

## Are Trainers Prepared on Basic Life Support stages? Qualitative Survey of the Knowledge of Sports Club Coaches in Trieste on the Sudden Cardiac Death in Sport

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### Abstract

Cardiac arrest is the primary cause of sudden death among young athletes. The first ideal rescuer is the trainer, but he/she is often not aware of the emergency standard techniques to do. The aim is analysis of the knowledge of sport club coaches in Trieste about Sudden Cardiac Death and his early treatment.

The descriptive experimental study involved 125 coaches in Trieste, who had to complete an online form. 65% of those questioned do not hold a Basic Life Support (BLS) certification and 82% of cases trainers are not required to have a cardiopulmonary resuscitation certification. However, the emergency action plan in case of cardiac arrest is guaranteed 86% of cases when the trainer has a BLS certification. There is a remarkable gap between the presence of a primary rescuer during a competition and during trainings. Only 40% of those trainers identified correctly the most important component of the cardiopulmonary resuscitation. 57% trainers do not feel comfortable in doing a cardiac massage and between them 12 trainers declared to be already in possession of a certification.

The results emphasize several deficiencies in their formation, which go from the incorrect recognition of the phenomenon to the lack of awareness about the importance of the cardiac massage. It appeared that BLS certified trainers also have these deficiencies.

**Keywords:** Sudden death; Sport; Knowledge; Trainers; Evaluation

### Introduction

It is unfortunately quite common for athletes to suffer from cardiac arrest during sports competitions or sports training.

Sudden cardiac death is the most frequent medical cause of death in athletes aged between 12 and 35 years. [1] The precise incidence is not known but the majority of studies have constantly reported worldwide incidence rates between 1:40,000 and 1:80,000 athletes per year. [2] The Italian incidence, on the other hand, is 1.9 cases in

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50,000 athletes per year. [3] This difference is probably due to the distinct methods of measuring and ascertaining cases. Still other studies have compared the relative risk of sudden cardiac death, which is 2.5 to 4.5 times higher in athletes than in non-athletes of equal age. [4,5]

Arrest is mainly due to congenital or genetically mediated cardiovascular diseases such as hypertrophic cardiomyopathy, coronary artery anomalies, and arrhythmogenic cardiomyopathy, which can manifest with the worst prognosis after intense physical exercise. [6-8]

In order to identify these abnormalities, the Italian and European cardiovascular screening system was designed, which, contrary to the US one, combines the anamnesis and the objective examination with a 12-lead ECG, in addition to requiring mandatory annual medical authorisation for all competitive athletes. [8-10]

However, it is not always possible to detect these pathologies during the suitability screening and some cardiac arrests may occur without any prior warning signal. To be adequately prepared, over the last decade, the Italian rules of Health Protection of sports activities have focused on the distribution of defibrillators to sports clubs in order to ensure the safety of athletes by increasing the degree of preparation in the field of cardiopulmonary resuscitation (CPR). [11,12]

The ideal rescuer for the population at risk would be the trainer, who is present during both competition and training and has the opportunity to immediately initiate CPR. [13] However, little is known about the status of trainers' certification. [14]

For this reason, this study aims to shed light on the current knowledge of trainers in Trieste regarding BLS-D through five objectives:

1. Assessing the capacity for early recognition of the event and activation of the emergency response system
2. Assessing the ability to perform cardiac massage
3. Evaluating the application of a rapid defibrillation
4. Assessing trainers' knowledge of the pathology analysed
5. Evaluating trainers' preparation on high-quality early CPR

## Materials and Methods

The qualitative survey consisted in the construction of a questionnaire specifically designed for this study in collaboration with a Cardiologist and a Specialist in Sports Medicine. The administration of

the online questionnaire and the data collection were carried out between May and July 2020. In particular, the questionnaire was sent to the Presidents of sports clubs, who forwarded the link to their trainers, and they filled it out on a voluntary basis. Anonymity and confidentiality of the participants were guaranteed.

## Results

A total of 125 trainers from Trieste were enrolled in the study, of whom 76 (61%) were between 30 and 60 years of age, 36 (29%) were aged between 18 and 30, and 13 (10%) were over 60. 93 of the subjects (74%) are male and 32 (26%) are female.

In terms of educational qualification, 83 respondents (66%) have a high school diploma, 25 (20%) a university degree or a postgraduate degree, and 17 (14%) a middle school diploma.

As for the participants' profession, almost the entire sample (91%) works as a trainer only as a second job or out of mere passion.

Among the 125 trainers interviewed, 27 (22%) coach Italian football, 19 (15%) coach basketball, 19 (15%) coach athletics, 13 (10%) coach volleyball, 13 (10%) coach water polo, 10 (8%) coach rugby, 6 (5%) coach swimming, 6 (5%) coach skiing, 5 (4%) coach fencing, 3 (2%) coach handball, 2 (2%) coach modern pentathlon, 1 (1%) coaches rowing and 1 (1%) coaches karate.

41 respondents (33%) have been coaching for 1-5 years, 39 (31%) for 11-20 years, 29 (23%) for 6-10 years, 10 (8%) for 20-30 years, and 6 (5%) for more than 30 years.

The average age of the athletes coached by the sample population lies between 6 and 12 years in 35 cases (28%), between 13 and 15 in 31 cases (25%), between 16 and 19 in 27 cases (22%), between 19 and 25 in 26 cases (21%), and is represented in 6 cases by individuals over 25 (5%).

Only 44 trainers (35%) have a BLS-D certification; among these, 20 (45%) took the course less than 2 years ago and 24 (55%) indicated either a date older than two years or a surreal date. The course was attended mainly (58%) for personal needs and not during the coach training.

Data shows that only 7 Italian football trainers (26%), 5 basketball trainers (26%), 6 athletics trainers (32%), 8 volleyball trainers (62%), 6 water polo trainers (46%) and 1 rugby trainer (10%)

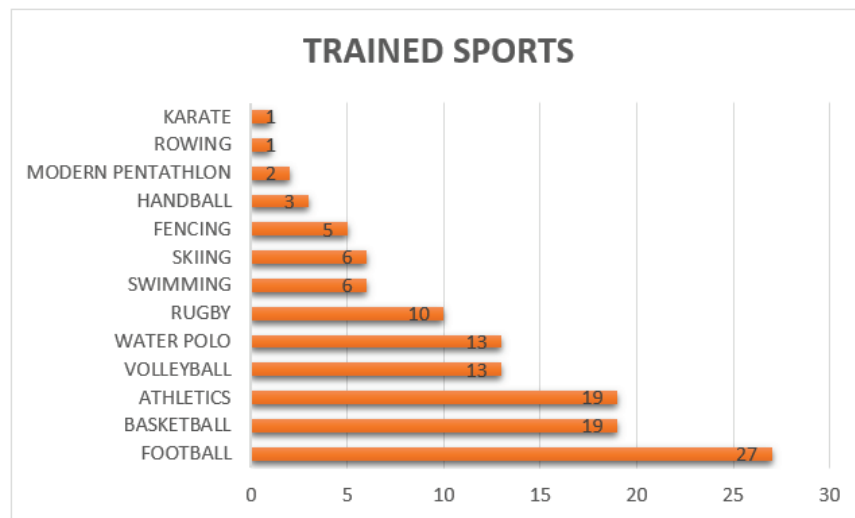


Figure 1: The 13 sports trained by the population under study.

have a BLS-D certification. Thus, among the most practiced and trained sports, the percentage of trainers with a certification never exceeds 50% except for volleyball ( $\text{Chi}^2= 27.749$ ,  $p\text{-value}= 0.023$ ).

Furthermore, only 23 respondents (18%) stated that the club requires trainers to be certified in CPR. Specifically, this was indicated by 2 of the Italian football trainers (7%), 5 of the basketball trainers (26%), 4 of the athletics trainers (21%), 5 of the volleyball trainers (39%), 2 of the water polo trainers (15%), 2 of the ski trainers (33%), 1 of the handball trainers (33%), 1 of the rowing trainers (100%), and 1 of the karate trainers (100%) ( $\text{Chi}^2= 26.451$ ,  $p\text{-value}= 0.033$ ).

Sport	Number of BLS certifications	Total trainers	%	Clubs requiring certified trainers	%
Football	7	27	25.9	2	7.4
Basketball	5	19	26.3	5	26.3
Athletics	6	19	31.6	4	21.1
Volleyball	8	13	61.5	5	38.5
Water polo	6	13	46.2	2	15.4
Rugby	1	10	10	0	0
Swimming	3	6	50	0	0
Skiing	4	6	66.7	2	33.3
Fencing	0	5	0	0	0
Handball	3	3	100	1	33.3

Modern Pentathlon	0	2	0	0	0
Rowing	1	1	100	1	100
Karate	0	1	0	1	100

Table 1: Comparison between sports and number of BLS certifications.

78 individuals (62%) stated at the same time that they had no certification and that the club did not require trainers to be certified.

51 people (41%) stated that there is no emergency action plan in case of cardiac arrest where they train. However, among the 102 cases in which the club does not require certification for trainers, an emergency action plan still exists in 52 cases (51%) ( $\text{Chi}^2= 13.712$ ,  $p\text{-value} < 0.001$ ). Additionally, the emergency plan is guaranteed in 38 cases (86%) when the trainer is BLS certified ( $\text{Chi}^2= 19.044$ ,  $p\text{-value} < 0.001$ ).

	No emergency action plan	Emergency action plan
Club does not require certification	50	52
Club requires certification	1	22
No BLS certification	45	36
BLS certification	6	38

Table 2: The presence of an emergency action plan in relation to the club's request for certified trainers and to the possession of a BLS certification.

92 trainers (74%) stated that a primary rescuer is always present during competition in case of cardiac arrest, and he/she is in 64 cases (67%) a doctor ( $\text{Chi}^2= 98.999$ ,  $p\text{-value} < 0.001$ ). On the other hand, only 40 trainers (32%) stated that a primary rescuer is always present during the training session, and he/she is represented in 22 cases (54%) by the trainer him/herself ( $\text{Chi}^2= 96.672$ ,  $p\text{-value} < 0.001$ ). Only 39 people (31%) stated that a primary rescuer is present both during the competition and during the entire training session ( $\text{Chi}^2= 4.371$ ,  $p\text{-value} = 0.037$ ).

Moreover, out of the 44 cases in which the trainer has a certification, coverage for CPR is also guaranteed in only 27 cases (61%) ( $\text{Chi}^2= 26.682$ ,  $p\text{-value} < 0.01$ ). Finally, among the 40 respondents who reported the presence of a primary rescuer during training, 9 (23%) coach individual sports and 31 (78%) coach team sports ( $\text{Chi}^2= 31.805$ ,  $p\text{-value} = 0.007$ ).

	No BLS certification	BLS certification
Rescuer not present during training	54	10
Rescuer present during training	13	27

**Table 3:** The possession of BLS certification in relation to the presence of a primary rescuer during training.

With regards to the perception of the time necessary for 112 to reach the sports field in case of an emergency, 42 participants (34%) answered 5-10 minutes, 38 (30%) 10-15 minutes, 31 (25%) more than 15 minutes and 12 (10%) less than 5 minutes.

63 respondents (50%) did not indicate properly the 3 main signs and symptoms of a peri-cardiac arrest situation. 54 trainers (43%) did not identify the right sequence of steps in the "Chain of Survival" and among them 9 people (17%) already had a BLS-D certification ( $\text{Chi}^2= 15.869$ ,  $p\text{-value} = 0.001$ ).

75 respondents (60%) did not recognise cardiac massage as the most important component of CPR and within this group, 16 subjects (21%) were already certified ( $\text{Chi}^2= 27.308$ ,  $p\text{-value} < 0.001$ ). 66 trainers (53%) did not know how to assess consciousness and 64 (51%) did not know which pulse is to be evaluated to determine absence of circulation.

On the other hand, 100 trainers (80%) correctly pointed out that external chest compressions are performed with the victim in the supine position.

37 participants (30%) knew that during chest compressions the hands should be placed on the lower half of the sternum and 31 (25%) knew that cardiac massage should be performed at a rate of 100-120 compressions per minute. Only 16 subjects (13%) correctly answered both questions ( $\text{Chi}^2= 29.292$ ,  $p\text{-value} = 0.001$ ). In addition, 69 respondents (55%) did not identify the correct ventilation/compression ratio when performing CPR. 85 respondents (68%) do not know that after about 10 minutes of cardiac arrest without CPR anoxic brain damage becomes irreversible. Among these 85 people, 23 (27%) already have a certification ( $\text{Chi}^2= 8.395$ ,  $p\text{-value} = 0.038$ ).

	No BLS certification	BLS certification
Awareness of anoxic brain damage after 10 minutes	19	21
Incorrect time indication of onset of anoxic brain damage	62	23

**Table 4:** Relationship between the time indication concerning the onset of anoxic brain damage and the possession of a BLS certification.

95 respondents (76%) know where the AED is located in the facility where they train and among these, 64 (67%) reported that the device is located at a distance of less than one minute.

Among the 44 trainers having a BLS-D certification, 41 (93%) stated that they know where the AED is located in the sports facility ( $\text{Chi}^2= 5.855$ ,  $p\text{-value} = 0.016$ ), while among the 40 trainers who reported the presence of a rescuer during training, 37 (93%) know where the AED is located ( $\text{Chi}^2= 10.464$ ,  $p\text{-value} = 0.001$ ). Only 26 respondents (21%) indicated simultaneously the possession of a BLS-D certification, the presence of a rescuer during training and the knowledge of the location of the AED.

In conclusion, 71 respondents (57%) do not feel confident in performing cardiac massage in case of an emergency. The main reasons are the following: fear of causing damage (35%), fear of legal repercussions (30%), tendency to panic in emergency situations (20%) or a combination of these factors (16%). Among the 44 trainers already certified, 12 (27%) do not feel confident in performing cardiac massage and the reasons are the same as those mentioned above ( $\text{Chi}^2= 22.305$ ,  $p\text{-value} < 0.001$ ). Conversely, 22

trainers (41%) among the 54 who stated that they feel confident in performing chest compressions do not have any certification.

	No BLS certification	BLS certification
Most important component: cardiac massage	22	28
Wrong component	59	16
Not feeling confident in chest compressions	59	12
Feeling confident in chest compressions	22	32

**Table 5:** Comparison of possession of a BLS certification with the right or wrong identification of the most important component of CPR and with the confidence in performing chest compressions.

123 trainers (98%) find it useful to include a BLS-D course during the coach training, and if there was a possibility to take the course for free, 98% would be willing to attend it. Only one respondent considers it useful to include the course within the training, although he would not attend it for free either ( $\text{Chi}^2 = 45.735$ ,  $p\text{-value} < 0.001$ ).

## Discussion

The ability of the study population to early recognise the event and activate the emergency response system is insufficient. In fact, considering all the questions asked to assess this aspect, 40% of the sample did not answer correctly at least once. More specifically, 43% of the respondents did not correctly identify the "Chain of Survival" sequence, of whom 17% already had a BLS-D certification ( $p\text{-value} = 0.001$ ).

53% of the trainers do not know how the assessment of consciousness should be carried out and 51% do not know which pulse is to be assessed to determine absence of circulation. While assessing consciousness is a relatively simple manoeuvre even for a lay rescuer, establishing the presence or absence of circulation is not. For this reason, the new AHA Guidelines recommend initiating CPR even if cardiac arrest is only presumed because the risk arising from not performing CPR on a pulseless victim outweighs the damage caused by unnecessary chest compressions. [15] The ability to perform cardiac massage was also found to be inadequate compared to the standards required to perform effective CPR.

The most striking figure is that 60% of the participants did not recognise cardiac massage as the most important component of CPR, of whom 21% were already certified ( $p\text{-value} < 0.001$ ). Only 13% of the sample correctly identified both the frequency of chest compressions and the position of the hands during external cardiac massage ( $p\text{-value} = 0.001$ ). Finally, 57% of the subjects surveyed do not feel confident in performing cardiac massage in case of emergency, and among these 17% were already certified ( $p\text{-value} < 0.001$ ). Fear of causing damage, legal repercussions and the tendency to panic in emergency situations are the three main obstacles faced by the lay public, and these are also confirmed by other studies. [16,17]

Regarding the application of a rapid defibrillation, 76% of the respondents stated that they know where the AED is located in the facility where they train, and among these 67% stated that the device is located at a distance of less than one minute; but 38% of the participants believe that defibrillation is performed before CPR. The AHA stresses the importance of an effective cardiopulmonary resuscitation followed by an early defibrillation, since the latter manoeuvre can be defined as the solving intervention of the arrhythmia that occurs. [15,18] Moreover, only 21% of the trainers stated at the same time that they have a BLS-D certification, that they know where the semi-automatic defibrillator is located and that a primary rescuer is always present during the training session.

The analysis of knowledge regarding the pathology analysed showed that the preparation of trainers is weak. In many cases within the array of incorrect answers there were people who already had a BLS-D certification. In fact, 50% of the respondents did not correctly indicate the main signs and symptoms of a pericardiac arrest situation and 68% do not know that after about 10 minutes of cardiac arrest without CPR, anoxic brain damage becomes irreversible. Among these people, 27% were already certified ( $p\text{-value} = 0.038$ ). Since 55% of the sample claimed that the emergency medical services reach the site of the emergency in more than 10 minutes, as also stated in the literature, it is evident that if external cardiac massage is not performed before the arrival of the medical staff, the possibility of permanent brain damage is very high. [19,20]

Finally, the results of this study coincide with those of other studies on the fact that the status of trainers' BLS-D certification is often unknown. [21]

65% of the respondents have no certification and in 82% of the cases the club does not require trainers to be certified in CPR. These findings are similar to the ones of the American study conducted by Harer et al. in Wisconsin. [14]

The emergency action plan in case of cardiac arrest, however, is guaranteed in 51% of the cases in which the club does not require trainers to be certified (p-value <0.001) and in 86% of the cases in which the trainer is certified in BLS (p-value <0.001). Moreover, when the trainer has the above-mentioned certification, in 61% of the cases there is coverage for CPR (p-value <0.001).

This means that by increasing the preparation of trainers and people involved in sports activities, the chances of survival of an athlete suffering a sudden cardiac arrest would increase. [13]

The results also show that there is a significant gap between the percentage of presence of a primary rescuer during competition and during training sessions (74% vs 32%). Only 31% of the sample stated that a primary rescuer is present both during competition and throughout the training session (p-value = 0.037).

In conclusion, team sports are more easily controlled from the point of view of the presence of a primary rescuer during training since athletes are all to be found in the sports facility in the same time slot as opposed to athletes of individual sports (p-value = 0.007).

### Research Limitations

The main limitation of the study lies in the sample representativeness since it is not possible to identify the exact number of trainers in Trieste and the population surveyed consists of trainers living in the same city and not across the whole country.

In addition, the COVID-19 emergency further circumscribed the administration of the questionnaire, which was carried out online, thus losing a share of older trainers not possessing an email account or a suitable device. Another limitation is represented by the lack of Italian and European studies concerning trainers' knowledge of BLS-D, which limited the accuracy of the questions presented in the questionnaire and the possibility to compare the results with realities different from ours.

To conclude, there is a bias in the compilation and interpretation of the questionnaire caused by some improper answers given by people who unwarrantedly answered after some filter questions,

even if it was not required by the option they indicated before, thus creating a mismatch in the information given.

### Conclusion

This study revealed several gaps in trainers' knowledge of CPR, ranging from misrecognition of the event to lack of awareness of the importance of cardiac massage. These knowledge gaps also belong to the share of the population that is already certified in BLS-D.

The study also shows that sports clubs should implement an emergency action plan in case of cardiac arrest, and that the trained sports instructor represents the ideal first rescuer for the population at risk as he/she can immediately initiate cardiac massage.

In order to improve training rates, it would be advisable to include a mandatory BLS-D course within the coach preparation and to increase the frequency of retraining of the course.

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