



The preparticipation cardiovascular screening of competitive athletes: is it time to change the customary clinical practice?

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The recent '*Recommendations and considerations related to preparticipation screening for cardiovascular abnormalities in competitive athletes: 2007 update*', state that it is not 'either prudent or practical to recommend the routine use of test such as 12-lead ECG' into the preparticipation screening, in contrast to previous Recommendations of the European Society of Cardiology (ESC) and the International Olympic Committee (IOC). This comment was, therefore, prompted by the personal consideration that it is timely and appropriate to clarify the rationale of the European Recommendations, in an effort to achieve an agreement on this controversial issue. The strongest evidence supporting the need for 12-lead ECG into the screening programme is the demonstration for substantial decrease in sudden deaths in screened individuals, compared with not screened ones (i.e. 3.6–0.4 deaths \times 100 000 person-years in the period 1979–2004), associated with a concomitant increase in individuals identified with cardiomyopathies (4.4–9.4%). Indeed, implementation of the 12-lead ECG appears to be associated with only a small proportion of abnormal findings requiring additional testing (such as inverted T waves, increased R/S wave voltages suggestive for LV hypertrophy, major conduction disorders), i.e. about 5% of a large, unselected population of 32 652 individuals. We believe, therefore, that a critical reassessment of the current customary clinical practice is needed for preparticipation screening. In particular, this change seems appropriate for elite athletes, a selected cohort of top-level competitors who have financial resources for a more comprehensive screening process.

The '*Recommendations and considerations related to preparticipation screening for cardiovascular abnormalities in competitive athletes: 2007 update*' recently published¹ represent the consensus recommendations and guidelines for screening competitive athletes in the United States. This document, which updates the previous statement of the American Heart Association (AHA) dated 1996, has been largely prompted by the recent Recommendations of the European Society of Cardiology (ESC) and the International Olympic Committee (IOC)^{2,3} supporting the routine use of 12-lead ECG into the preparticipation screening programme of young competitive athletes.^{2,3}

The AHA document represents the response to European Recommendations regarding the appropriate methodology of the screening and, specifically, the justification for not implementing the 12-lead electrocardiogram into the screening programme in USA. In this respect, we believe that it is timely to clarify the rationale and justifications of the

European Recommendations, in an effort to potentially achieve an agreement on this controversial issue.

The proposal of the European Society of Cardiology and International Olympic Committee

The ESC Consensus Statement was prompted by the recognition that intense athletic training and competition acts as a trigger for sudden death (SD) or disease progression in susceptible individuals with underlying heart disease.⁴ The ESC document states that preparticipation screening is a feasible strategy to prevent athletic field deaths, and best serves to this scope if performed systematically in all young competitive athletes, including not only a complete personal and family history and physical examination, but also the 12-lead ECG.² This proposal largely derives from the long-standing experience in Italy, where a preventive screening programme for competitive athletes has been implemented by legislative initiative since 1982.⁵ This programme targets nearly three million young competitive

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athletes, representing about 5% of the overall population in this country. Implementation of the screening in Italy was made possible from the large number of sports clinics available and the expertise of the examining physicians, who have to attend a full-time, 4-year post-graduate residency training programme prior to be dedicated to the screening.⁵

Other European countries had either limited screening programmes or no medical programmes for competitive athletes, and the endorsement by the ESC of this proposal has represented a big step forward a larger implementation of preparticipation screening across Europe.

Moreover, the IOC in 'The Lausanne Recommendations'³ stated that a systematic cardiovascular evaluation (including 12-lead ECG) is recommended for all young competitive athletes. The position of the IOC is of paramount relevance for implementation of the screening programme throughout National Olympic Committees and International Federations. After the IOC position statement, it is likely that participation to future Olympic Games and World Championships would imply for athletes to undergo a preparticipation screening evaluation, which will include the electrocardiogram.

The position of the American Heart Association

In the present statement, the AHA panel 'continues to support preparticipation cardiovascular screening for young athletes and other participants in organized competitive sports as justifiable, necessary, and compelling on the basis of ethical, legal and medical grounds. Indeed, preparticipation screening is viewed as an important public health initiative'.¹ Moreover, the panel clearly acknowledges that preparticipation screening as previously recommended (i.e. only medical history and physical examination) was encumbered by substantial number of false-negative results and 'detection of HCM by the standard screening examination may be unreliable'.¹ In fact, only 3% of athletes with HCM and other structural heart diseases who died suddenly were suspected to have cardiovascular abnormalities when screened with medical history and physical examination.⁶

Nevertheless, the AHA panel 'does not believe it to be either prudent or practical to recommend the routine use of test such as 12-lead ECG'¹ and, paradoxically, the panel persists in recommending a screening methodology comprising uniquely medical history and physical examination.

Most of the AHA criticism was based on practical considerations, including the lack of adequate economic resources available and the need for federal government subsidization, but also the absence of an appropriate class of specialized physicians to perform the screening and interpret the results. In addition, significant concern exists that the widespread use of 12-lead ECG would convey a large number of borderline (and false positive) test results, requiring additional testing to resolve the ambiguity of diagnosis,^{1,7} and increasing substantially the cost of the screening. Although the statement of the AHA panel appears sound and justified by practical considerations, evidence is raising that suggests a change in customary clinical practice.

The efficacy of the screening

The strongest evidence is the recent demonstration of a substantial decrease in the incidence of SDs in young individuals undergoing preparticipation screening, compared to young not-screened individuals. In screened individuals, Corrado *et al.*⁸ described a sharp decrease in annual incidence of sudden cardiac deaths, from 3.6 to 0.4 deaths \times 100 000 person-years, corresponding to 90% reduction, in association with implementation of the screening programme in the Veneto region over the 1979–2004 period. Reduction in mortality was associated with a concomitant increase in number of young athletes identified with cardiomyopathies (i.e. HCM, arrhythmogenic right ventricular cardiomyopathy and dilated cardiomyopathy) at screening, from 4.4 (in the 1979) to 9.4% (in the 2004).⁸ On the other hand, there was no change in death rate in non-screened individuals, suggesting that the substantial decrease in mortality was not due to changes in the population death rate. Instead, the decrease in mortality was largely attributable to reduced deaths from cardiomyopathies (from 36% prior the screening to 17% after the screening).⁸

The abnormal ECGs

There is a wide clinical perception, highlighted in the document of the AHA,¹ that routine implementation of the 12-lead ECG will convey a large proportion of borderline and abnormal findings, requiring additional testing to resolve the ambiguity of cardiovascular diagnosis, and raising substantially the cost of the screening.

In reality, the ECG abnormalities which raise justified clinical suspicion for cardiac disease appear to be restricted to a minority of young athletes. In a large, unselected population of 32 652 young individuals evaluated in Italy within the national screening programme, the ECG pattern was judged abnormal in 3853 (or 11.8%). However, most of these abnormalities (7%) were prolonged PR interval, incomplete RBBB and early repolarization pattern, commonly believed to be innocent expression of the athlete's heart. Other ECG changes, such as deeply inverted T waves, increased R/S wave voltages suggestive for LV hypertrophy and major conduction disorders, which required additional testing were present in the remaining 4.8% of the athlete population.⁹ Therefore, expensive diagnostic testing appear to be needed only in a small minority of the screened individuals, which largely minimizes the current concern regarding the implementation of the 12-lead ECG into the screening programme.

Moreover, scientific evidence is also emerging that the negative test results of the screening programme are true negatives results in the overwhelming majority, which implies that most of the individuals considered normal by the 12-lead ECG are actually free of cardiac abnormalities, and do not require additional testing.¹⁰

Is it time to change the customary practice?

We believe, therefore, that it is time for a critical reassessment of the current customary clinical practice of preparticipation screening. We consider more ethically and legally appropriate for the examining physician to provide complete, truthful information to athlete (and families and

Colleges/High Schools) regarding the limitations of the current screening process (i.e. history and physical examination), as well as the potential efficacy of the 12-lead ECG. We believe that young athletes (and their families), when properly informed, should not be deprived of the opportunity to be screened by the electrocardiogram. We also believe that educational institutions and athletic organizations share an implicit ethical obligation to ensure that young individuals are not subjected to an unacceptable and avoidable risk related with their sport participation.¹

In particular, this change seems appropriate for elite athletes, a selected cohort of top-level competitors who have financial resources for a more comprehensive screening process. At present, the US Olympic athletes undergo a simple screening process before the Summer or Winter Games, which customarily includes only the history and physical examination. Only the NBA mandates standardized screening for all players routinely including the 12-lead ECG and echocardiography, while the NFL generally perform electrocardiograms and echocardiograms only if clinically indicated.¹¹ To our perspective, elite athletes, who achieve the largest visibility in the world not only for their outstanding physical performances, but also for the large economic interests surrounding their activity, should be routinely evaluated within a more comprehensive and efficient screening programme. We believe that this privileged athletic minority needs implementation of (at least) 12-lead ECG, and eventually a prudent, progressive application of other non-invasive testing, such as echocardiography.

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