

## [ Guest Editorial ]

# Cardiovascular Preparticipation Screening in Young Athletes: Looking Through One Lens

Cardiovascular (CV) screening in young competitive athletes is recommended by the majority of medical and sports governing organizations. There is, however, substantial controversy surrounding the most appropriate screening protocol and whether to add a resting 12-lead electrocardiogram (ECG) to the preparticipation history and physical examination. Rather than continue polarized debates and contentious discourse, the American Medical Society for Sports Medicine (AMSSM) took a unique stance and formed a task force of balanced perspectives to address the current evidence and knowledge gaps regarding preparticipation CV screening in athletes from the eye of a primary care sports medicine physician (<http://www.amssm.org/Publications.html>). This collaborative effort<sup>1-4</sup> is summarized in Table 1 and produced several new paradigm shifts.

## RECOGNIZING THE LIMITATIONS OF THE PREPARTICIPATION PHYSICAL EVALUATION

While the preparticipation physical evaluation (PPE) may serve many purposes, the ability to identify athletes with cardiac disorders at potential risk of sudden cardiac arrest and death (SCA/D) through a screening history questionnaire and physical examination is significantly limited. The AMSSM position is the second consensus statement in 2016 acknowledging the limits of the PPE in regards to effective CV screening. An Inter-Association Task Force convened by the National Collegiate Athletic Association (NCAA) also recognized that the history questions designed to detect previously undiagnosed CV conditions has never been scientifically validated.<sup>5</sup> Understanding the limits of the traditional model for CV screening in the United States is a critical first step in the appraisal of current evidence and the delineation of knowledge and infrastructure gaps when considering other screening strategies.

## DIFFERENTIAL RISK: RETIRING THE “ONE SIZE FITS ALL” APPROACH

The primary aim of CV screening in competitive athletes is to identify underlying cardiac disorders predisposing to SCA/D, with the goal of reducing morbidity and mortality through individualized and disease-specific management. Different screening models (with or without ECG) offer their respective benefits and limitations, but the absence of clear outcomes-based evidence precludes any universal or mandated policy for all athletes. It is also clear that some athlete groups are at substantially higher risk of SCA/D than others, suggesting that a “one size fits all” approach is not appropriate.

A key factor for determining a suitable screening strategy in a select population includes the concept of differential risk. For instance, the annual risk of sudden cardiac death for a male Division I college basketball athlete is 10-fold higher than the traditional college athlete and 16-fold higher than a typical high school athlete. Evidence supports that differential risk for SCA/D in young athletes is influenced by age, sex, race, sport, and level of play—important considerations when identifying optimal screening strategies.

## KEY KNOWLEDGE GAPS

While there has been considerable progress in sports cardiology research over the past 25 years, there are still a significant number of questions that need to be addressed. The lack of mandatory reporting systems and standardized autopsy protocols for athlete SCA/D both pose challenges in understanding the true incidence, etiology, and magnitude of major CV events in athletes. Similarly, the absence of outcomes-based data for different screening strategies and a lack of understanding for the natural history of athletes identified with cardiac disorders are also significant knowledge gaps. However, the deficiency in data should not dissuade reassessment of current clinical practices,

Table 1. Executive summary

1.	The overall role of the preparticipation physical evaluation (PPE) is to evaluate the health of the athlete to optimize safe sports participation.
2.	Early detection of athletes at risk for sudden cardiac arrest and death (SCA/D) is an important objective of the PPE for athletes.
3.	The primary goal of cardiovascular screening of athletes is to identify underlying cardiac disorders predisposing to SCA/D with the intent to reduce morbidity and mortality by mitigating risk through individualized, patient-centered, and disease-specific medical management.
4.	The natural history and absolute risk of conditions associated with SCA/D in athletes identified with a cardiac disorder during screening is largely unknown with limited outcomes-based evidence.
5.	Exercise is a known trigger and can unmask occult cardiac disease to precipitate SCA/D.
6.	The differential risk of SCA/D between athletes and nonathletes is not fully understood based on current epidemiologic evidence.
7.	Athletes display a differential risk for SCA/D based on age, sex, race, sport, and level of play.
8.	The current PPE history and physical examination, while pragmatic and widely practiced, is limited in its ability to identify athletes with conditions at risk for SCA/D.
9.	The electrocardiogram (ECG) increases early detection of some cardiac disorders associated with SCA/D.
10.	ECG interpretation accuracy and reliability are challenges with the principal concern of adding false-positive results to the PPE screening process.
11.	Results from centers with considerable experience in athlete ECG screening have demonstrated improved detection of cardiac conditions with potential risk for SCA/D and decreased false-positive rates.
12.	While there is general agreement that early detection of cardiovascular conditions associated with SCA/D in athletes is important, the absence of clear outcomes-based research at this time precludes the American Medical Society for Sports Medicine (AMSSM) from endorsing a single or universal cardiovascular screening strategy for all athletes.
13.	AMSSM supports individual physician autonomy to assess the current evidence and implement the most appropriate cardiovascular screening strategy unique to their athlete population and community resources.
14.	Considerations for implementing a cardiovascular screening strategy in a targeted athlete population should include the risk of SCA/D, the available infrastructure and cardiology resources, and the physician assessment that screening for early detection of cardiac disorders has a favorable risk-benefit ratio that will improve athlete outcomes with limited harm.
15.	Physicians incorporating ECG in the cardiovascular screening process should optimize strategies to assure accurate ECG interpretation and adequate cardiology resources to conduct the secondary evaluation of ECG abnormalities.
16.	No screening program provides absolute protection against SCA/D; an emergency action plan (EAP) and access to an automated external defibrillator (AED) are essential to improve outcomes from SCA in athletes.
17.	AMSSM is committed to evidenced-based research, education, and policy initiatives that will validate and promote the most efficacious strategies to foster safe sport participation and reduce SCA/D in athletes.

especially given that sports medicine teams are still responsible for the CV screening of athletes and guide policy recommendations for potentially high-risk populations.

Accordingly, a cornerstone of the AMSSM position statement is respect for the autonomy of individual physicians to assess the current evidence, evaluate their clinical population and available cardiology resources, and decide what they believe to be the most appropriate screening strategy for their unique clinical situation. Within this framework, some physicians may choose

to perform an ECG in all athletes or targeted risk groups, while others may not. Factors to consider in selecting a particular CV screening strategy include:

1. The differential risk for SCA/D in the individual or athlete population
2. Available sports cardiology resources and expertise
3. The potential benefits and harms of the screening process
4. Directives from sports governing organizations.

## ENSURING QUALITY

While ECG screening offers enhanced disease detection, it also increases the potential for false-positive results and associated downstream consequences. All ECG screening programs should have a strong and capable physician infrastructure with high-quality control. Sports medicine physicians conducting or considering ECG screening as a part of the PPE are strongly encouraged to establish a close and collaborative relationship with local cardiology resources as part of a CV care team. Considerations when identifying appropriate cardiology resources include specialist availability with rapid turnaround, access to timely diagnostic testing, familiarity with contemporary athlete-specific ECG interpretation criteria, and a commitment to work in partnership after the establishment of an exercise or competition limiting diagnosis.

## WHAT LIES AHEAD

The future of CV screening in young athletes requires a commitment to advancing both evidence-based research and educational initiatives, along with a continual reassessment of screening strategies as new data emerges. Potential areas for research and education include:

1. Higher quality data on the etiology of SCA/D
2. A better understanding of the clinical course and natural history of athletes diagnosed with CV disease
3. Potential mechanisms to refine and improve the history and physical examination as a screening tool
4. The ability to replicate results of ECG screening from specialized centers in novice sites with less experience, and an understanding of the potential impact of computerized ECG interpretation algorithms using technological advances.

New international consensus recommendations for ECG interpretation in athletes with accompanying educational modules and the fifth update to the PPE monograph are both due in 2017 and offer a chance for promising progress within these domains.

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