (AHA) published a scientific statement recommending that 12 items for the early detection of cardiovascular abnormalities in athletes be included in the PPE [2]. These 12 items include 5 personal history questions, 3 family history questions, and 4 physical examination assessments (Table 1). Pfister et al [3] conducted an assessment of preparticipation cardiovascular screening of collegiate athletes that included NCAA divisions I, II, and III with a 79% participation rate and revealed that fewer than 1% of the PPE forms used between 1995 and 1997 included all

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Table 1. *Twelve American Heart Association–recommended screening items for cardiovascular abnormalities in collegiate student-athletes*

Screening Item	n (%) Included in Screening Forms by Universities
Personal history items	
Chest pain	238 (92.6)
Syncope	249 (96.9)
Excessive fatigue	167 (65)
Heart murmur	241 (93.8)
High blood pressure	228 (88.7)
Family history items	
Sudden death at <50 y	234 (91.0)
History of heart disease at <50 y	183 (71.2%)
History of Marfan syndrome, long QT syndrome, hypertrophic cardiomyopathy, or arrhythmias	145 (56.4)
Physical examination items	
Heart murmur	83 (32.3)
Femoral pulses	49 (19.1)
Marfan syndrome stigmata	56 (21.8)
Blood pressure	254 (98.8)

12 AHA-recommended screening items. In 2007 the AHA scientific statement was updated and again recommended use of the 12-item screening process to reduce SCD in competitive collegiate athletes [4]. The purpose of this study was to evaluate screening practices and PPE forms currently used to identify, or raise suspicion of, cardiovascular abnormalities in NCAA Division I collegiate student-athletes.

METHODS

Team physicians or certified athletic trainers at all 347 NCAA Division I universities were contacted by phone and/or e-mail in 2010-2011 and invited to participate in a phone or e-mail survey. Participating physicians and athletic trainers were asked specific questions about the administration of preparticipation screening at their universities, including the frequency, timing, and location of screening, the credentials of the examiners, and the use of a standardized PPE form. The universities were asked to submit the most current version of their athlete history questionnaire and physical examination form. Forms were analyzed by 2 persons for the inclusion of the 12 AHA-recommended screening items: personal history of (1) exertional chest pain, (2) exertional syncope or presyncope, (3) excessive fatigue, (4) heart murmur, and (5) high blood pressure; family history of (6) sudden death when younger than 50 years, (7) heart disease when younger than 50 years, and (8) Marfan syndrome, long QT syndrome, hypertrophic cardiomyopathy, or arrhythmias; and physical examination for (9) heart murmur, (10) femoral pulses, (11) stigmata of Marfan syndrome, and (12) blood pressure [4].

RESULTS

Screening Process

Of the 347 NCAA Division I universities initially contacted, 257 universities (74%) agreed to participate. All 257 participating universities (100%) required preparticipation screening that included a personal and family history and physical examination for freshman and transfer athletes before the start of any athletic participation. Regarding full (history and physical) PPE for returning athletes, 83 universities (32%) required an annual PPE; 8 universities (3%) required an annual PPE for returning football players; 12 universities (5%) required a biennial PPE; and 162 universities (63%) did not require a full PPE for returning athletes. For universities not requiring a full PPE for returning athletes, an updated medical history, typically screened by the athletic trainer, was required annually. If a "red flag" appeared on the updated history, a full physical examination was pursued.

PPEs were performed on campus at 218 of the universities (85%), whereas 39 of the universities (15%) allowed the PPE to be completed by the athlete's physician of choice before the athlete arrived on campus. On campus, athletes completed the history questionnaire, which was reviewed by an athletic trainer and signed off on by a physician at the time of the examination. Practitioners from numerous physician specialties completed the physical examinations: 156 family physicians, 53 internists, 2 pediatricians, 4 emergency medicine physicians, 3 medicine/pediatrics physicians, 4 physiatrists, 1 gynecologist, 9 cardiologists, and 8 orthopaedic surgeons. Of these physicians, 99 (45%) had completed a sports medicine fellowship. Many universities reported that physician assistants, nurse practitioners, residents, and fellows were part of the health care team screening the athletes. Nine universities (4%) had cardiologists conduct the cardiovascular examination for incoming athletes. Nine universities (4%) performed an electrocardiogram, and 1 university (0.4%) performed an echocardiogram for every incoming athlete in 2010.

PPE Forms

The most up-to-date version of the PPE form was obtained via fax or e-mail from each university. Two hundred forty-two universities (94%) required that the PPE be completed with use of their standardized form, whereas 15 universities (6%) allowed athletes to use any form provided by their physician. Eleven universities (4%) were using the recently updated American College of Sports Medicine (ACSM) 4th edition PPE, released in 2010, and 16 universities (6%) were using the ACSM 3rd edition PPE, released in 2005.

The PPE forms were analyzed for the inclusion of the 12 AHA-recommended screening items (Table 1). Of the PPE forms analyzed from the participating 257 Division I