

Sudden Cardiac Death in Athletes: Is Universal ECG Screening Plausible?

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I would like to commend Dr Farzin Halabchi and colleagues regarding their excellent review article of "Sudden cardiac death in young athletes"^[1]. The identification of underlying cardiovascular disease is a primary screening objective of physicians who care for athletes. I would like to take this opportunity to clarify some points made in the article and make some suggestions for future screening and research.

There is a lot of debate regarding the use of electrocardiogram (ECG) as a universal screening tool for cardiac diseases in the preparticipation physical exam (PPE). Italy has employed this and has shown a significant decrease in their athletes' mortality from sudden cardiac death (SCD). Extrapolation of data about ECG screening and decreases in SCD and its generalization to other countries has to be done with caution. The prevalence of Arrhythmogenic Right Ventricular Dysplasia in Italy accounts for a large proportion of their cases of SCD. This high proportion of genetic cardiomyopathy will support the use of ECG screening as compared to populations where there are lower rates of identifiable cardiac diseases. The rate of SCD in Italy prior to national screening is quoted to be about 1:28,000 persons per year, with 0.9/100,000 directly attributable to ARVD. The largest and most statistically significant decrease of SCD from a specific cause was a decrease in death from ARVD to 0.15/100,000^[2]. Statistics of SCD from all causes in the United States vary from 1/300,000 to 1/160,000^[3]. This proportion is much lower than that found in the Italian population. The European Society of Cardiology (ESC)

bases their recommendation of universal ECG screening for European athletes on the success of the Italian screening program. There is no data looking at the incidence of SCD in other European countries. If the incidence of SCD is lower along with a decrease prevalence of cardiomyopathy, the effectiveness of this universal screening protocol comes into question. The ESC estimates the cost of adding an ECG to all preparticipation evaluations would represent a 50% increase in cost^[4]. This only represents about ten Euros, but there is no mention of the overall financial effects on European health care systems. Their recommendations do not take into account the availability of access to specialty care in the case of abnormal screening tests. This could have a serious impact on the health care systems of other European countries. The Italian experience has shown that universal ECG implementation into the preparticipation screening exam saves lives and is a cost effective tool. I caution the generalization of this data to a large population that varies in its economic and genetic diversity.

There is some emerging evidence in the United States showing a higher incidence of SCD in certain populations. A recent study of college athletes shows an incidence of SCD to be approximately 1:45,000 college athletes per year^[3]. This is a much higher proportion than the population based incidence of 1:160,000. There have been studies using updated incidence data that show an increased sensitivity of detecting causes of SCD with mandatory ECG screening. This information

has lent itself to research in subpopulations of athletes to determine the effectiveness of ECG screening. This risk stratification is an area that requires further investigation. As opposed to instituting ECGs for an entire population of athletes, it may be prudent to screen certain populations that are at increased risk of SCD. College athletes seem to have a much higher rate of SCD than that of high school athletes. Certain sports have a higher rate of SCD due to extra physical demands. Most cases of SCD occur in football and basketball athletes^[5]. Is the risk of SCD from cardiomyopathy the same in a baseball player and a football player? Further research into the area of risk stratification may be useful to narrow the population of athletes that would benefit from ECG screening.

Improving the screening test is another mechanism that can make a screening program more effective. Through eliminating isolated voltage criteria of left ventricular hypertrophy as an indication for further cardiac evaluations, the false positive rate of the ECG drops from about 15% to about 2%^[3]. Studies have shown that a normal ECG carries a high negative predictive value for hypertrophic cardiomyopathy and other causes of SCD^[6]. The combination of an increase in incidence of SCD in the United States and decrease in the false positive rate of the ECG makes universal ECG screening more plausible.

Currently, in the USA, financial responsibility of receiving a PPE to participate in sports falls on the individual. Certain schools and organizations may have screening programs, but the majority of individuals receives their screening through payment by private insurance or out of pocket expense. Adding the cost of ECG to PPE screening may be more than institutions or individuals are able to afford; therefore, restricting access to those with health insurance. This would prevent a large population of people from being able to participate and benefit from athletic competition. In addition to the financial considerations of ECG screening in the United States, the implementation of a nation-wide screening mandate would be difficult. Preparticipation screenings are regulated at the state level and there is little uniformity regarding the guidelines in different states. The Preparticipation Physical Exam Monograph is a multidisciplinary guideline published jointly by the American Academy

of Family Physicians, American Academy of Pediatrics, American College of Sports Medicine, American Medical Society of Sports Medicine, American Orthopaedic Society for Sports Medicine, and the American Osteopathic Academy of Sports Medicine that provides the most uniform guideline for performing the PPE, but there is no mandate for its use^[7]. A nationwide mandate for standardization of the PPE is needed for universal ECG screening to take effect, but this is unlikely as healthcare is managed at the state level.

As a final word of caution, implementation of a universal screening program will lead to a certain number of false positives requiring further evaluation. There will be a subset of athletes that have an “abnormal” echocardiogram that may not have underlying cardiovascular disease. It may be difficult to detect the difference between an athlete with Hypertrophic Cardiomyopathy, a life threatening condition, and athletic heart, a physiologic adaptation to exercise. This could lead to a significant number of athlete’s being unnecessarily restricted from activity or being delayed from activity for extended periods of time. In the athlete, this could lead to undo stress. Being restricted from sports has been equivocated to the stress of death of a close relative^[8].

Dr. Halabchi’s article discusses the plausibility of implementing universal screening for the entire of Asian athletes^[1]. Plans for a continent wide screening protocol in Asia would be difficult to implement considering the vast size of the population and the genetic differences of its people. It would be more prudent for individual countries to evaluate their incidence of SCD and the prevalence of its underlying causes. This information would allow for countries to institute nationwide guidelines. A wide approach towards Asia would not benefit everyone appropriately from a medical or financial perspective.

In conclusion, ECG screening as part of the PPE appears to be a very useful tool. More research needs to be done to determine the proper settings to use this modality as opposed to using it for universal screening. I believe that ECG will become part of medical screening in certain settings in the United States. With a recognized increase in the incidence of SCD and increased specificity of ECG interpretation, use of the

ECG as part of the PPE has an important role in screening athletes for congenital cardiac disease. Its implementation into universal screening remains complicated due to the financial and social complexities of health care.

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