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Research Article

Automated External Defibrillator Availability and CPR Training among Police Officers in the Campania Region: a Comparison of conventional and Peer-Led Trainings

Maurizio Santomauro[1]*, Carla Riganti[2], Ciro Aiello[3], Mario Alberto Santomauro[1], Raffaele Giordano[1], Francesco Elia[4], Riccardo Franco[4], Mario Petretta[4] and Domenico Bonaduce[4]

[1]Department of Cardiovascular Emergency, Internal Medicine and Geriatric, Medical School, Federico II University of Naples, Italy

[2]General Direction, 2nd Medical School, Federico II University of Naples, Italy

[3]Clinic Center, Police Department, Naples, Italy

[4]Department of Translational Medical Sciences, Federico II University Naples, Italy

***Corresponding Author:** Maurizio Santomauro, Department of Cardiovascular Emergency, Internal Medicine, Geriatric, Medical School, Federico II University, Italy.

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Abstract

Theory: Survival rate after cardiac arrest strongly depends on the delay occurring from the beginning of Basic Life Support and Defibrillation (BLSD) and then Advanced Life Support (ALS). Providing more bystanders as first rescuer could improve survival after cardiac arrest on the territory.

Hypothesis: In this study we wanted to compare a peer to peer BLSD training to a professional BLSD training for police officers in the Campania region. Furthermore we matched in these two different trainings the skills maintained after one year.

Methods: In this retrospective study we evaluated the feasibility and efficacy of a peer to peer BLSD teaching compared to a professional teaching in the police officers. From 2013 to 2018 700 police officers (Group A) were trained in peer to peer while 620 police officers (Group B) were trained with traditional course.

Results: The results demonstrated that check for responsiveness percentage was 68.5% in Group A and 70.4% in the Group B; the calls to Emergency System 118 percentage was 88.5% in the Group A and 90.9% in the Group B; open the airway and giving breaths percentage was 52% in the Group A and 52,3% in the Group B; chest compressions percentage was 83.9% in the Group A and 86.4% in the Group B; correct use of AED percentage was 93.5% in the Group A and 92.4% in the Group B; the percentage of police officers that passed the questionnaire after the training was 63.2% in the Group A and 69.8% in the Group B (p 0.05).

Conclusion: The police officers that were trained by peer instructors showed comparable skills in BLSD for adult compared to those that were trained by professional instructors.

Keywords: Cardiac Arrest; Basic Life Support; Peer to Peer Education; Police Officers; Training

Theory

It has been widely demonstrated that bystanders' CPR improves survival rate of out of hospital cardiac arrest: for this reason, more bystanders should be trained to BLSD. To such extent BLSD training could be very challenging, especially if addressed at non medical population. Previous investigations in United States showed that police officers could be trained to use effectively AED and that police's AED programs are cost-effective [1,4]. In addition, many studies demonstrated that police officers equipped with AED within large metropolitan cities achieved a decrease of call-to-shock time provided by police officers as first responders and an increase in patient survival from out-of-hospital cardiac arrest [5,15]. Cardiac arrest is an important cause of death in the Italy. Although estimates of the annual number of sudden deaths due to out-of-hospital cardiac arrest vary widely, data from the Center for Disease Control and Prevention estimates that in the Italy approxi-

City or Region	Time	Population	CA in public (%)	Schockable Rhythm (%)	Bystanders BLS (%)	ROSC (%)	Survival (%)
Torino (16)	1992-1994	BW-OHCA	14	32	28	18	9.7
Mestre (17)	1996-1997	BW-OHCA	ND	73	40	33	13
Piacenza (18)	1999-2000	A-OHCA	13	24	ND	13	11
Brescia (19)	1997-2002	A-OHCA	14	30	21	10	4.4
Forlì (20)	1994-2005	BW-OHCA	26	38	ND	ND	15
Friuli Venezia Giulia (21)	1994 and 2003-2004	Non-EMS W-OHCA	23	20	25	27	10.3
Lombardia (22)	2000 and 2003	A-OHCA	25	14	22	24	3.4
Cernusco sul Naviglio (23)	2003-2004	S-OHCA	ND	14	22	24	3.4
Bologna (24)	2004-2007	AW-OHCA	80	33	50	34	10
Sorrento (25)	2007- 2017	BW-OHCA	36	31.1	16.7	22.4	8.6

Table 1: The main italian studies from '90 that investigate the outcome of out-of-hospital cardiac arrest with PAD programs.

CA: cardiac arrest; BLS: basic life support; ROSC: return of spontaneus circulation; BW-OHCA: bystander witnessed out-of-hospital cardiac arrest; PAD: public access to defibrillation; A-OHCA: all out-of-hospital cardiac arrest; Non-EMS W-OHCA: non emergency medical service witnessed out-of-hospital cardiac arrest; S-OHCA: out-of-hospital cardiac arrest with shockable rhythms; AW-OHCA: all witnessed out-of-hospital cardiac arrest.

mately 60.000 people die annually before reaching a hospital or in emergency room [15]. In particular in Campania Region the annual number of sudden deaths due to out-of-hospital cardiac arrest was estimated approximately at 5.500 people. The main Italian studies from '90 on outcome of out-of-hospital cardiac arrest showed an improvement of survival by the rise of bystanders' CPR [16,25] (Table 1).

Hypothesis

In this study we wanted to compare a peer to peer BLSD training to a professional BLSD training for police officers in the Campania region. Furthermore we matched in these two different trainings the skills maintained after one year.

Methods

In the years 2013-2018 in the Campania region we started a BLSD training program for police officers. We organized a total of 87 courses and compared peer to peer training to professional training on 1320 police officers (from 20 to 52 years old, 986 male and 334 female). The inclusion criteria were the willingness to participate to the study and informed consent was obtained. The police officers were divided in Group A (peer to peer training) and Group B (professional training). None of them were previously trained to BLSD, as confirmed by a questionnaire administered to the police officers before starting the course. In this questionnaire there were 20 questions about BLSD according to AHA and ILCOR Guidelines for CPR (2010) and to the AHA Guidelines update (2015) [26,27] and it was based on PROCES study [28]. Each question had four possible answers and only one of them was correct. We gave 1 point for each correct question and 0 point for each wrong question: the test was passed giving 16 correct answers. The questions evaluated included: recognition of unconsciousness, initial evaluation, ratio of compressions/ventilations, characteristics of effective compressions, opening the airway and giving breaths, recognizing the phone number of Emergency Medical System (EMS), following the common steps of AED use (Appendix). The potential peer-instructors were recruited from senior police officers. Ten senior police officers attended a two-day BLSD instructor's course at the Federico II University according to the AHA instructors course. The instructors of the professional group were recruited from cardiologists and anesthesiologists or from AHA certified BLSD instructors. The course was structured according to AHA and ILCOR guidelines [26,27] with video and skill training; at the end of the course we submitted to police officers the same questionnaire administered before starting the BLSD training. Then a final practical exam to assess the BLSD skills acquired by police officers was made by two blinded instructors. The skills evaluated were check for responsiveness, the calls to Emergency System 118, opening the airway and giving breaths (head tilt and chin lift, mouth to mouth breaths, mouth to mask breaths), chest compressions (correct hand posi-

tion, adequate depth, correct rate, complete chest recoil) and correct ad safety use of AED (proper placement of the AED electrode pads, recall when to press the shock button, don't touch the victim while the AED is analyzing the heart rhythm or delivering a shock) (Table 2). BLS skills were measured with the Q-CPR using Resusci Anne manikin (Laerdal Medical -Stavanger, Norway). Furthermore we used AED Phylips HS1 trainer model. After one year we organized a refresh BLSD training and we evaluated the skills maintained in Group A and Group B with using the questionnaire and the practical exam.

Check	Responsiveness or no movement
Call EMS	Calls 118 Get AED
Open airway	Head tilt-chin lift maneuver Place ear near the victim's mouth and nose
Giving breaths	Mouth-to-mouth breaths (2 breaths -1 second each)
Chest compression	Starts immediately Correct hands position Right compression frequency of 90-110 bpm Right compression depth (5 cm) Complete chest recoil Ensures continues effective chest compression (No brake of more than 10 s)
AED	Proper placement of the AED electrode pads Recall when to press the shock button Don't touch the victim while the AED is analyzing the heart rhythm or delivering a shock
Questionnaire	20 points

Table 2: BLSD skills evaluated.

Statistical analysis

The data were analyzed using a statistical software (SPSS for Windows, version 21, SPSS Inc, Chicago, IL). The results were expressed as mean+ SD or number of agents (%) as appropriate. Unpaired t-test was used to compared the continuous variables between Group A and Group B. P values was two sided with $P \leq 0.05$ considered to be statistically significant.

Results

The data demonstrated that the two groups were comparable for age, height, weight, gender (Table 3). The results were expressed in percentage of skills properly executed. Check responsiveness percentage was 68.5% in Group A and 70.4% in the Group B (ns); the percentage of calls to Emergency System 118 was 88.5% in the Group A and 90.9% in the Group B (ns); open the airway and giving breaths percentage was 52% in the Group A and 52.3% in the Group B (ns); chest compressions percentage was 83.9% in the Group A and 86.4% in the Group B(ns); the percentage of correct AED use was 93.5% in the Group A and 92.4% in the Group B (ns) (Figure 1). While before the course the percentage of police officers that passed the questionnaire was 30% in both groups, after the training the percentage was 63.2% in the Group A and 69.8% in the Group B (p 0.05) (Figure 1). After one year from the BLSD training course the results were similar in both group: in particular 70.9% in the Group A and 76.4% in the Group B (ns) adequately performed the chest compressions (Figure 2), the percentage of correct AED use was 80.5% in the Group A and 81.4% in the Group B (ns) (Figure 3) and the percentage of police officers that passed the questionnaire was 69.2% in the Group A and 75.5% in the Group B (ns) (Figure 4).

Characteristic value	Group A= 700	Group B= 620	p-
Age yr (SD)	38,8 + 9.8	40.9 + 9.1	ns
Height-cm (SD)	165,5 + 8.8	163 + 7.4	ns
Weight-kg (SD)	70.7 + 10.1	73.7 + 9.8	ns
Male Sex no (%)	535/700 (76,4)	451/620 (72,7)	ns

Table 3: Demographic data.

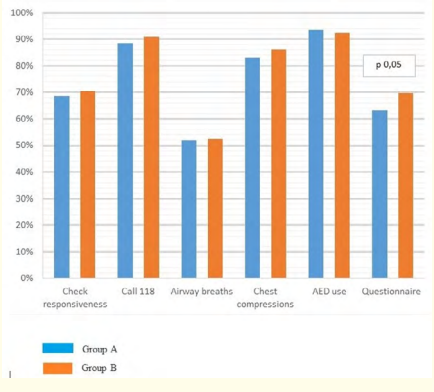

Figure 1: Percentage of skills properly executed after BLSD training.

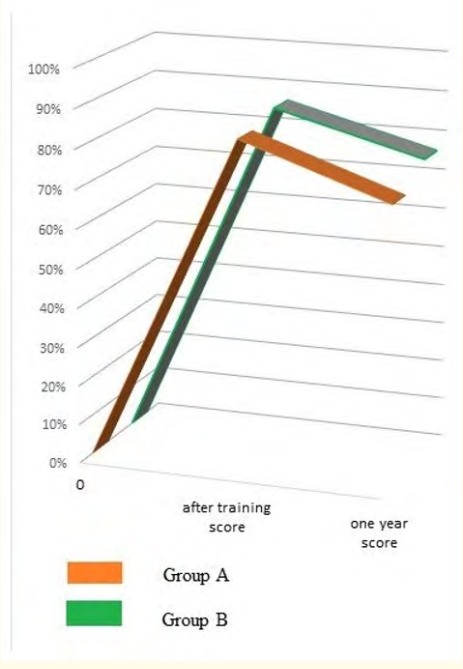

Figure 2: Chest compression.

Figure 3: Correct AED use.

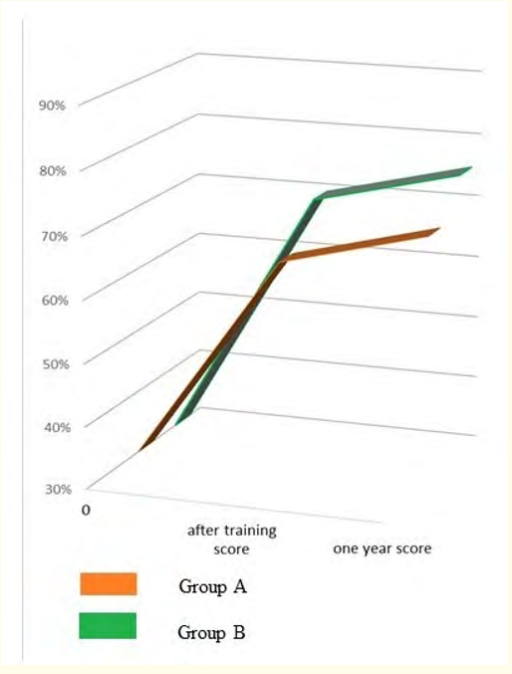

Figure 4: Questionnaire.

Discussion

Our study clearly showed that there were no difference in the quality of training between the two groups. The comparison between the groups for the single skill did not demonstrate any significant differences. But the only significant difference was how the course was perceived: police officers in Group A confirmed that they enjoyed the course and most of them would have to participate to the retraining course. In order to get the best and most effective compressions, the AHA and ILCOR recommends that the rescuers rotate every 2 minutes or at the end of every fifth CPR cycle [26]. At the 2015 Consensus Conference reached several conclusions about chest compressions and the of AHA and ILCOR 2015 new guidelines changed the steps of CPR from A-B-C (airway, breathing, circulation) to C-A-B (circulation, airway, breathing) [27]. The highest priority is to maintain circulation with high-quality chest compressions, then breathing and opening airway [29,31]. Furthermore compression-only (hand-only) CPR is recommended as the method of choice for the untrained rescuers because it is simpler to perform and it is easier to give instructions on the phone [26,27]. In adults with out-of-hospital cardiac arrest, compression-only CPR performed by the bystanders has a higher success rate than standard CPR. In our study opening the airway and giving breaths percentage maneuvers were low in both group. The fail-

ure to ventilate adequately is often caused by not maintaining an open airway. Regarding this maneuver Lester C., *et al.* [32] demonstrated with a questionnaire that the people expressed reluctance to resuscitate victims with unpleasant characteristics, like if vomit was present, if the casualty was dirty and if there was an unpleasant smell. Other deterrents mentioned were bleeding in or around the mouth, serious injuries, dangerous situation for the rescuer, HIV-positive status. In these situations the police officers can make compression-only CPR to alleviate the anxiety to perform ventilations. A key problem in learning and performing CPR is the loss of acquired knowledge over time. In fact in a study looking at the retention of CPR skills of successfully trained adults, after one year from the training course only 47% demonstrated correct hand placement on the manikin, 44% adequately performed the compressions depth and the compression rate was adequate in just 59% [30]. On the contrary another study demonstrated that in a group of secondary students the use of a song related to basic CPR was capable to reduce the loss of acquired theoretical knowledge compared to the traditional CPR training. Our study showed that after one year the BLSD skills were adequately performed whether by peer trained police officers or by professional trained police officers and the scores at the questionnaire were higher in both groups: this last finding probably was related to the refresh BLSD course. This result indicated the ability of peer instructor to teach effectively BLSD and that there were not necessary to organize a refresh course before one year from BLSD training. The recommendation for a defibrillation is one shock at a time for patients in a shockable rhythm. Today AEDs are easy to use and give clear and simple voice commands to guide the users. Furthermore police officers are not liable if someone die in Italy during a rescue. In fact first responders are immune from civil liability for any personal injury that results from act or omission in the use of the defibrillator in an emergency setting: they are protected under the license of the Medical Program Director, regional legislation, and the national Law [39].

Conclusion

This study demonstrated that a peer to peer BLSD training for police officers was feasible and could be as effective as a professional BLSD training. Peer education is an interesting concept for CPR training because it could improve the learning. Involving peers in the police officers' BLSD training could reduce the request of professional trainers. Police officers need to be convinced that aiding a victim in cardiac arrest is a worthwhile use of their time. Early defibrillation makes a profound difference between life and death. It aligns with the Police mission to protect and serve.

Conflict of Interest Statement

No conflict of interest was declared by the authors.

Financial Disclosure

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Appendix: Questionnaire

1. It is important to starting CPR in safety conditions?
2. Can the rescuers move the victim?
3. For checking responsiveness, the rescuers must ask how the victim is?
4. For checking responsiveness, can the rescuers shaking carefully the victim?
5. How long the checking of circulation signs?
6. Where is the correct position of AED?
7. It is correct to do CPR during the analysis of the heart rhythm by AED?
8. What is the correct position of AED electrodes?
9. During the AED heart rhythm analysis, what is the correct position of the rescuer?
10. When it is possible to use AED?
11. When it is possible to deliver a shock?
12. How to check circulation signs?
13. How to check breathing?
14. It is correct to attach the AED to a conscious person?
15. How does a defibrillator work?
16. What are the benefits of using an AED during a SCA?
17. Can a heart stop beating after an AED has got it beating again?
18. It is possible to shock a victim accidentally?
19. Why it is wrong to wait the arrive of EMS before starting BLSD?
20. What requiring the maintenance of AED?

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