

Sudden Cardiac Death in Athletes: Protocols and Routines of Professional Soccer Clubs in São Paulo



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ABSTRACT

Sudden cardiac death in athletes is neither a new nor an isolated phenomenon. Historically, it mainly affects young athletes with a higher incidence as hypertrophic cardiomyopathy. In 2005, the Brazilian Society of Sports Medicine established the Guideline on Sudden Death in Exercise and Sports. The implementation of these recommendations by professional soccer clubs can contribute to early detection of risk and prevention of sudden cardiac death in these athletes. Objective: To identify the adoption of protocols and routines by professional soccer clubs concerning the pre-participation evaluation of athletes and their suitability to the Guideline. Method: All professional football clubs in São Paulo, members of the São Paulo Soccer Federation, were evaluated through interviews with the doctor in charge of the Medical Department of each club, after the project has been approved by the Ethics in Research Committee and the subject under research provided his authorization. The answers were submitted to descriptive statistics and compared with the Guideline. Results: No club fully adopts the tests suggested by the Guidelines; however, complete history and examination with focus on cardiovascular stress test and resting electrocardiogram are performed by all. Echocardiogram is performed by 82.5% of clubs. Conclusion: All clubs evaluated follow an institutional protocol that includes part of the recommendations of the Guideline. The integration between agencies responsible for sports in Brazil and private partnerships is suggested with the aim to reduce the effective cost of the examinations.

Keywords: soccer, cardiovascular diseases, physical exercises, physical examinations.

INTRODUCTION

Physical activity is a reflection of the health status and quality of life of a society. It may explain the difficulty of the public opinion in understanding sudden cardiac death in young athletes during sports practice, as consecutively occurred in the 2003 and 2004 years in national and international soccer fields⁽¹⁻⁴⁾.

When we try to establish a correlation between physical activity and sudden cardiac death in exercise and sports, we face a thought which can lead to prevention aspects associated to practice as well as to a warning about factors as real causes. Thus, physical exercise can be seen as a paradox^(1,3,5).

Regular and continuous physical activity practice provides a protective factor in primary and secondary prevention of coronary arterial disease due to progressive decrease of the atheromatous plaque, improvement of the lipid profile as well as reduction of pressoric levels. However, specific cardiac diseases may contribute to the onset of arrhythmias during exertion, a situation which is a contraindication to this activity^(3,6).

The association between unsuspected cardiovascular diseases and sudden cardiac death in athletes is not a coincidence. The probability substantially increases with the participation in competitive sports and the numbers reach up to 90% of the death episodes occurred during training or even during competition. Sudden cardiac death is not limited to competitive athletes and it spreads to non-athletes or recreational athletes^(4,7).

Sudden cardiac death in exercise and sports is defined by Oliveira and Leitão (2005) as "... death which occurred in an unexpected way, instantly or not, and/or death which occurs from six to 24 hours after practice of a sports physical activity"⁽⁸⁾. It may occur to individuals who present a structurally normal or physiopathologically altered heart and is mainly related to the onset of severe arrhythmias^(2,5,9).

It is estimated that in the United States its incidence is of 100 deaths per year, being hypertrophic cardiomyopathy its main cause. In Italy, the high indices are associated with right ventricle cardiomyopathies, while in Germany myocarditis responds for the majority of the cases, and in China, the Marfan Syndrome is highlighted⁽¹⁾. Brazil is scarce in epidemiological studies which characterize the prevalence of sudden cardiac death causes⁽⁵⁾. A study developed in the 70's revealed that the valvulopathies corresponded to 26% of the found pathologies⁽¹⁰⁾.

Prevalence of sudden cardiac death in young athletes is two times higher than in a non-athlete. Such fact occurs because during physical training morphological and functional adaptations which characterize the heart of an athlete are generated^(3,9,11-13).

These adaptations, in the great majority of the times, are reversible and benign, related to the sum of the alterations occurred by the exercise systematic repetition. These alterations result from an intrinsic body need derived from activities and dependent on the training volume and intensity, as well as frequency and years of practice^(3,9,11-13).

Field soccer is considered an intermittent exercise with few periods of static exercises (isometric) and many dynamic periods (isotonic), as well as periods of aerobic and anaerobic metabolism. Such fact leads the athlete to the development of both physiological alterations/adaptations imposed by these exercises during their career⁽¹⁴⁾.

These alterations/adaptations are expressed as development of cardiac concentric hypertrophy derived from the isometric and anaerobic physical exercise periods, and also from the onset of cardiac eccentric hypertrophy due to the isotonic and aerobic exercise moments. Therefore, a heart of a soccer athlete increases both in diameter of the atrial/ventricular cavities and in thickness of the cardiac wall^(3,7,13,15).

Corrado et al. (2005) observed that from the 49 cases found in their studies on sudden cardiac death, five involved soccer athletes.

Physiopathologically, among the mechanisms which can lead to activation of sudden cardiac death we can mention the immediate and important reduction of cardiac debt secondary to myocardial ischemia, onset of lethal arrhythmias and decrease of the cerebral blood flow with consequent loss of the conscience level⁽⁸⁾.

Corrado was a pioneer in conducting studies on sudden cardiac death involving athletes in the city of Veneto (Italy) in the beginning of the 70's. During 25 years, together with his collaborators, he developed research with the aim to identify the causal agents and its physiopathology, such findings were subsequently corroborated by further studies developed in many parts of the world^(9,16).

As a consequence of this research, the European Pre-Participation Protocol was designed, in which all athletes and non-athletes should be evaluated when engaging in a sports activity in order to early diagnose cardiac structural alterations which could end up in the onset of lethal arrhythmias and sudden cardiac death^(9,16).

In Brazil, until 2004, when the death of a soccer player took place during a match of the national championship, there were not expressive discussions on sudden cardiac death in athletes. After this episode, more emphasis on studies dealing with this problem can be observed.

In 2005, the Brazilian Society of Sports Medicine defined the Guideline on Sudden Cardiac Death in Exercise and Sports which classifies sudden cardiac death in athletes and suggests a pre-participation evaluation⁽¹⁷⁾. All athletes should be submitted to an evaluation to detect possible risk factors to the development of sudden cardiac death, as well as its prevention. This evaluation recommendation is in agreement with previous international protocols^(5,17).

The results presented here will be able to contribute as an alert to health professionals, sports authorities as well as athletes on the need to fully adopt the pre-participation evaluation and optimize the prevention on sudden cardiac death in athletes.

OBJECTIVE

The present study has as aim to identify the protocols and routines used by soccer clubs from the São Paulo city and metropolitan area, concerning prevention and identification

of underlying factors to sudden cardiac death in athletes and whether they fit in the recommendations of the Brazilian Society of Sports Medicine Guideline on Sudden Cardiac Death in Exercise and Sports.

METHOD

All professional soccer clubs from São Paulo city and metropolitan area, totalizing seven, were evaluated on the adoption of protocols and routines suggested by the Guideline of the Brazilian Society of Sports Medicine on Sudden Cardiac Death in Exercise and Sports, through interviews with the doctors responsible for the medical department of each club.

The research Project was approved by the Research Committee (CPq) and Ethics in Research Committee (CEP) of the São Camilo University Center under protocol number 144/06, according to the decree number 196/96 of the Ministry of Health.

The conditions "Professional soccer club from São Paulo" and "affiliated with the Soccer federation of São Paulo" were used as inclusion criteria in this study.

The data were recorded with the use of the Microsoft Origin program in descriptive statistics.

RESULTS

No club has refused to participate in the research; therefore, seven clubs were assessed according to the inclusion criteria adopted.

The ranking criteria from the Brazilian Historic Soccer of the Brazilian Soccer Confederation were followed where the soccer clubs assessed, once called D, E and G, are classified as big; club C as medium, and clubs A, B and F as small. This classification considers only competitions organized by the confederation itself and punctuates according to the participation of the clubs in annual competitions, giving more points to the team which are better ranked in the more important competitions⁽¹⁸⁾.

The mean of the number of athletes who compose the soccer clubs was of 33.3 ranging between 25 and 34 athletes per club. The small soccer clubs (A and B) present the same number of athletes as the big clubs (club D); both with 28 athletes, while clubs E and F are composed of 30 athletes each. Club C presents the lowest number of athletes, with a total of 25.

According to figure 1, when characterizing the soccer clubs concerning age of athletes, it is observed that the big clubs count with a higher number of athletes aged between 33 and 35 years. The soccer club D presents athletes aged between 18 and 34 years (mean of 26 years); club E aged between 17 and 35 years (mean of 26), and club G between 17 and 33 years (mean of 25).

The medium club (C) has athletes aged between 17 and 31 years (mean of 24).

Concerning the small clubs assessment, in club A ages range between 20 and 33 years (mean of 26.5), in club B between 17 and 34 (mean of 25.5) and, in club F, between 15 and 22 (mean of 18.5).

The composition of the professional health team of each club is described as follows in table 1:

The routine clinical examinations performed by all soccer clubs with all athletes are described in table 2 below:

Only soccer clubs A and B mentioned not to require the

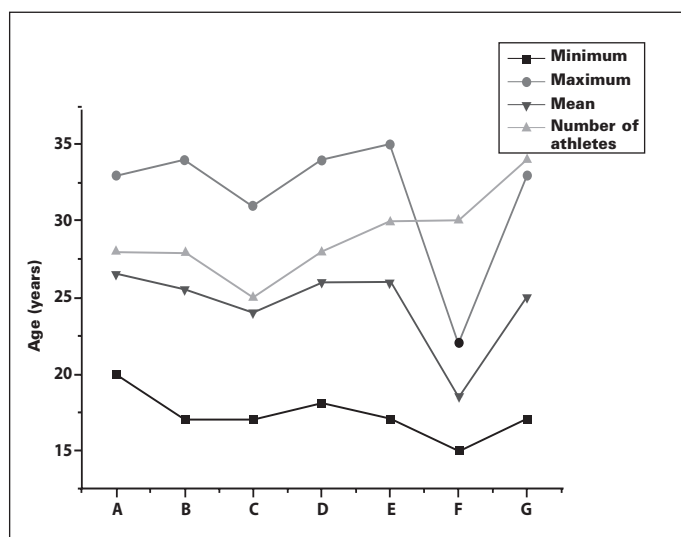


Figure 1. Distribution of the soccer clubs according to age and number of athletes. São Paulo, 2007.

Table 1. Composition of the professional health team of the soccer clubs of São Paulo - São Paulo - 2007.

Clb	Cardio	Spt Doc	Ort	N	N tech	Phyt	Physt	Nut	MasT	Phy Prep
A		x	x		x	X				
B	X	x			x	x				
C		x	x	X	x	x		x		
D		x	x		x	X	X			
E			x		x	X	X		x	x
F			x		x	X	X			x
G	x		x	x		X		x		
TT	2	4	6	2	6	7	3	2	1	2

Clb: clubs; Cardio: cardiologist; Spt Doc: sports medicine doctor; Ort: orthopedist; N: nurse; N tech: nursing technician; Phyt: physiotherapist; Physt: physiologist; Nut: nutritionist; Mas.T: massage therapist; Phy Prep: physical preparator; TT: total.

Table 2. Routine clinical examinations performed by the soccer clubs of São Paulo. São Paulo, 2007.

Exm/clb	A	B	C	D	E	F	G	Total
Anamnesis	Yes +	Yes +	Yes	Yes	Yes	Yes	Yes +	7
HMG	Yes +	Yes	Yes	Yes	Yes	Yes	Yes +	7
Hb Elect.	Yes +	Yes	No	No	Yes	No	Yes +	4
Sickl t.	No	Yes	No	No	Yes	Yes	Yes +	4
VDR/LFTA	No	Yes	No	Yes	Yes	No	Yes +	4
Chagas ds	No	Yes +	No	Yes	Yes	No	Yes +	4
ECG	Yes +	Yes	Yes	Yes	Yes	Yes	Yes+	7
ET	Yes +	Yes	Yes	Yes	Yes	Yes	Yes +	7
ECHO	Yes +	No	Yes	Yes	Yes	Yes	Yes +	6
Thorax XR	No	Yes	No	Yes	Yes	Yes	No	4
MC	No	No	No	No	Yes	No	Yes	2

Exm: exams; Clb: clubs; HMG: hemogram; Hb Elect: hemoglobin electrophoresis; Sickl t: sickling test; Chagas ds: Chagas disease; ECG: electrocardiogram; ET: ergometry test; ECHO: ehocardiogram; XR: X-Ray; MC: myocardial scintigraphy +: semestery periodicity.

previous medical history when players are borrowed or bought from another club.

All sport clubs state there has been detection of cardiac anomalies in the exam results of some soccer players. The adopted measure was the follow-up for confirmation of the pathology through performance of complementary examinations and later, adoption of suitable therapeutic procedures. After the treatment, the soccer player is reassessed in order to conclude whether he is apt again to participate in sports competitions or if his professional career will be ended.

DISCUSSION

Studies corroborate that several factors may contribute to cardiac alterations, such as age, sex, ethnic group and sports modality⁽⁹⁾.

Sudden cardiac death in athletes covers a wide age range, which goes from young athletes to individuals older than 35 years^(1,2,7-9,16).

In the present study, athletes' age ranged from 17 to 35 years, agreeing with the ages mentioned concerning onset of sudden cardiac death.

Age group is relevant concerning etiology of sudden cardiac death, where hypertrophic cardiomyopathy and the anomalous origin of the coronary artery are the most incident in the group with lower age, and the coronary arterial disease in the group of higher age^(1,2,6,8,9).

Considering that the assessed clubs have athletes at potential age for development of coronary arterial disease, exams which identify or diagnose alterations suggestive of onset of the disease should be performed.

It is observed that club F has younger athletes, since youth categories of a big club also evaluated in this research.

Although the Guideline of the Brazilian Society of Sports Medicine on Sudden Cardiac death does not suggest the composition of the health team, neither the medical specialties involved in the athletes' evaluation, it is believed that a multidisciplinary team may provide the player better quality in his evaluation through a holistic and contextualized approach in scientific data based on sports physiology.

The most frequent medical specialties observed in the present study were orthopedics and sports medicine.

Regardless of the medical specialty the soccer club chooses, this professional should be skilled in preventing specific diseases and sports lesions, treating and recovering, constantly reassessing the athlete until the beginning of the physical activities in a progressive and careful way⁽¹⁹⁾.

This professional, working with a multidisciplinary team composed of physiotherapists, physiologists, nurses, psychologists and nutritionists, will later on free the athlete to resume the physical training guided by physical preparators and, finally, to collective or individual training guided by the coach⁽¹⁹⁾.

Club C is the only which is in agreement with the regulation from the Nursing regional Board (COREN) – Law number 7.498, from June 25, 1986, which determines that the nursing technician can only perform his/her tasks under direct supervision of the nurses⁽²⁰⁾.

The exams suggested by the mentioned Guideline are: com-

plete anamnesis, with emphasis on the cardiovascular apparatus and past history of cardiovascular pathologies in the family; complete hemogram; hemoglobin electrophoresis; sickling test; VDRL/FTA-Abs; sorology for Chagas Disease; rest electrocardiogram; ergometry test; exercise cardiopulmonary test (ergospirometry); and echocardiogram. However, it was observed that no soccer club fully follows this recommendation.

All the studied clubs performed anamnesis, complete hemogram, rest electrocardiogram and ergometry test, which are simple and of low cost exams and can significantly contribute to the early identification of the risk factors involved with the development of sudden cardiac death.

Active search for information through complete anamnesis, focused mainly on the athlete's cardiovascular and family history is of great contribution to the team providing an evaluation perspective on occasional future alterations, which enables an early intervention with the aim to avoid or reduce damage caused by it. A physical exam focused on the same field, aids in the detection or conformation of cardiac anomalies^(3,8).

The Pre-Participation European Protocol proposed systematic evaluation of all athletes, with emphasis on the cardiovascular area, under the justification it identifies the risk of evolution to sudden cardiac death. Subsequently, the American Heart Association stated it would not fully adopt the protocol under the justification that it would have an effective cost too high and inefficient if implemented in an athletic population with considerable numbers^(2,9).

Specifically, the divergence occurs in the requirement of an echocardiogram and rest electrocardiogram during the pre-participation extended to all competitors. According to the American Heart Association the echocardiogram would not be mandatory to all competing athletes, and the cardiovascular history and rest electrocardiogram of the athlete would be sufficient. The echocardiogram should be required only when in the presence of alterations in the electrocardiogram or in cases of family history positive for cardiovascular events^(2,9,16).

Nevertheless, Corrado et al. (2005) and Maron et al. (2007) state that the evaluation based only on the anamnesis and on the physical exam is not sensitive enough to guarantee the detection of all cardiovascular anomalies linked to sudden cardiac death in athletes.

The present study identified that only club B did not perform the echocardiogram. It can be inferred that the high cost of the exam is a factor to be considered for the absence of this exam, since the club has 28 athletes and is classified as a small one, which results in a substantial cost to a club with probable restrict budget.

According to the Brazilian Society of Sports Medicine, despite the exams high cost, (especially the echocardiogram), they become justifiable when we analyse that late detection of alteration may lead to financial damage even higher, including with deaths^(8,17).

Other exams, such as hemoglobin electrophoresis and VDRL/FTA-Abs, are required by 57.2% of the clubs, which is maybe justified for being complementary to the hemogram.

Out of the assessed clubs, four performed sorology tests for Chagas Disease, a pathology responsible for myocardial com-

promising leading to cardiac hypertrophy and insufficiency. As commonly known, many players of the soccer clubs from São Paulo are from endemic areas of the Chagas Disease in Brazil and may have the disease early diagnosed.

Although the Guideline does not suggest the performance of thorax X-Ray, four clubs routinely do it. Such exam is simple, has effective cost relatively low and can be extended to all sports activities practitioners as an example of evaluation for the cardiac area.

It is interesting to observe that the same club (G) which does not require thorax X-ray annually performs myocardial scintigraphy in all its athletes. Such exam is less frequently required by the other clubs and is not mentioned in the recommendations of the Guideline.

Periodicity of the exams is not mentioned by any authors here or by the Guideline.

It is highlighted that, in case the players are borrowed or bought, in order to have a better continuous clinical evaluation, the hiring soccer clubs should require the medical history of the athlete. Although this information is relevant, 28.5% of the clubs do not follow this procedure. Additionally, there is a need of physical evaluations in the semestral championships off-season with the requirement of specific exams whenever necessary.

It is a fact that clubs with bigger infrastructure offer their players greater support, while smaller clubs cannot do the same.

Brazil counts with thousands of soccer clubs, including amateur clubs, which many times do not have the necessary physical infrastructure, organization or planning in the evaluation of their athletes.

However, the full implementation of all exams to all Brazilian soccer clubs, regardless of their size or professional status is important. Complete engagement will be only possible when the operational costs for their performance are decreased. The effort to decrease costs or sponsor them require integration between the Sports Federations, Brazilian Society of Sports Medicine, Ministry of Sports and private partnership, with the single aim of guarantying better quality in the pre-participation evaluation of all athletes.

CONCLUSION

None soccer club fully adopts the Guideline from the Brazilian Society of Sports Medicine. However, anamnesis, complete hemogram, rest electrocardiogram and ergometry test are performed by all, and, from identified alterations, further complementary exams can be required.

Some criticism is the non-observance of the routine lipid profile evaluation, considering that alterations in this variable contribute to the development of coronary artery disease and increase of risk of sudden cardiac death.

It is crucial that public-private ventures are adopted in order to reduce operational costs and facilitating the engagement to the Brazilian protocol as well as its extension to all clubs.

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