

Pre-participation Cardiovascular Screening of Young Competitive Athletes: Policy Guidance

The sudden and tragic death of a young athlete is shocking, especially given his or her seeming peak physical condition. As a result, such incidents garner extensive attention from the media and policymakers, who look toward approaches such as mandating particular screenings in the hope of reducing the risk for these incidents happening again. One example is the move to require preparticipation cardiovascular screening (prescreening) – “the systematic practice of medically evaluating large, general populations of athletes before participation in sports for the purpose of identifying (or raising suspicion of) abnormalities that could provoke disease progression or sudden death.”¹ This document summarizes the American Heart Association’s (AHA) policy guidance on this issue.

Sudden Cardiac Death in Athletes

Sudden cardiac death (SCD) represents a public health risk to competitive and non-competitive youth, high school, college, recreational, and professional athletes in the United States.^{1,2,3} It is the leading non-traumatic cause of death among young athletes.¹ The precise incidence of SCD among high school athletes, for example, is unknown, but estimates range from 1 in 23,000 to 1 in 300,000.⁴ SCD of athletes can be caused by a variety of cardiovascular diseases, but is most commonly associated with congenital or acquired malformations. Intense athletic activity can trigger SCD or disease progression in these susceptible individuals.

Screening Guidelines

Prescreening competitive athletes can improve detection of cardiac abnormalities and minimize the risks associated with athletic participation. However, as prescreening policy is considered, it is critical to take into account many factors, including the relative infrequency of the cardiovascular diseases associated with SCD in young athletes, the burden that a policy may place on the health care system, and the need to address disparities in access to care. Few young athletes have cardiovascular conditions that place them at risk for SCD, which limits the benefit of an expensive initial screening program that includes the use of echocardiograms, exercise stress tests or ambulatory rhythm monitoring. The latest American Heart Association/American College of Cardiology scientific statement provides updated clinical considerations for competitive sports participation for athletes with cardiovascular abnormalities and emphasizes shared decision-making and nuanced deliberation that offers options to clinicians and athletes.⁵

One prospective trial of high school students (13-19 years old) participating in voluntary cardiovascular screening evaluated the AHA 14-element screening, 12-lead ECG and limited echocardiograms.⁶ The authors concluded that the AHA 14-element screening performed less well compared with ECG for cardiovascular screening of high school athletes.⁶ However, the authors’ comparisons assume the AHA 14-element screening is done alone versus in tandem with further testing when any positive finding is found.⁶ Further analysis is provided on the results of this study that underscores why the 14-point assessment is still the most important initial screening and should have more widespread uptake, even for non-athletes.⁶ Including the AHA 14-point assessment into annual check-up, even for non-athletes, allows for seamless, equitable initial evaluation that may lead to further testing if there are any positive findings.

While the inclusion of a resting 12-lead ECG is reasonable as it improves detection of underlying cardiac

conditions in asymptomatic competitive athletes compared with medical history and physical examination alone,⁵ a mass mandatory ECG screening program may strain the health system as there may not be enough qualified medical professionals currently available to accurately interpret these tests. An important percentage of both false positive and false negative findings do occur. A recent systematic review found false positive rates for physician-read ECGs of athletes generally ranges from 1.3–2.8%, but can be as high as 6.8% in Arab and Black athletes.⁷ Computer-read ECGs have false positive rates from 2.3% to 5%.⁷ False-negative rates of 12-lead ECG have been demonstrated to be 10% for hypertrophic cardiomyopathy (the leading cause of SCD in athletes).⁶

Requiring all athletes to have ECGs may also be inaccessible to children from low-income families unless there is accompanying financial support. This is particularly important to recognize, as studies suggest certain racial groups may be at greater risk of sudden death.⁸ As a result, prescreening programs that require the use of expensive tests would need to find a way to overcome these critical access disparities.

Based on the factors above, the AHA has recommended that competitive athletic prescreening should happen annually and consist of a targeted personal history, family history and physical examination.^{1,2} The recommendation outlines 14 key prescreening elements – such as a history of elevated systemic blood pressure, knowledge of certain cardiac conditions in family members, and the presence of a heart murmur – that are designed to identify, or at least raise the suspicion of, cardiovascular diseases that place certain athletes at risk.² Patients would receive ECGs, echocardiograms, and other follow-up tests if the screening indicates the presence of a problem. Unfortunately, most physicians do not know or currently follow AHA's screening guidelines. According to a survey of pediatricians, family doctors, and high school athletic directors in Washington State, less than 6% of doctors follow national sudden cardiac death screening guidelines when performing physicals on high school athletes.⁸

AHA Recommendation

The AHA recommends the following with regards to preparticipation screening of young competitive athletes:^{1,2}

- Competitive athletic prescreening should happen annually and consist of a targeted personal history, family history and physical examination. This includes 14 key prescreening elements such as a history of elevated systemic blood pressure, knowledge of certain cardiac conditions in family members, and the presence of a heart murmur that are designed to identify, or at least raise the suspicion of, cardiovascular diseases that place certain athletes at risk. Those athletes with positive findings should be referred for further evaluation and testing.
- At this time, the AHA does not recommend the use of tests such as a 12-lead ECG or echocardiogram in mandatory preparticipation screening programs. Instead, these tests are best used as follow-up if an initial screening raises suspicions about the presence of a cardiovascular disease.
- National standards and guidelines should be developed to ensure systematic, uniform, evidence-guided preparticipation cardiovascular screening of high school athletes. If local authorities choose to develop a preparticipation cardiovascular screening strategy, the program should be accessible to all children, regardless of financial means, have the support of adequate resources and medical personnel, including pediatric cardiology specialists, and track its performance and outcomes over time. In particular, monitoring should record the proportion of positive screens and what follow-up was recommended and where possible, data regarding the follow-up of positive screens, such as the false positive rate and need for additional diagnostic studies.
- Any expansion of screening programs should be made in response to new science.
- Policies, programs, training, and continuing education that increase provider knowledge of prescreening guidelines should be implemented.

References:

- ¹ Maron BJ, Thompson PD, Ackerman MJ, et al. Recommendations and Considerations Related to Preparticipation Screening for Cardiovascular Abnormalities in Competitive Athletes: 2007 Update. *Circulation*. 2007; 115: 1643-1655.
- ² Maron, BJ., Friedman, RA., Kligfield, P., Levine, BD., Viskin, S., Chaitman, BR., Okin, PM., Saul, JP., Salberg, L., Van Hare, GF., Soliman, EZ., Chen, J., Matherne, GP., Bolling, SF., Mitten, MJ., Caplan, A., Balady, G., Thompson, PD., Assessment of the 12-lead ECG as a screening test for detection of cardiovascular disease in health general populations of young people (12-25 years of age): A scientific statement from the American Heart Association and the American College of Cardiology. *Circulation*. 2014;130:1303-1334.
- ³ Maron BJ. Sudden Death in Young Athletes. *N Engl J Med*. 2003; 349: 1064-1075.
- ⁴ Sheikh N, Sharma S. Overview of Sudden Cardiac Death in Young Athletes. *Physician and Sportsmedicine*. 2011; 39(4).
- ⁵ Kim, JH. Baggish, AL., Levine, BD., Ackerman, MJ., Day, SM., Dineen, EH., Guseh, JS., La Gerche, A., Lampert, R., Martinez, MW., Papadakis, M., Phelan, DM., Shafer, KM. Clinical considerations for competitive sports participation for athletes with cardiovascular abnormalities: A scientific statement from the American Heart Association and American College of Cardiology. *Circulation*. February 20, 2025.
- ⁶ Williams EA, Pelto HF, Toresdahl BG, Prutkin JM, Owens DS, Salerno JC, Harmon KG, Drezner JA. Performance of the American Heart Association (AHA) 14-Point Evaluation Versus Electrocardiography for the Cardiovascular Screening of High School Athletes: A Prospective Study. *Journal of the American Heart Association*. 2019;8(14):e012235.
- ⁶ Maron BJ, Thompson PD, Maron MS. There is No Reason to Adopt ECGs and Abandon American Heart Association/American College of Cardiology History and Physical Screening for Detection of Cardiovascular Disease in the Young. *Journal of the American Heart Association*. 2019;8(14):e013007.
- ⁷ Petek BJ, Baggish AL. Pre-participation Cardiovascular Screening in Young Competitive Athletes. *Current emergency and hospital medicine reports*. 2020;8(3):77-89.
- ⁸ Drezner J, Salerno J. Few doctors follow sudden cardiac death screening guidelines for athletes, abstract 10798. *American Heart Association*. November 13, 2011. Available at: <http://newsroom.heart.org/pr/aha/prv-few-doctors-follow-sudden-cardiac-217740.aspx>