Medical News & Perspectives

Interassociation Task Force Punts Decision on Universal ECG Screenings for Athletes

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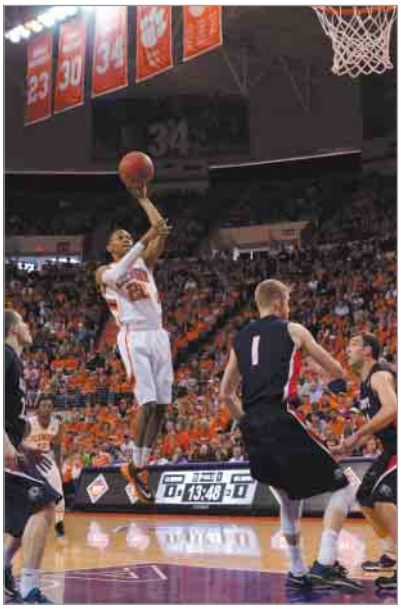
In 2009, Dominic Murray, a seemingly healthy 17-year-old student basketball player at Farmingdale State College in New York, died of sudden cardiac death (SCD) during a pickup game. Although Murray had a physical and electrocardiogram (ECG) and had been cleared to play basketball, an autopsy revealed he died of undiagnosed hypertrophic cardiomyopathy (http://bit.ly/1r3tSNq). Murray was one of 79 college athletes who died of SCD between 2003 and 2013 (http://bit.ly/1TlrB9M; Harmon KG et al. *Circulation*. 2015;132:10-19).

Sudden cardiac death strikes about 1 of every 53 703 college athletes each year, and for Division I male college basketball players, the risk is much higher, at 1 SCD estimated for every 5200 athletes annually (Harmon KG et al. *Circulation*. 2015;132:10-19). Atrial fibrillation, ventricular fibrillation, long QT syndrome, and changes in the heart's structure or size can cause SCD, and a study of athletes in Great Britain who died of SCD found that 35% had underlying myocardial disease (Finocchiaro G et al. *J Am Coll Cardiol*. 2016;67[18]:2108-2115).

A National Collegiate Athletic Association (NCAA)-led multidisciplinary task force hopes that such deaths can be minimized with the implementation of cardiovascular screening guidelines for college athletes that are outlined in a new interassociation consensus statement (http://bit.ly/1WbFQ3j). Published in April, the statement does not recommend universal ECG screening before clearance to play for the approximately 460 000 student athletes who compete in sports at more than 1121 NCAA schools (http://on.ncaa.com/1Sh3W86).

Instead, the guidelines recommend that physicians conducting preparticipation athlete assessments follow the American College of Cardiology (ACC) and American Heart Association (AHA) 14-point checklist for conducting physical examinations and personal and family histories of heart problems (http://bit.ly/1rahVFQ). Among other recommendations, the guidelines suggest that NCAA colleges have written procedures in place for responding to cardiac emergencies during athletic practice and competitive events.



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The task force comprised 29 physicians and athletic trainers representing the ACC, American College of Sports Medicine, AHA, National Athletic Trainers' Association, and other organizations.

At the September 2014 task force meeting, intense debate, discussion, and review of the clinical evidence preceded the task force's decision to stop short of advising ECG screening of all college athletes before they are permitted to partake in their sport, noted Brian Hainline, MD, the NCAA's chief medical officer. The vigorous discussion stemmed from conflicting data regarding the efficacy of preparticipation ECG screening in reducing SCD among student athletes, the limitations of ECGs as a screening tool, and the financial and logistical burden such a directive would place on smaller colleges lacking the facilities and staff to conduct large-scale screening programs.

For example, according to one study, the estimated cost of administering annual ECGs to all 8.5 million high school and college athletes in the United States over 20 years for a total of 170 million screenings would save a total of 4831 lives—but at a cost of $51 billion to $69 billion (Halkin A et al. *J Am Coll Cardiol*. 2012;60[22]:2271-2276). In addition, ECGs, when administered to competitive athletes, can have a false-positive rate of 9% to 25% (Sharma S et al. *JAMA Intern Med*. 2015;175[1]:125-127).

"Some [task force members] advocated very strongly for it, and others advocated against it. It is a controversial area. The emotions are high, and the consequences are severe," Hainline said.

Ultimately, the consensus statement leaves the decision for universal ECG screening of athletes up to individual colleges and specifies protocols for administering and interpreting the results.

"This is common sense," said Rod S. Passman, MD, a professor of cardiology and preventive medicine at Northwestern University's Feinberg School of Medicine, who did not serve on the task force. "There is no randomized clinical data suggesting [universal ECG screening] will reduce the risk of sudden death, and you run the risk of telling an athlete they won't be able to play sports when they would be fine participating in those activities."

Conflicting Evidence

What's more, observational studies have provided contradictory data on whether preparticipation ECG screenings translate into lower SCD rates among college athletes. An often-referenced study of competitive athletes aged 12 to 35 years in the Veneto region in Italy found that SCD incidence dropped 90% in the 22 years after an Italian law passed in 1982 mandated preparticipation ECG screening for all athletes involved in organized sports with regular competition and training as compared with the 2-year period beforehand (Corrado D et al. *JAMA*. 2006;296[13]:

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Key Points of the Interassociation Consensus Statement

- College athletes should undergo a preparticipation evaluation that includes a physical examination and a personal and family history based on the American College of Cardiology/American Heart Association 14-point assessment (http://bit.ly/1rahVFQ).
- Athletic administrators, trainers, and physicians should discuss whether all athletes should receive electrocardiogram screenings or only those in high-risk groups.
- Coaches, athletic trainers, athletic staff, and players should be trained in cardiopulmonary resuscitation and the use of automated external defibrillators (AEDs), as well as how to respond to a cardiac emergency.
- Colleges should have AEDs within a 3-minute walk of playing fields, gyms, weight rooms, and other locations where athletes train and play. The AEDs should be charged and checked monthly.
- Colleges should work with local emergency medical services to develop cardiac emergency response plans for both practice and competition events.

1593-1601). A *JAMA Internal Medicine* commentary noted that the Italian study is often cited as "the most persuasive evidence for efficacy of ECG-based screening in reducing SCD [in athletes]" but cautioned that another study contradicts the findings (Sharma S et al. *JAMA Intern Med*. 2015;175[1]:125-127). That study found no differences in SCD rates between the young Italian athletes who did undergo ECG screening and a comparable demographic group of athletes in Minnesota who did not (Maron BJ et al. *Am J Cardiol*. 2009;104[2]:276-280).

In addition, the Italian study may not have taken into account other factors that could also explain the results, such as improved methods for reviving athletes who went into cardiac arrest (Van Brabandt H et al. *BMJ*. doi:10.1136/bmj.i1156 [published online April 20, 2016]).

Eric Prystowsky, MD, director of the cardiac arrhythmia service at St Vincent's Hospital in Indianapolis who treats many student athletes with cardiac conditions, agrees with the task force's decision.

"I used to be in favor of routine ECG screenings, but if you look at the numbers, it's pretty hard to make the case," noted Prystowsky, who said identifying an athlete with a potentially lethal condition is like "looking for a needle in 12 haystacks."

In some cases, normal ECGs may not reveal potentially dangerous congenital abnormalities, and in other cases, an abnormal ECG may be due to a normal heart thickening in competitive athletes, he pointed out.

"You start going down these cul de sacs that lead to nowhere," said Prystowsky, who wasn't on the task force.

But he stressed that any red flags identified during the athlete's medical history or physical examination should be aggressively followed up with additional testing, including an ECG.

Some committee members favor ECG screening of college athletes—but only if colleges have the resources to conduct such screenings properly.

"The evidence is quite clear that early detection is enhanced in programs that use ECGs," said Jonathan Drezner, MD, professor of family medicine at the University of Washington School of Medicine in Seattle (Harmon KG et al. *J Electrocardiol*. 2015;48[3]:329-338).

"The challenge is that there is a huge infrastructure gap at most institutions where the physician and cardiology expertise to do ECG screening well does not exist," Drezner added, who is also a team physician for both the university and the Seattle Seahawks.

Mobile ECGs Evolving

One area not addressed in the consensus statement is the role of mobile ECG screenings. The task force informally discussed mobile ECG technology, but the topic was not part of the formal agenda, and the task force viewed such technology cautiously, Hainline said.

"I don't think mobile apps have any role in screening athletes, at least not yet. They do not provide a 12-lead ECG," Drezner said.

One example of portable ECG technology is a mobile heart monitor that has received US Food and Drug Administration (FDA) approval. Individuals use a smartphone app and a sensor that attaches to the smartphone to take their own ECGs in 30 seconds (http://bit.ly/1SwKWVC; http://bit.ly/1UqE7HB). An FDA-approved automated algorithm analyzes the results and alerts the patient if atrial fibrillation is detected. Users can share the results with their physicians by email if they choose.

In college athletes, the app has been validated for specificity of 99.2% for atrial fibrillation. Sensitivity for atrial fibrillation could not be determined among the 123 athletes participating in the study because none tested positive (Haberman ZC et al. *J Cardiovasc Electrophysiol*. 2015;26[5]:520-526).

Because athletes can so easily take their own ECG now and send the data to their primary care physician or a cardiologist, there's no reason why all athletes should not have an ECG or multiple ECGs using a mobile app, noted Leslie Saxon, MD, a professor of clinical medicine and executive director of the Body Computing Center at the University of Southern California (USC) in Los Angeles.

"Why not collect continuous data and gain insight into why these [SCD] events are occurring?" commented Saxon.

The more data the better, she added. Her USC laboratory is developing an integrated mobile app that can compile and analyze data on an athlete's ECG readings, nutrition, sleep patterns, and class schedules. The data will be stored in Health Insurance Portability and Accountability Act (HIPAA)-compliant data cards and in a HIPAA-compliant cloud storage, Saxon said. Once the app is ready for commercial use, physicians can use the app data to pinpoint the circumstances that may put excessive strain on an athlete's heart with more precision than a 1-time ECG taken in a physician's office, she explained.

Because a smartphone ECG app already has been approved, it's disappointing that the interassociation task force did not address the role of mobile technology in their guidelines, she said.

"The NCAA should be acknowledging that we can very nimbly and continuously and on demand record ECGs from athletes that allow for discovery and understanding of syndromes [related to SCD], and this was a missed opportunity for research and learning," Saxon said.

Prystowsky also appreciates the value of mobile technology in tracking ECGs. Student athletes whose preparticipation evaluations have raised questions are often referred to him, and he uses implantable loop recorders to assess their heart rhythms over time. Such devices, which are about the size of a USB driver and battery-powered, are

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inserted beneath the athletes' skin and can record the heart's rhythm for up to 3 years (Mofrad PS. *Circulation*. 2012;126:e472-e474).

Hainline is skeptical about the reliability of student athletes' do-it-yourself ECGs using a smartphone app. Mobile technology is still evolving, he said. If mobile ECGs get to the point where they are as informative as ECGs conducted with 12-point leads and are interpreted by an expert, such apps may become useful diagnostic tools, he said.

Currently, however, ECG apps are no substitute for carefully conducted ECG screenings that are coupled with a personal history and read by clinicians educated in interpreting results who can provide follow-up care, Hainline said.

Interpreting ECGs

Ultimately, what's important is not whether ECGs are mandated, but that they're performed and interpreted correctly and athletes with abnormal results receive appropriate follow-up care, said Drezner.

This is why, for those colleges like University of Washington that require preparticipation ECGs for student athletes, the interassociation consensus statement recommends that ECG data be assessed by clinicians versed in the ACC/AHA/Heart Rhythm Society ECG standards and interpretation guidelines (Kligfield P et al. *Circulation.* 2007;115:1306-1324).

"The knowledge base of how to interpret an ECG is all over the place," Hainline said. "Sports cardiology as a discipline is relatively new, with rapidly emerging data on how to interpret an ECG in an elite athlete versus a nonathlete."

This variability in interpreting ECGs is a significant reason why, after all the discussion, the task force ultimately decided against recommending universal screenings, he noted.

"ECG provides a benefit when it is done well," Drezner said. "And it has the potential to cause problems when it is not done well." ■

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