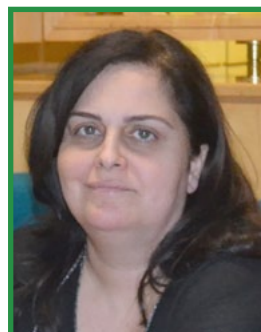


# Sudden Cardiac Death in Young Athletes: A Myth or a Reality?



**Mona Osman MD, MPH, MBA**  
Family Medicine Specialist  
American University of Beirut  
Medical Center

## Introduction

Sudden cardiac death is defined as death that happens within one hour of the onset of symptoms in a person not known previously to have a cardiovascular disease (1). Sudden cardiac death is the leading cause of death among young athletes aged 12 to 35 years (2). Its average incidence is 1 in 50000 and it has been reported to reach 4.4 in 100000 per year (2, 3). Sudden cardiac death was found to affect males more than females and basketball and football players more than other athletes (2).

The incidence of sudden cardiac death is 2.5 to 2.8 fold higher in competitive young athletes when compared to non-athletes of the same age group (4, 5). These athletes can be school or university students engaged in competitive sports as well as professional athletes. Competitive sports are the types of sports with regular competition aiming to an achievement, whether in teams or individually (6). Box 1 includes names of some of the professional athletes who were victims of sudden cardiac death.

Undiagnosed cardiovascular diseases are reported to be the most common cause of sudden cardiac death in young athletes (6). Exercise can increase the risk of sudden cardiac death in susceptible athletes with specific cardiac conditions (6). Sudden cardiac death in young athletes can happen during sports activities, within an hour of exercise or even outside of sports (2).

Sudden cardiac death in young athletes might be rare, but

it is devastating not only to the family of the athlete but also to his/her peers, institutions (schools, universities, and sports clubs) and communities.

### Box 1. Names of some professional athletes who died from sudden cardiac arrest

- Jim Fixx - Marathon runner (1984)
- Flo Hyman - Olympic volleyball player (1986)
- Pete Maravich - Basketball player (1988)
- Hank Gathers - Basketball player (1990)
- Reggie Lewis - Basketball player (1993)
- Sergei Grinkov - Olympic skating champion (1995)
- Marc Vivian Foe - Football player (2003)
- Miklos Feher - Football player (2004)
- Gregory Mertens - Football Player (2015)
- Tim Nicot - Football Player (2015)

## Causes of Sudden Cardiac Death in Young Athletes

Causes of sudden cardiac death in young athletes can be classified into three main categories outlined in table 1 (3). The majority of these conditions, if detected, can be managed either by medications or interventions such as ablation, insertion of implantable cardioverter defibrillators (ICD), or surgery. Even abstinence from sports can save the lives of young athletes if the heart disease is detected early.



Structural Heart Diseases	Electrical Heart Diseases	Acquired
<ul style="list-style-type: none"> <li>• Hypertrophic cardiomyopathy</li> <li>• Congenital Coronary Artery Abnormalities</li> <li>• Arrhythmogenic right ventricular cardiomyopathy</li> <li>• Marfan syndrome</li> <li>• Mitral valve prolapse</li> <li>• Congenital heart disease</li> </ul>	<ul style="list-style-type: none"> <li>• Wolf Parkinson White Syndrome</li> <li>• Long QT syndrome</li> <li>• Brugada syndrome</li> </ul>	<ul style="list-style-type: none"> <li>• Infection (myocarditis)</li> <li>• Trauma (Comotio cordis)</li> <li>• Environment (hypothermia or hyperthermia)</li> </ul>

Table 1. Causes of sudden cardiac death in young athletes

## Can we prevent sudden cardiac death in young athletes?

Prevention of sudden cardiac death in young athletes is not an impossible mission! Prevention can be both primary and secondary. Primary prevention includes cardiac screening that aims at early detection of life threatening conditions in young athletes. There is a general agreement among major

scientific authorities on the importance of preparticipation cardiac screening of young athletes before enrollment in competitive sports and periodically thereafter; however the main debate is on the screening protocol (7). In this respect, the American Heart Association recommends 14 elements cardiac screening based on medical history and physical examination (8, 9, 10); these elements are outlined in table 2. This recommendation is adopted also by the American College of Sports Medicine (9).

Table 2. The 14 elements recommendations for cardiac screening of competitive athletes (10)

Medical History	
Personal History	<ol style="list-style-type: none"> <li>1. Chest Pain, discomfort, tightness or pressure related to exertion</li> <li>2. Unexplained syncope or near syncope (judged not to be neurocardiogenic or vasovagal)</li> <li>3. Excessive or unexplained dyspnea, fatigue or palpitations associated with exercise</li> <li>4. Prior recognition of a heart murmur</li> <li>5. Elevated systemic blood pressure</li> <li>6. Prior restriction from participation in sports</li> <li>7. Prior testing for the heart ordered by a physician</li> </ol>
Family History	<ol style="list-style-type: none"> <li>8. Premature death in one or more relatives ( sudden and unexpected, or otherwise) before age 50 years due to heart disease</li> <li>9. Disability from heart disease in a close relative &lt;50 years of age</li> <li>10. Specific knowledge of sudden cardiac conditions in family members including hypertrophic cardiomyopathy, dilated cardiomyopathy, long QT syndrome, other ion channelopathies, Marfan syndrome, clinically important arrhythmias</li> </ol>
Physical Examination	
Components of Physical Exam	<ol style="list-style-type: none"> <li>11. Heart murmur</li> <li>12. Femoral pulses</li> <li>13. Physical stigmata of Marfan Syndrome</li> <li>14. Brachial artery blood pressure</li> </ol>



On the other hand, the European Society of Cardiology (8, 9) recommends adding a routine electrocardiogram (EKG) to the history and physical examination based on the results of a national screening program in Italy that succeeded in decreasing sudden cardiac death by 89% through making preparticipation cardiac screening (medical history, physical examination and EKG) mandatory for all competitive athletes. The recommendations of the European Society of Cardiology are adopted by the International Olympic Committee and the Federation International De Football (FIFA) (9).

Thus, the debate is mainly whether to include EKG in the cardiac screening of young athletes or not. Opponents of adding the EKG to the cardiac screening criticized its high false positive rates and consequent increase in cost due to additional tests; however, many refinements of the EKG interpretation in young athletes were done over the last decades resulting in improving its specificity and decreasing its false positive rates and the need for additional tests (11). Several recent studies based on the refined criteria of EKG interpretation showed that the inclusion of an EKG in the preparticipation screening of young athletes improve the overall sensitivity of the cardiovascular screening and is cost-effective (4, 12).

Secondary prevention of sudden cardiac death is namely improving the chances of survival for victims of sudden cardiac arrest. This entails prompt recognition of sudden cardiac arrest, the presence of trained personnel to initiate cardiopulmonary resuscitation (CPR) and early access

to an automated external defibrillator (AED) (3). The availability of an emergency plan and the prompt use of defibrillation have been shown to improve the survival rates for victims of sudden cardiac arrest (7).

### Recommendations for preventing sudden cardiac death in young athletes in Lebanon

There is currently no law in Lebanon that mandates cardiac screening for young athletes! There is currently no law in Lebanon that mandates the availability of AED in sports facilities! It is the time to make a change and protect the lives of our young athletes! Box 2 outlines a few recommendations that might help in addressing the burden of sudden cardiac death among young athletes in the country and preventing it.

It is worth noting that several incidents of sudden cardiac death among young athletes happened during the last few years in Lebanon. One of these incidents resulted in the establishment of Champs Fund, a humanitarian fund that aims at preventing sudden cardiac death in young athletes. More details about Champs fund and its activities are highlighted in Box 3.



### Box 2. Recommendations to address the burden of sudden cardiac death among young athletes and prevent it in Lebanon:

- Raise the awareness of young athletes and other relevant stakeholders (ministries, sports clubs, schools, universities) regarding the risk of sudden cardiac death in young athletes and ways of prevention.
- Make preparticipation exam including the cardiac screening mandatory for all young athletes engaged in competitive sports (professional or school/university teams). The cardiac screening should include medical history, physical examination and EKG. The national school health program can be a good niche for the preparticipation cardiac screening of young athletes in schools.
- Make the presence of automated external defibrillators (AED) mandatory in all sports facilities in schools, universities, sports clubs and gyms.
- Make the certification in cardiopulmonary resuscitation (CPR) and use of AED mandatory for coaches and physical education teachers. This certification should be renewed periodically.
- Make reporting of sudden cardiac death in young people (aged 12 to 35 years) mandatory in Lebanon. This will allow better estimation of the burden of sudden cardiac death in young athletes in the country and will facilitate designing effective strategies to address this burden.



### Box 3. Champs Fund: The Hicham El Hage Program for Young Hearts & Athletes Health

Champs Fund was established in April 2014 in the department of family medicine at the American University of Beirut Medical Center. It is a humanitarian fund established in the memory of Hicham El Hage, a 15 year young athlete who collapsed on the football field while practicing with his school team on May 1, 2010. Hicham was found to have Hypertrophic Cardiomyopathy, where sudden cardiac death can be the first and only presentation!

Champs Fund aims at preventing sudden cardiac death in young athletes through raising awareness of the public regarding the cardiac risk in the young namely young athletes, advocating for mandatory cardiac screening of young athletes and ensuring the safety and preparedness of sports facilities for addressing any incident of sudden cardiac arrest.

The main activities of the Fund so far include:

- Provision of free cardiac screening for young athletes. Cardiac screening included a doctor's assessment, blood pressure measurement and electrocardiogram (EKG). Around 700 athletes were screened so far.
- Provision of certification in CPR and use of AED to coaches and physical education teachers in schools, universities and sports clubs in collaboration with the Life Support Center at the American University of Beirut Medical Center. Around 60 coaches and physical education teachers were trained so far and received a Heartsaver certificate from the American Heart Association valid for two years.
- Organizing several awareness sessions at multiple levels: public, decision makers, sports authorities and health professionals.
- Training a group of physicians in primary health care centers on conducting preparticipation examination and interpreting electrocardiogram (EKG) in young athletes.
- Launching a certification of "Heart Safe Youth Facilities", which aims at turning facilities where youth spend majority of their times safe for their hearts. These facilities include for example schools, universities, sports clubs etc.



No young athlete should die from an undiagnosed heart condition!

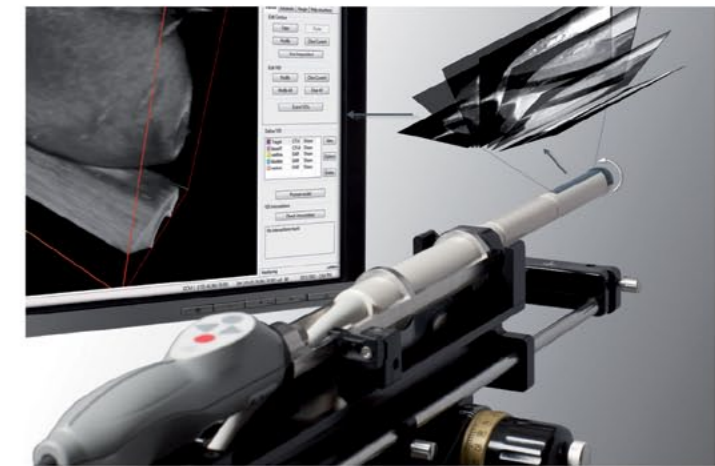
Screening of the heart may save young lives!



References

1. Montagnana M, Lippi G, Franchini M, Banfi G, Guidi GS. Sudden Cardiac Death in Young Athletes. *Internal Medicine* 2008; 47: 1373-1378.
2. Harmon K, Drezner J, Wilson M, Sharma S. Incidence of sudden cardiac death in athletes: a state-of-the-art review. *Br. J Sports Med* 2014; 48:1185-1192.
3. Chandra N, Bastianaen R, Papadakis M, Sharma S. Sudden Cardiac Death in Young Athletes: Practical Challenges and Diagnostic Dilemmas. *Journal of American College of Cardiology* 2013; 61(10): 1027-1040.
4. Wheeler MT, Heidenreich PA, Froelicher VF, Hlatky MA, Ashley EA. Cost-Effectiveness of Preparticipation Screening for Prevention of Sudden Cardiac Death in Young Athletes. *Ann. Intern. Med.* 2010; 152: 276-286.
5. Corrado D, Basso C, Rizzoli G, Schiavon M, Thiene G. Does sports activity enhance the risk of sudden death in adolescents and young adults? *J Am Coll Cardiol* 2003; 42:1959-63.
6. Pellicia A, Link M. Risk of sudden cardiac death in athletes. In: *UpToDate, Zimetbaum P, Manaker S (Ed), UpToDate, Waltham MA, 2014. www.uptodate.com.*
7. Corrado D, Drezner J, Basso C, Pellicia A, Thiene G. Strategies for the prevention of sudden cardiac death during sports. *European Journal of Cardiovascular Prevention & Rehabilitation* 2011; 18(2): 197-208.
8. Link M, Pellicia A. Screening to prevent sudden cardiac death in athletes. In: *UpToDate, Zimetbaum P, Manaker S (Ed), UpToDate, Waltham MA, 2014. www.uptodate.com*
9. Sharma S. Point/Mandatory ECG screening of young competitive athletes. *Heart Rhythm Society* 2012; 9: 1642-1645.
10. Maron BJ et al. Assessment of the 12-Lead ECG as a Screening Test for Detection of Cardiovascular Disease in Healthy 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: 1-33. Accessed from <https://circ.ahajournals.org/content/early/2014/09/15/CIR.0000000000000025>
11. Baggish AL. A decade of athlete ECG criteria: where we've come and where we're going. *Journal of Electrocardiology* 2015; 48(3): 324-328.
12. Baggish AL, Hutter AM Jr, Wang F, Yared K, Weiner RB, Kupperman E, Picard MH, Wood MJ. Cardiovascular screening in college athletes with and without electrocardiography: A cross-sectional study. *Ann Intern Med.* 2010 Mar 2; 152(5): 269-75.

# For Sale (Brand New)



## Low Dose Brachytherapy

- 1- Robotic delivery system Seed Selectron Nucletron: provides the physician with an automatic tool to compose a configuration of radioactive seeds and spacers under radiation protection and deliver this configuration into the selected needle implanted in the prostate. After delivery of the configuration in the selected needle, that needle is automatically extracted and the seeds and spacers remain accurately placed in the prostate, securing a high quality implant. The integration with the planning system enables the user to make adjustments of loading in accordance to clinical findings.
- 2- Robotic prostate seed treatment system Oncentra Nucletron including all functionalities for transversal and sagittal imaging, contouring, inverse planning and manual planning, plan evaluation, RTOG export, image fusion for seeds treatment planning and connection with Seed Selectron. Oncentra seeds enable the user to determine the optimal implant geometry, based upon live ultrasound information. It guides the user during the implantation of the treatment needles/seeds and performs the treatment planning, optimization and evaluation of the implant while the patient is still in the operating theater. More info on: <http://www.elekta.com/healthcare-professionals/products/elekta-brachytherapy/oncentra-brachy.html>
- 3- Integrated ultrasound system Prosius: upgrade Oncentra seeds & prostate with a specially developed ultrasound device for prostate brachytherapy, resulting in excellent image quality before, during, and after insertion of needles. The cart is equipped with ultrasound device integrated, biplane trans-rectal probe and software.”



For more info, kindly contact the procurement department at LAUMC-RH  
 Tell: 01 200 800 Ext: 5528 / 5028  
[purchasing@umcrh.com](mailto:purchasing@umcrh.com)