KNOWLEDGE OF THE MILITARY FIRE BRIGADE ON CARDIOPULMONARY RESUSCITATION

CONHECIMENTO DO CORPO DE BOMBEIROS MILITAR SOBRE RESSUSCITAÇÃO CARDIOPULMONAR

CONOCIMIENTO DEL CUERPO DE BOMBEROS MILITAR SOBRE RUSUSCITACIÓN CARDIOPULMONAR

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ABSTRACT

Objective: to identify the knowledge of military firefighters on the maneuvers of cardiopulmonary resuscitation. **Method:** quantitative, descriptive and exploratory study. A questionnaire was administered to 41 professionals with questions regarding the conceptual and practical aspects of CRA according to the guidelines of the American Heart Association/2015. For the statistical analysis, the programs Stata 12.0 and WinPepi, version 11.43, were used. **Results:** male prevailed, mean age 35 years, with higher education and more than five years of experience. Regarding the conceptual aspects, only the definition of "Golden time" presented hits less than 50%. For the practical aspects, the variables on the posture and depth of the chest compressions were below 50% of hits. The association between age and the relationship between errors and correct answers to questions about practical aspects was statistically significant. **Conclusion:** it was revealed the need for qualification in search of excellence in the assistance to the victim of CRA due to its emergency nature. **Descriptors:** Cardiorespiratory Arrest; Cardiopulmonary Resuscitation; Emergencies; Lifeguards; Firefighters.

RESUMO

Objetivo: identificar o conhecimento de profissionais do corpo de bombeiros militar sobre as manobras de ressuscitação cardiopulmonar. **Método:** estudo quantitativo, descritivo e exploratório. Foi aplicado questionário em 41 profissionais com questões referentes aos aspectos conceituais e práticos sobre a PCR de acordo com as diretrizes da American Heart Association/2015. Para a análise estatística, foram utilizados os programas Stata 12.0 e WinPepi, versão 11.43. **Resultados:** prevaleceu o sexo masculino, idade média de 35 anos, com formação superior e mais de cinco anos de experiência. Sobre os aspectos conceituais, apenas a definição de "Tempo de ouro" apresentou acertos inferiores a 50%. Para os aspectos práticos, as variáveis sobre a postura e profundidade das compressões torácicas ficaram abaixo de 50% de acertos. A associação da idade e a relação entre erros e acertos das questões sobre os aspectos práticos foi estatisticamente significativa. **Conclusão:** revelou-se a necessidade de qualificação em busca da excelência no atendimento à vítima de PCR dada a sua natureza emergencial. **Descritores:** Parada Cardiorrespiratória; Ressuscitação Cardiopulmonar; Emergências; Socorristas; Bombeiros.

RESUMEN

Objetivo: identificar el conocimiento de profesionales del cuerpo de bomberos militares sobre las maniobras de resucitación cardiopulmonar. **Método:** estudio cuantitativo, descriptivo y exploratorio. Se aplicó cuestionario en 41 profesionales con cuestiones referentes a los aspectos conceptuales y prácticos sobre la PCR de acuerdo con las directrices de la American Heart Association / 2015. Para el análisis estadístico, se utilizaron los programas Stata 12.0 y WinPepi, versión 11.43. **Resultados:** prevaleció el sexo masculino, edad media de 35 años, con formación superior y más de cinco años de experiencia. Sobre los aspectos conceptuales, sólo la definición de "Tiempo de oro" presentó aciertos inferiores al 50%. Para los aspectos prácticos, las variables sobre la postura y profundidad de las compresiones torácicas quedaron por debajo del 50% de aciertos. La asociación de la edad y la relación entre errores y aciertos de las cuestiones sobre los aspectos prácticos fue estadísticamente significativa. **Conclusión:** se reveló la necesidad de calificación en busca de la excelencia en la atención a la víctima de PCR dada la su naturaleza de emergencia. **Descriptores:** Parada Cardiorrespiratoria; Resucitación Cardiopulmonar; Emergencias; Socorristas; Bomberos.

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INTRODUCTION

Cardiovascular Diseases (CVD) are the leading causes of death in the world. In 2012, about 17.5 million people died from CVD representing 31% of all deaths globally.¹ In the State of Bahia, these diseases accounted for 19,619 deaths (24.42%). More specifically, in the city of Juazeiro, 241 deaths (20.77%), related to diseases of the circulatory system in 2012.²

Cardiorespiratory arrest (CRA) is the most serious consequence of CVD, defined as the sudden interruption of systemic circulation, mechanical ventricular and ventilatory activity in individuals with no expectation of death at that time, not suffering from chronic disease or without a cure.^{3,4}

In the case of CRA victims, early care with immediate cardiopulmonary resuscitation (CPR) contributes considerably to the increase in survival rates, requiring health professionals, rescuers and lay people to have minimal knowledge in reversing the condition.⁵ A survey carried out in Amsterdam, The Netherlands, concluded that these first-aiders with CPR training, that includes chest compressions and ventilation, can perform CPR effectively.⁶

In Brazil, Pre-Hospital Care (PHC) before a CRA can be performed in two ways: through the Basic Life Support (BLS) with execution of the primary care sequence during the initial minutes of an occurrence; and the Advanced Life Support (ALS) with the continuity of care is done by the Emergency Medical Care Service (EMCS) performed exclusively by doctors and nurses.⁷

The professionals of the Military Fire Brigade (MFB) carry out the SBV, which, being CPR, one of their duties. However, the care does not involve invasive maneuvers for the preservation of life, being this care under the responsibility of EMCS.⁷

Given the relevance and magnitude of CVD and its potential complications, knowledge about proper conduction in CRA situations becomes an essential tool for MFB professionals. In addition, data that involve this theme can help the institutional bodies responsible in the process of training/updating their teams.

OBJECTIVE

To identify the knowledge of military firefighters' personnel about cardiopulmonary resuscitation maneuvers.

METHOD

A quantitative, descriptive and exploratory study that occurred from December 2015 to February 2016. The sample was of a non-probabilistic type, made up of 41 professionals from the headquarters of the 9th Military Fire Brigade Group (MFBG), and with operators from the Integrated Center (CICOM), both located in the city of Juazeiro, BA, Brazil. Firefighters operating as CICOM operators are responsible for managing incidents arising from number 193, through instructions from those requiring telephone guidance, within the competencies of the profession.

The following inclusion criteria were used: to be characterized as a professional member of the operational framework of the MFB and CICOM corporation, of both sexes, who accepted to participate in the study by signing the Free and Informed Consent Term (TCLE). Those professionals who performed exclusively administrative activities or who were away from the activities due to holidays and/or leave.

For the data collection, a self-administered questionnaire containing sociodemographic information and objective questions about the subject in question was used. The variables of interest were: 1) Information related to the professional - sex, age, schooling, training time and participation in training/training on CRA care; 2) Questions related to the conceptual and practical aspects that involve a CRA in BLS based on the American Heart Association/2015 guidelines on how to identify a CRA, conduct after CRA identification, definition of "Golden time", correct sequence of maneuvers CPR, BLS actions during CRA, adequate maneuvering of patient ventilation, adequate posture during chest compression, minimum depth during chest compression, and thoracic compression/ventilation by a single rescuer.

The results were processed and analyzed in a descriptive way by double entry. Categorical data were presented in absolute and relative frequencies and the association was verified using Fisher's exact parametric test, with a significance level of 5%. The confidence interval (95% CI) was calculated for the proportions assuming binomial distribution. For the statistical analysis, the programs Stata 12.0 and WinPepi, version 11.43.

The research began after the approval of the Committee of Ethics in Research with Human Beings of the University of Pernambuco, CAAE No. 49345215.9.0000.5207, obeying the ethical aspects determined by

Resolution No. 466, of December 12, 2012, of the Council National Health.⁸

RESULTS

Of the total of 49 professionals who are part of the corporation based on the established criteria, 41 individuals participated, of which the male sex was prevalent (70.7%). The mean age of participants was 35 years, with a predominant

age range of 26-30 years. The majority of the sample had a complete upper level (56.1%) and claimed to have more than five years of training in the corporation (70.7%). Regarding the participation of training in CPR, the responses were as follows: 38 affirmed yes (92.7%), two answered no (4.9%) and one did not respond. The sociodemographic characterization of professionals can be observed in table 1.

Table 1. Sociodemographic characterization of professionals of the Military Fire Brigade. Juazeiro (BA), Brazil, 2016.

Variables	n(41)	%
Sex		
Male	29	70.7
Female	12	29.3
Age		
26 to 30	11	26.8
36 to40	9	22
31 to 35	7	17.1
46 to 50	6	14.6
20 to 25	4	9.8
41 to 45	4	9.8
Education		
Highschool	6	14.6
Incomplete higher education	12	29.3
Complete higher education	23	56.1
Training time at the corporation		
< 1 year	2	4.9
1 to 5 years	10	24.4
> 5 years	29	70.7

The distribution of MFB professionals' responses on the conceptual aspects related to CRP and CPR is described in table 2. The majority (70.7%) of the participants stated that the defining characteristics of a CRA were: lack of awareness, respiratory movements and of the central pulse. Regarding the proper conduct after the identification of a CRA, 61% of the sample

referred as primary conduct call for help. For 48.8% of professionals, "Golden Time" was defined as the time of four minutes between the identification of the CRA and the beginning of the CPR maneuvers. On the correct sequence of the CPR maneuvers, the majority (53.7%) answered CAB: compressions, airways and breathing (breathing).

Table 2. Responses of professionals of the Military Fire Brigade on conceptual aspects related to CRP and CPR. Juazeiro (BA), Brazil, 2016.

Variables - Conceptual aspects	n (41)	%	IC (95%)
How to identify a PCR			
Absence of consciousness, respiratory and central pulse movements	29	70,7	54,46 - 83,87
Absence of peripheral pulse and respiratory movements	8	19,5	08,82 - 34,87
Absence of consciousness and breathing movements	3	7,3	01,54 - 19,92
Other Answer *	1	2,4	00,06 - 12,86
Conduct after PCR identification			
Call for Help	25	61	44,50 - 75,80
Open airways	11	26,8	14,22 - 42,84
Placing the victim in the supine position	5	12,2	04,08 - 26,20
Definition of "Golden time"			
Time between PCR identification and beginning of CPR maneuvers: 4 minutes	20	48,8	32,88 - 64,87
Time between PCR identification and onset of CPR maneuvers: 5 minutes	12	29,3	16,13 - 45,54
PCR Detection Time: 10 minutes	5	12,2	04,08 - 26,20
Time between the start of the emergency and the arrival at the reference hospital: 8 minutes	1	2,4	00,06 - 12,86
Do not know	3	7,3	01,54 - 19,92
Correct sequence of CPR maneuvers			
CAB	22	53,7	37,42 - 69,34
ABCDE	7	17,1	07,15 - 32,06
A B C D	6	14,6	05,57 - 29,17
ABC	4	9,8	02,72 - 23,13
None of the previous	2	4,9	00,60 - 16,53

* absence of carotid pulse and respiratory movements without absence of consciousness.

** Confidence Interval of 95% for the proportion assuming the binomial distribution.

The distribution of the participants' responses on the practical aspects related to CRA and CPR is described in table 3. 87.8% of the sample stated that the actions of BLS during the occurrence of a CRA would be: recognition of CRA, chest compressions, opening airway obstruction, artificial ventilation and defibrillation. Regarding the ventilation maneuver of the patient during a CRA, 95.1% of the professionals answered that the use of the manual resuscitator (AMBU®), with an oxygen enriched mask, would be adequate. With regard to the proper posture assumed during the chest compression, two responses had equal percentages of 48.8%, namely: trunk above the patient's body, with arms forming an angle of 90° in relation to the thorax, keeping the elbows extended and trunk at the same time. keeping the elbows extended. Regarding the minimum depth applied during chest compression, 43.9% of the participants stated five centimeters. The thoracic/ventilation ratio of 30/2 was reported by 73.2% of the sample.

Table 3. Responses of professionals of the Military Fire Brigade on practical aspects related to CRA and CPR. Juazeiro (BA), Brazil, 2016.

Variables - Practical aspects	n (41)	%	IC (95%)
Actions of BLS during CRA			
Recognition of CRP. chest compressions. airway opening. artificial ventilation and defibrillation	36	87.8	73.80 - 95.92
Opening of the airways and artificial ventilation	5	12.2	04.08 - 26.20
Adequate patient ventilation maneuver			
Manual resuscitator (AMBU®) with oxygen-enriched mask	39	95.1	79.29 - 99.74
Mouth to mouth resuscitation	2	4.9	00.26 - 20.71
Proper posture during chest compression			
Upper body above patient's body. with arms at 90 ° angle with chest. keeping elbows extended	20	48.8	28.63 - 69.22
Upper body next to patient's body while keeping elbows extended	20	48.8	28.63 - 69.22
Upper body above patient's body. with arms forming a 45° angle with thorax. keeping elbows flexed	1	2.4	00.01 - 16.77
Minimum depth during chest compression			
5 centimeters	18	43.9	24.46 - 64.78
4 centimeters	12	29.3	13.08 - 50.38
4.5 centimeters	5	12.2	02.73 - 30.83
6 centimeters	1	2.4	00.01 - 16.77
Do not know	5	12.2	02.73 - 30.83
Relation Thoracic Compression/Single-Rescue Ventilation			
30/2	30	73.2	52.19 - 88.63
15/2	5	12.2	02.73 - 30.83
100/2	4	9.8	01.69 - 27.64
5/2	1	2.4	00.01 - 16.77
Do not know	1	2.4	00.01 - 16.77

** Confidence Interval of 95% for proportion assuming the binomial distribution.

Table 4 describes the association between sociodemographic/professional variables and the knowledge of the conceptual/practical aspects of the Military Fire Brigade professionals on CRP and CPR. The association between age and the relationship between errors and correct answers to the practical aspects of CRP was statistically significant using Fisher's Exact test.

Table 4. Association between sociodemographic/professional characteristics and knowledge of the conceptual/practical aspects of the Military Fire Brigade professionals on CRP and CPR. Juazeiro (BA), Brazil, 2016.

Variables	Conceptual aspects					Practical aspects				
	Right		Wrong		p value*	Right		Wrong		p value*
	N	%	N	%		N	%	N	%	
Sex										
F	4	50.00	8	24.24	0.202	1	14.29	11	32.35	0.651
M	4	50.00	25	75.76		6	85.71	23	67.67	
Age										
20-30	3	37.50	12	36.36	1.000	6	85.71	9	26.47	0.016
31 to 40	3	37.50	13	39.39		1	14.29	15	44.12	
41-50	2	25.00	8	24.24		0	0.00	10	29.41	
Education										
Full-time	1	12.50	5	15.15	1.000	--	--	6	17.65	0.244
Incomplete	2	25.00	10	30.30		4	57.14	8	23.53	
Suppository										
Sup. Complete	5	62.50	18	54.55		3	42.86	20	58.82	
Training time										
Less than 1 year	--	--	2	6.06	0.776	1	14.29	1	2.94	0.112
1 to 5 years	1	12.50	9	27.27		3	42.86	7	20.59	
More than 5 years	7	87.50	22	66.67		3	42.86	26	76.47	
Participation in training										
Yes	8	100.00	30	93.75	1.000	6	100.00	32	94.12	1.000
No	--	--	2	6.25		--	--	2	5.88	

* Fisher's Exact Test

DISCUSSION

Knowledge about the technical-scientific knowledge and provenance of the victims of CRA should be investigated, serving as a

parameter for effective actions and behaviors in care.⁹

According to the objective of this research, the sample was characterized in the sociodemographic information, being predominant the male sex in the corporation. This result can be explained by the fact that the presence of women in public security institutions in Brazil is a recent event (1970s), a period of incorporation of women into the Military Police personnel.¹⁰ The presence of women in the Brazilian Armed Forces is growing. Currently, there are 22,208 military personnel, representing 34% of the country's total military personnel. This growth was facilitated by changes in the system of entry into military careers.¹¹

The age group of the sample represents a portion of the population considered productive. This characteristic is due to the necessary requirements to develop the work activities within the corporation, where the physical effort is constant in the attendance of the occurrences.¹² The association of age and the relation between errors and the correct answers to the questions about the practical aspects of a CRA were significant, where the number of answers considered wrong exceeded the correct answers in all age groups.

Schooling is considered an indicator of the economic and social development of developing countries.¹³ The majority of the participants of this research with higher education and, with minimum requirement of average level to enter the corporation, can be affirmed that these have the necessary characteristics to develop a scientific and critical thinking about their activities.

The importance of the level of schooling of groups that perform activities in the military area was observed in a survey conducted with military police in the Federal District. The idea was that, because these professionals perform functions with a high degree of discretion, the ideal is to have police officers highly educated.¹⁴

For the professional who works in the care of victims of CRA, knowing the defining signs of this condition is fundamental since the maneuvers must be performed with quality and timeliness.¹⁵ In this research, most of the corporation claimed to have participated in training and training involving the theme in question. However, when this variable was associated with the type of response (right or wrong), the number of wrong answers proved to be prevalent for both conceptual and practical aspects.

Although 70.7% of the participants in this study had more than five years of training in the Fire Brigade, responses regarding both conceptual and practical aspects, of CRA presented significant variations.

Regarding the correct identification of a CRA, although most have answered correctly, the other answers represent a worrying fact evidencing the need for leveling of the entire team.

The clinical diagnosis of cerebral cardiorespiratory arrest is defined by the abrupt cessation of circulatory, respiratory and cerebral functions. It is characterized, generally, by the set of signs: absence of central pulse, spontaneous or gasping type ventilation and unconsciousness due to sudden deficiency in cerebral tissue oxygenation. It is worth noting that the pulse verification time at this moment must be between at least five seconds and at most ten seconds in order not to aggravate the situation of collapse.¹⁶⁻⁷

After the diagnosis of CRA, the appropriate course of action is to call for help by triggering the emergency service, requesting the automatic external defibrillator (AED), avoiding the fatigue of the rescuer until the arrival of the ALS for the implementation of invasive procedures of advanced airway and venous puncture.¹⁸ In this variable, the responses referred to in this study corroborate, for the most part, the orientations of the guidelines cited in this research.

Another variable addressed in this research was the "Golden Time". For the majority of the interviewees, the responses were consistent with the current literature, defined as: early detection of cardiopulmonary collapse, activation of the emergency medical service and intervention within four minutes with high quality CPR, increasing the chances of spontaneous circulation return (SCR).⁵ However, among the other responses on this variable, some participants stated that the "Golden Time" would be the CRA detection time in ten minutes, the consequences of which are aggravated the longer the duration of time. After five minutes without care, there is already a risk of neurological damage; with eight minutes, the deficit is already installed and in ten minutes, brain death is confirmed.¹⁹

With respect to knowledge about the correct sequence of maneuvers recommended in a CPR, most respondents responded correctly. The early implementation of CPR maneuvers occurs through a maneuvering sequence known as CAB mnemonic: compressions, airway and breathing. It

comprises the first three links of the survival chain in extra-hospital CRP and aims at prioritizing the circulation by keeping arterial blood flow oxygenated to vital organs, especially the brain and heart, minimizing disruption. This is because, in a sudden CRA, arterial oxygen content is adequate at the time of collapse, taking a few minutes to reach a critical level of hypoxemia.^{5,17}

Nevertheless, on this variable, some participants answered other sequences like ABCDE and ABCD. They are believed to have responded to these sequences by resembling guidelines used to treat trauma victims.²⁰

The SBV is defined as the systematized steps of the care that can be performed before an non-hospital environment CRA (NHCRA) by lay people under guidance, trained rescuers and/or health professionals, increasing the chances of survival and reducing the risks of sequels. They comprise the first three links of the survival chain: 1 - Recognition and activation of the emergency medical service; 2 - High quality immediate CPR and 3 - Rapid defibrillation. This chain has been updated with regard to differences in intra- and extra-hospital care.^{17,21}

Regarding the practical aspects in the care of the professional of the Fire Department, when asked about the actions of BLS for victims of CRA, most of the sample responded correctly: CRA recognition, chest compressions, opening of the airways, artificial ventilation followed by defibrillation.¹⁷ An issue that must be addressed in this context is the defibrillation procedure. The defibrillator has an important role in NHCRA since 85% of the heart rhythms detected in these cases are ventricular fibrillation (VF) and ventricular tachycardia (VT) without pulse, both considered shocking rhythms. Thus, the rapid and effective implementation of CPR techniques, along with early defibrillation, corresponds to the recommended treatment.²²

The equipment used in the prehospital environment to perform cardiac rhythm readings, indicating whether or not the shock is applied, is the Automatic External Defibrillator (AED).^{17,22} Therefore, it is important that the MFB professionals know the operation and handling of the AED and that it be present in the vehicles that provide BLS. The opening of the airway should only be performed after a cycle of 30 high-quality chest compressions.³

The variable on the adequate maneuvering of patient ventilation during a PCR had the most prevalent response to use the manual resuscitator (AMBU®) with oxygen-enriched

mask. Although there are other devices for this purpose, besides allowing efficient oxygenation of the victim, the protection of the rescuer against contact with fluids and secretions such as facial tissue with anti-flow valve and pocket-mask, the manual resuscitator bag-valve-mask better known as AMBU®, is the most used.²³

The risk of contamination from performing mouth-to-mouth ventilation is considered minimal, however, existing. Thus, the rescuer is instructed to use barrier mechanisms at the time of the procedure, performing two ventilations that promote chest elevation after the initial compressions.⁵

Regarding the proper posture during chest compression, there were variations in the responses regarding the positioning of the rescuer's body, as well as the angulation of the arms. However, the correct answer, which ensures a high-quality maneuver, is to keep the rescuer's trunk above the patient's body with arms at a 90 degree angle to the patient's chest and to keep the elbows extended.²⁴

Thoracic compression consists of the rhythmic application of pressure on the associated thorax at a velocity of 100 to 120/min, guaranteeing a blood flow to noble organs, and the carotid flow can reach up to 30% of normal. In this way, the rescuers should position themselves next to the victim with the trunk above the patient's body, hypothenar region of the hands on the intermamillary line, arms extended, forming an angle of 90°. ^{5,17,25}

Still on the practical aspects during a CRA, the minimum depth during the chest compression was another variable investigated in this research. The most prevalent responses were in accordance with current guidelines of five centimeters, not exceeding six centimeters. This parameter must be added to the total chest return, thus avoiding an excess of inefficient compressions that do not generate satisfactory blood flow.^{24,26} Within this context, it is recognized the difficulty of judging the limit compression depth without the use of devices such as the metronome. However, the main objective in seeking this control in the depth of the maneuver would be to avoid the occurrence of non-life-threatening injuries such as rib fractures.²⁷

During the CPR maneuvers, the compression/ventilation ratio is essential, providing a systematic and quality care. Most of the sample from this study responded correctly about this ratio, when performed by a single rescuer, who would be 30/2. This relationship prioritizes the systematic

application of BLS actions by means of 30 high quality early compressions followed by two ventilations.²⁸

Given the results, it can be inferred that the implications of this study are relevant, with data that configure the local scenario, which may help in the development of other research involving this population group in other locations. However, some limitations should be mentioned, such as the fact that the instrument used was not validated, few publications related to the topic with this group, and the research was carried out with a specific sample of a region of the interior of Bahia, and it is not possible to infer that the conclusions are applicable in other regions.

CONCLUSION

The study revealed that the corporation of the Military Fire Brigade presented some knowledge about the conceptual and practical aspects that involve the care of the victim of CRA. On the conceptual aspects, the answers of all the variables, except the one that approached the definition of "Golden time", were more than fifty percent of correct answers. Regarding the practical aspects, two of the five variables covered were below fifty percent correct responses that were related to posture and depth during the chest compression maneuvers. The association between age and the relationship between errors and correct answers to the practical aspects of a CRA was significant, where the number of answers considered to be wrong exceeded the correct answers in all age groups.

These data reflect the need for constant professional updating since the possibility of a good prognosis is directly associated to the execution of BLS in an excellent way in all its stages.

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