Effects of the Use of Theoretical *versus* Theoretical-Practical Training on Cardiopulmonary Resuscitation

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Abstract

Background: Theoretical knowledge and skill to perform good quality cardiopulmonary resuscitation (CPR) are essential for the survival of patients with sudden death.

Objective: To determine whether a theoretical course alone is sufficient to promote good quality CPR training and knowledge for health professionals in comparison to a theoretical-practical basic life support training.

Methods: Twenty volunteer nurses participated in the theoretical CPR and automated external defibrillation (AED) training by means of a theoretical class and video used in the Basic Life Support Training of the American Heart Association (BLS-AHA; group A). They were compared to other 26 health professionals who attended regular theoretical-practical BLS-AHA training (group B). After the training, the participants took theoretical and practical tests as recommended in BLS-AHA courses. The practical tests were recorded and were later scored by three experienced instructors. The theoretical test was a multiple choice test used in regular BLS-AHA courses.

Results: No difference was observed in the theoretical tests (p = ns). However, the practical tests were consistently worse in group A, as evaluated by the three examiners ($p < 0.05$).

Conclusion: The use of CPR videos and theoretical training did not improve the individuals' psychomotor ability to perform good quality CPR; however, it may improve their cognitive ability (knowledge). Critical areas of intervention are the primary ABCD and the correct use of AED. (Arq Bras Cardiol 2010; 95(3): 328-331)

Key words: Cardiopulmonary resuscitation; advanced cardiac life support; inservice training.

Introduction

Basic Life Support (BLS) is a course designed by the American Heart Association (AHA) to teach cardiac emergencies, particularly cardiopulmonary resuscitation. It is used in many countries for the training of physicians, nurses, and other health professionals in improving survival in cases of sudden cardiac death[1]. It is a practical hands-on course that uses manikins to create interactive clinical settings[2].

Mortality and morbidity of victims of sudden cardiac arrest are directly related to health professionals' or laypersons' skills of appropriately using their knowledge (cognition) and performing cardiopulmonary resuscitation (psychomotor performance).

Some authors reported improved survival of patients undergoing early prehospital cardiopulmonary resuscitation performed by laypersons[3-5].

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The primary objective of this study was to analyze whether theoretical classes and videos designed for training could teach health professionals how to perform good quality cardiopulmonary resuscitation, according to the AHA recommendations.

Methods

Twenty volunteer nurses participated in the training, which consisted of a two-hour theoretical class followed by a BLS video, both based on the 2005 AHA guidelines (group A). No participants in this group had attended a regular BLS course previously, nor did they know any of the instructors or examiners that participated in the study. This group was compared to that of 26 health professionals that had attended a conventional (theoretical-practical) BLS course (group B). Individuals from both groups agreed to participate in the study and gave written informed consent; all took the same theoretical and practical tests by the end of the course. The theoretical test was the same administered in BLS courses, and was composed of multiple choice questions designed by the AHA. The practical test was administered by the same team of instructors, in the same clinical setting, and was recorded on DVD to be scored later by three different instructors experienced in AHA courses, following

the check-list of practical tests of AHA immersion courses (Advanced Cardiac Life Support - ACLS), which included CPR assessment and the use of an automated external defibrillator (AED). This check-list stressed the importance of good quality CPR and the correct use of AED, and the score ranged from 0 to 16 points. The setting for the practical test was the same: "a man was found in an empty corridor; he seemed unconscious and was not breathing". None of the three instructors from the AHA training center who were responsible for the practical test had participated in the BLS course of the group B, or of the theoretical class and video of the group A; likewise, they did not know the participants of either of the two study groups.

The checklist of the practical test was divided into three parts for the analysis of each variable: i) before AED arrival (primary ABCD); ii) AED (assessment of the correct use of AED); and iii) continuation of the second and third CPR sequences by the student. The objective of the first part was to observe the following actions: check responsiveness; call for help and request an AED; open the airway by hyperextending the head and lifting the chin up; check breathing (for at least 5 seconds and at most 10 seconds); provide two rescue breaths (each one for 2 seconds); check the carotid pulse correctly (up to 10 seconds); correctly position the hands for CPR; and perform the first series of chest compressions at an adequate rate (acceptable: less than 23 seconds for 30 compressions). The objective of the second part was to check the adequate use of the AED: turn on the AED; select adequate pads; position the pads correctly; ensure that no one touches the victim during the analysis phase and deliver the shock with confidence (the position of the pads should be visible and the voice prompt audible - maximum time elapsed since AED arrival < 90 seconds). The last part consisted of two phases: perform a second CPR sequence with correct position of the hands, two ventilations (each one for 2 seconds) with visible chest elevation; and perform the third chest compression sequence with adequate chest compression and return of the chest to its original position. All items had the same value (one point) and all 16 points were tested.

Ethics

This study was approved by the ethics committee of Biocor Institute (Minas Gerais, Brazil).

Statistical analysis

The data were initially analyzed using descriptive statistics and were later summarized in tables. The theoretical test and scoring of the practical test were compared between the two groups. Subgroups based on age, time of graduation and gender were also compared in order to establish similarities between the groups. Continuous variables were analyzed using the Student's t test; ANOVA and Kruskal-Wallis test were used for non-parametric tests. The chi square test and the Fisher's exact test were used for categorical variables. P values < 0.05 were considered statistically significant for all variables studied.

Results

Group A comprised 20 participants, and group B comprised 26 individuals, of whom 14 and 21 were females, respectively. Group A participants were younger and had graduated in the nursing course more recently than group B participants ($p < 0.05$). Both groups completed the training and performed the theoretical and practical tests.

The comparison of the mean score of the theoretical test did not show significant differences between the groups (80.3 ± 11.5 and 86.3 ± 15.3 respectively, $p > 0.05$). However, the scores of the practical tests of the group B were significantly higher in comparison to those of group A, according to the evaluation of the three examiners (7.7 ± 2.3 *versus* 12.5 ± 2.9; 11.7 ± 1.5 *versus* 13.9 ± 3.3; 12.3 ± 1.8 *versus* 14.2 ± 2.2 respectively, $p < 0.05$) (Tables 1 and 2).

Group A participants were less efficient in the following areas: open the airways correctly; check breathing correctly; mouth-to-mouth ventilation in 1 second; check carotid pulse; and position hands properly in the thorax for chest compression ($p < 0.05$). After AED arrival, group A participants had difficulty switching it on, turning on the rhythm analysis, and delivering shock, although they were able to position the pads more correctly in comparison to group B ($p < 0.05$). Participants of the exclusively theoretical training did not perform the 2nd and 3rd CPR sequences properly ($p < 0.05$) (Table 3).

Table 1 - Theoretical and practical tests of the group of theoretical classes and video alone (group A) compared to the group of conventional BLS (group B)

Assessment mode	Theoretical course (group A) ± SD (n = 20)	Conventional BLS training (group B) ± SD (n = 26)	P
Theoretical test	80.3 ± 11.5	86.3 ± 15.3	N.S.*
Examiner 1	7.7 ± 2.3	12.5 ± 2.9	<0.05
Examiner 2	11.7± 1.5	13.9 ± 3.3	<0.05
Examiner 3	12.3 ± 1.8	14.2 ± 2.2	<0.05

± SD - standard deviation; N.S. - non-significant.

Table 2 - Characteristics of participants of the theoretical group (class + video, group A) and of the conventional BLS group (group B)

	Group A (± SD)	Group B (± SD)	P
Number	20	26	-
Age (years)	27 ± 4.3	36.1 ± 12	<0.05
Gender			
Male	6 (30%)	5 (20%)	N.S.*
Female	14 (70%)	21 (80%)	
Time since graduation (years)	2.3 ± 2.6	8.3 ± 7.2	<0.05

*± SD - standard deviation; * N.S. - non-significant.*

Table 3 - Percentage of incorrect critical phases of performance in the class/video group (group A; n = 20) versus conventional BLS group (group B; n = 26)

Critical phases of performance	Group A (%)	Group B (%)	P
Check responsiveness	9	5	N.S.*
Ask someone to call the emergency service and take an AED**	22	8	N.S.*
Open airway using the head tilt / chin lift maneuver	52	18	<0.05
Check breathing - for at least 5 seconds; at most 10 seconds	43	18	<0.05
Provide 2 ventilations (1 second each)	19	5	<0.05
Check carotid pulse - for at least 5 seconds; at most 10 seconds	52	6	<0.05
Bare the victim's chest and position hands correctly for CPR***	13	2	<0.05
Perform the first series of compressions at the correct rate. Acceptable < 23 seconds for 30 compressions	19	11	N.S.*
Provide 2 ventilations (1 second each)	19	13	N.S.*
AED** arrival			
Switch AED** on	0	10	<0.05
Select adequate size pads and place them correctly	2	6	N.S.*
Clear victim for analysis - (Should use visual and voice prompts)	65	43	<0.05
Clear victim before pushing the shock bottom (should use visual and voice prompts). Maximum time after AED arrival < 90 seconds	67	48	N.S.*
The student proceeds with CPR***			
Perform the second sequence of compressions with correct positioning of the hands – Acceptable > 23 seconds for 30 compressions	41	18	<0.05
Perform 2 ventilations (2 second each) with visible chest elevation	59	16	<0.05
Perform the third compression sequence with adequated depth and complete return of the chest to its original position. Acceptable > 23 compressions	67	24	<0.05

** N.S. - non significant; ** AED - automated external defibrillator; *** CPR - cardiopulmonary resuscitation.*

Discussion

Good quality, early cardiopulmonary resuscitation influences the outcome; however, the best way to prepare and keep laypersons' and health professionals' skills remains controversial[6-9].

Dorth et al tested remote CPR training over the telephone for lay elderly using the local emergency dispatcher and found a very poor quality CPR[10]. Using a self-instructional video with a special manikin (Laerdal Family CPR Trainer™), Braslow et al showed that this method was similar or superior to the standard BLS training to make laypersons able to achieve skills to perform CPR, even 60 days after the training[11]. Batcheller et al[12] showed that the performance of cardiopulmonary resuscitation by volunteers, especially those over forty years of age, was better when using self-instructional videos, as compared to traditional training. Isbye et al[13] came to the same conclusion using a 24-minute DVD and a low-cost manikin (MiniAnne mannequin). Caffrey et al[14] demonstrated that laypersons learned to use automated external defibrillators (AED) and perform CPR, thus improving survival, in a public setting where 3-minute public announcements were displayed every half hour on television monitors in the waiting areas of the Chicago airport. This video indicated the availability of AED, explained their purpose, and encouraged their use, while printed materials were being distributed[14].

Miotto et al[15,16] demonstrated that older health professionals show decreased knowledge retention of psychomotor and cognitive abilities. However, despite the older age, the group that received conventional BLS training (group B) performed better in the practical test (Table 2).

Classes and videos may produce good quality CPR, and this can improve survival, both for in-hospital and out-of-hospital cardiac arrest. On the other hand, we demonstrated that theoretical training alone was not able to produce good quality CPR, especially regarding maneuvers such as airway opening; correct positioning of the hands; and adequate chest compressions, ventilation and ventilation-compression cycles. The concept that laypersons and health professionals may learn CPR by means of a theoretical training alone (using folders, videos, and other) should be reviewed.

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Potential Conflict of Interest

No potential conflict of interest relevant to this article was

reported.

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Study Association

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