

Permanent Education in BLS and ACLS: Impact on the Knowledge of Nursing Professionals

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Summary

Background: The theoretical knowledge and practical skills of the Basic Life Support (BLS) and the Advanced Life Support (ALS) are among the most important determining factors of the cardiopulmonary reanimation success rates.

Objective: Assess the impact of a permanent training program in BLS and ALS on the knowledge of nursing professionals.

Method: Cross-sectional study. Population was made of nursing professionals of a tertiary level hospital. Assessments were carried out before and after training. The critical points of the International Liaison Committee on Resuscitation (ILCOR) analysis were addressed.

Results: 213 professionals were assessed (76 nurses, 35.7%; 38 assistants, 17.8%; and 99 technicians, 46.7%). Pre-course assessment average grades were statistically different ($p < 0.001$) among assistants (3.25), technicians (3.96) and nurses (4.69). Single professional without kids showed performance significantly superior to married professional with kids ($p = 0.02$ and 0.004 respectively). Pre-training level of knowledge was inversely proportional to the time elapsed since the completion of undergraduate course or technical course. Main deficiencies were related to the initial approach of airways, to post-resuscitation cares and to the external cardiac massage technique. The post-course general average grade was 7.26. Assistants achieved a performance of 131.2%, technicians, of 78.9% and the nurses, of 85%, with no significant statistic difference ($p = 0.43$).

Conclusion: The permanent training program in BLS and ALS resulted in important increment in the level of knowledge of nursing professionals. (Arq Bras Cardiol 2009; 93(6):582-588)

Key Words: Cardiac Arrest; Permanent Education; Cardiopulmonary Resuscitation; Advanced Cardiac Life Support.

Introduction

The theoretical knowledge and practical skills of the Basic Life Support (BLS) and the Advanced Life Support (ALS) are among the most important determining factors of the cardiopulmonary reanimation (CPR)¹ success rates. Both maneuvers performed in BLS as in the ALS require a well-trained team, once the cardiorespiratory arrest requires swift, efficient and integrated actions, and, therefore, better performed by a team than by a single team member.

Nursing professionals are usually the first to witness a cardiac arrest at the hospital². They are those who frequently call the assistance team. Thus, these professionals need to have updated technical knowledge and practical skills developed to contribute more efficiently to cardiac arrest maneuvers³.

Some studies have shown the presence of at least one professional trained in ALS increase the survival of cardiac arrest victims⁴. Dane et al reported increase of the survival in around four times when the Nursing professional was trained in ALS⁵.

Sampaio et al assessed the teaching-learning process of nursing professional in CPR maneuvers and verified failures both in theoretical knowledge and in practical skills⁶. Verplancke et al⁷ researched the possible causes of low quality of the BLS and found that the rate of participation in cardiac arrest assistances had influence on the assistance performance⁷. In study that assessed the education needs of nurses in Australia, 91.4% of them pointed out the cardiac arrest as a highly important area⁸. These data confirm the need for continuing educational actions in BLS and ALS aiming at improving the level of knowledge of these professionals and, thus, contribute to increase the CPR success rates.

The main purpose is to assess the impact of a permanent training program in BLS and ALS on the level of knowledge of nursing professionals.

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Methods

This study is descriptive with transversal approach. Nursing professionals (assistants, technicians and nurses) were assessed. They comprised a team working for a tertiary level hospital of the private health care system of the city of Recife, State of Pernambuco, signed up for the training program in BLS and ALS from February 2007 to January 2008.

The research project was approved by the Research Ethics Committee of the Federal University of Pernambuco (Opinion N.º 093/08). 213 professionals participated of the study, 143 of which completed training. A questionnaire containing social and demographic information, as well as 12 multiple choice questions with only one correct answer (pre-examination), was used to collect data. Such questions approached points considered as critical within the ILCOR (International Liaison Committee on Resuscitation) guidelines⁹, indispensable knowledge for any first-aider^{1,10}.

Professionals were subject to an 8-hour training, 4 hours dedicated to theoretical training and 4 hours for practical activities. By the end of the course, the assessment was repeated (post-examination) with alteration of the order of questions, in order to disguise the similarity of examinations. Scores in pre and post-examinations were calculated by means of arithmetic average and the percentage gain was obtained from the post-examination versus the pre-examination. To assess the performance and scores versus quantitative variables, the Pearson's Correlation Coefficient was used. For qualitative variables, Mann-Whitney and Kruskal-Wallis non-parametric tests were used. The results whose descriptive levels (values of p) were inferior to 0.05 were considered statistically significant.

Results

Out of the 213 professionals of the sample, 76 were nurses (35.7%), 38 were nursing assistants (17.8%) and 99 were nursing technicians (46.7%). Most of them were females (85%). Average age was 30 years old. Average time elapsed from completion of undergraduate course or technical course until the beginning of training was 5.5 years. The average professional activity time was 5.2 years. Weekly working hour load ranged around 56 hours. Among nurses, the average time of completion of residence or specialization until the beginning of training was of 4 and 3.4 years, respectively.

Other social and demographical data of the participants is shown in Table 1. Table 2 presents educational data only of the professional with upper education in Nursing.

As to the scores achieved by professionals upon answering the pre-examination questions, a general average of 4.1 points was obtained. In relation to the post-training assessment, a general average of 7.3 points was obtained.

Pre-examination and post-examination scores and the performance (percentage gain) are set out in Table 3, according to qualification. By means of Kruskal-Wallis test, it was possible to observe statistically significant difference ($p < 0.05$) among professionals with different educational backgrounds when it comes to the grade in pre-examination ($p = 0.001$). However, concerning the percentage gain obtained in the course, there was no significant difference ($p = 0.432$). The distribution of the

Table 1 - Social and demographical characterization of studied population

Variables	N.º (%)
Married*	
No	133 (62.7%)
Yes	79 (37.3%)
Kids†	
No	123 (59.1%)
Yes	85 (40.9%)
Previous training in CPR‡	
No	140 (66.4%)
Yes	71 (33.6%)
N.º of professional occupations	
One	122 (57.3%)
Two	82 (38.5%)
Three	9 (4.2%)
Another upper course?	
No	190 (89.2%)
Yes	23 (10.8%)
Works in an area other than in nursing	
No	196 (92.0%)
Yes	17 (8.0%)

Basis - 213 professionals. * 1 professional has not answered; † 5 professionals have not answered; ‡ 2 professionals have not answered.

Table 2 - Educational characteristics of professionals with undergraduate degree in nursing

Variables	N.º (%)
School	
Private	22 (28.9%)
Public	54 (71.1%)
Graduate course or Specialization	
No	34 (44.7%)
Yes	42 (55.3%)

percent of right answers in pre and post-assessments, according to the critical points evaluated, is specified in Table 4.

Correlations between social and demographical variables, scores obtained in the pre-examination and the performance achieved in the training are shown in Table 5.

The higher the time interval between the undergraduate course or technical course and the training is, lower is the

Table 3 - Average grades in pre-examination and post-examination and performance against professional categories

Qualification	Average grade in pre-examination	Average grade in post-examination	Performance (percentage gain)
Assistant	3.25	6.49	131.20
Technician	3.96	6.99	78.87
Nurse	4.69	8.05	84.95
Total	4.09	7.26	91.20

Table 4 - Percent of right answers in pre-examination and post-examination according to critical points assessed.

Assessed Points	General		Nurse		Assistant		Technician	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
How drugs are administered in cardiac arrest	38.7	98.6	49.3	100	23.7	96.4	36.4	98.5
Automatic External Defibrillator	20.8	95.8	33.3	94	10.5	92.9	15.2	98.5
Handling of airways in BLS	5.2	29.9	6.7	46	2.6	21.1	5.1	21.2
BLS assistance sequence (primary ABCD)	66.5	100	74.7	100	65.8	100	60.6	100
Preferred administration route of drugs	80.7	98.6	74.7	100	84.2	100	83.8	97
Recognition of cardiac arrest	60.4	89.6	65.3	96	50.0	82.1	60.6	87.9
Recognition of ventricular fibrillation	50.9	52.1	68.0	72	28.9	35.7	46.5	43.9
Straight line protocol	52.4	74.3	54.7	80	47.4	75	52.5	69.7
Indication of defibrillation based on rhythms	37.3	77.8	50.7	86	26.3	67.9	31.3	75.8
Handling of external automatic defibrillator	38.2	57.6	40.0	74	31.6	42.9	39.4	51.5
Recognition of ventricular tachycardia	23.1	42.4	21.3	52	10.5	32.1	29.3	39.4
Recognition of possible causes of cardiac arrest	16.5	54.9	24.0	66	7.9	32.1	14.1	56.1

Table 5 - Association between variables that characterize the population, the pre-examination grade and the performance

Variables	Correlation Coefficient with the pre-examination grade	Correlation Coefficient with the performance
Age	p=0.052	p=0.798
Months of completion of undergraduate course/ technical course	p=0.011*	p=0.136
Months of the completion of specialization	p=0.610	p=0.636
Time of professional practice	p=0.081	p=0.557
Weekly working hour load	p=0.257	p=0.415
Gender	P=0.492	P=0.931
Marital Status	P=0.017	P=0.126
Kids	P=0.004	P=0.296
Previous training in CPR	P=0.146	P=0.177

score obtained in pre-examination. Married professionals with kids obtained a grade in pre-examination significantly lower than the single professionals without kids. Statistically significant correlation between the analyzed variables and the performance in training was not found. Professionals who had previous training in CPR have not presented better performance in relation to those with no training background.

Among nurses, there was no significant difference among those with undergraduate diplomas from public or private colleges in the pre-examination ($p=0.408$) and in performance assessment ($p=0.349$). The same was observed in the event of analyzing correlations between a background of residence and the score in the pre-examination ($p=0.08$) and the performance ($p=0.176$).

Discussion

Although the hospital's purpose by implementing permanent training in BLS and ALS has been ultimately to improve patient assistance as for the cardiac arrest maneuvers, professionals were not obliged to attend the course. The significant weekly working hour load of these professionals must also be taken into account, insofar as this is a factor which impaired their time availability to attend the course. Other important aspect is the motivation to attend training. At least 50% of the total training course duration was destined to practical skills, aiming at making learning more significant and contextualized. This teaching strategy has been recommended for adults as the performance is considered better when there is motivation to participate^{11,12}. In spite of this, there was high percent of professionals who did not complete the course (32.9%).

The score in pre-course assessment was low (4.1 points). However, this low percent is partly attributable to the average time of completion of educational qualification of this sample was superior to five years; that the average time of professional activity was relatively low; and that a significant percent of these professionals could not have had the chance to refresh their knowledge on cardiac arrest since completion of educational qualification. Besides this, there is lack of permanent education programs in most health institutions.

Boaventura and Coutinho¹³ reported a similar score (4.3 points) among Nursing professionals who were subject to assessment on BLS. Galinsk et al¹⁴ verified that the theoretical knowledge on BLS among 413 evaluated nurses was insufficient. Granzotto et al¹⁵ assessed the qualification in BLS in a university hospital and showed that the average percent of right answers in an initial theoretical assessment was 63%. However, the sample of this study was comprised also of physicians, Medicine and Nursing School students, in addition to nurses. The percent of right answers in the assessment made by the end of the training was 84%.

In this study, the percent of right answers in the assessment made after the end of training was of 72.9%, which stands for an average of 7.26. There has been no statistically significant correlation ($p = 0,432$) found between the performance of different professional who comprised the sample, probably due to the short duration of the course, which has not

allowed a higher influence of external variables of the learning process.

Among the groups analyzed, nursing assistants achieved the best performance (131.2%) compared to nursing technicians (78.87%) and to nurses (84.95%). In part these results may be explained by the lower pre-training level of knowledge of nursing assistants, compares to the other professionals assessed.

Finding significantly low scores in pre-training assessment of nursing assistants compared to those of technicians and of these vis-à-vis the nurses' scores may be explained by the level of technical qualification of each category assessed. In this sample, 55% of the nurses had graduate course and/or specialization. In study carried out at intensive care unit (ICU) for assessing the level of knowledge of professionals on cardiac arrest and CPR, the professional level of educational background was found to influence the rate of right answers¹⁶.

Many of these professionals are subject to excruciating load of working hours, small compensation and double journeys – mainly the nurses. Such factors concur to the fact that the time destined to professional refresher needs to be reduced. In the current scenario of permanent education in health, there is urging need for technological and scientific updating, as reported by many professionals. On the other side, there is lack of social and economic conditions to implement such updating. In this sample, with high weekly working hour load, score in pre-examination of married professionals with kids was significantly lower. However, these variables have not influenced the percentage gain acquired after the course, probably because this course elapsed little time, not long enough for these social and economic variables to influence the performance.

Costa et al¹⁷, in study involving 348 Nursing professionals, concluded that the main complaints related to shift working system were impaired social life due to interference in personal and familial relationship, to restrictions to social activities and to the difficulty to make plans for their own lives. This dissatisfaction is even higher among married professionals with kids. Gomes et al¹⁸, as comparing professionals of different marital status, found out married professionals wished to abandon their occupations and had more frequent physical health problems. They also observed that the desire to quit abandon their occupations was lower in the group of nurses with younger kids, associated to a higher level of stress related to compensation and familial problems, among others.

In relation to the critical points assessed, scores in pre-examination and post-examination, in the question on airway handling, was of 5.2 and 29.9, respectively, indicating low level of knowledge on handling of airways and usage of devices alternative to the orotracheal tube, such as the laryngeal mask (LM). This result may be grounded on the little familiarization of these professionals with said device. It is important to highlight that the LM, as well as the esophageal tracheal Combitube®, may be used by any trained health care professional. However, the mask is not available for all health care service units, which renders the application of theoretical learning in practice difficult.

In relation to the external cardiac massage technique (ECM), the average of right answers was of 20.8% in the pre-

examination and of 95.8% in the post-examination. In spite of the good performance achieved, the initial assessment grade calls attention to the deficiency in knowledge on critical actions in cardiac arrest assistance. Nurses achieved a percent of right answers (33.3%) higher than the technicians (15.2%) and assistants (10.5%).

According to Act n.º 7498/86 of nursing professional activity, nurses are in charge of direct assistance to patients at risk for life and of the practical activities which demand higher complexity and scientific knowledge¹⁹. Concerning the ECM, this practice poses some constraints on the development of technicians' and assistants' skills, justifying their lower percent of right answers. Currently, disclosure of knowledge and skills on BLS among lays has been fostered, as they are, in many cases, the first-aider for cardiac arrest victims outside the hospital. Similarly, it is advisable to invest in training of assisting teams, specially nursing technicians and assistants¹⁰.

Only 66.5% of the professionals answered correctly the BLS sequence of actions. However, in the post-assessment, all professionals answered correctly this question, which confirms the importance of training. Non-satisfactory results were also found in other studies. Granzotto et al¹⁵ assessed the behavior of physicians and nurses while approaching a cardiac arrest maneuver in a university hospital and found out that, among nurses, only 60% asked for help, 29% opened airways and 47% started ventilation. Zanini et al¹⁶ showed that 61.5% of the ICU nurses at a general hospital could not recognize the importance of assessing the level of awareness when questioned on the identification of a cardiac arrest.

Concerning the administration of drugs in CPR, results showed that the participants' knowledge in pre-examination is very low (38.7%), considering this is an action usually assigned to these professionals. Colino et al²⁰ reported that 54% of the assessed professionals stated not to have knowledge on preparation of drugs.

In pre-examination, it was observed that 60.4% of the participants knew how to correctly identify the clinical signs of a cardiac arrest, given this contrast in the study reported by Zanini et al¹⁶ carried out at a ICU, in which only 15.4% of the Nursing professionals, including all categories and with experience above two years at a ICU, knew how to recognize a cardiac arrest. This same study also showed that 69.5% of the participants recognized only the asystolia as cardiac arrest, which more once contrasts with our study, in which 50.9% of the participants also recognized the ventricular fibrillation (VF) as a cardiac arrest mechanism.

Birnbaum et al²¹ assessed the knowledge of physicians and nurses on the ALS and found out that 33% of the nurses and 22% of the physicians could not identify a VF. The identification of cardiac arrest paces by means of cardiac monitor demands higher professional knowledge⁹ and this may be a justification for the higher percent of right answers among nurses than among nursing technicians and assistants. The fact that the VF is the most common cardiac arrest mechanism in hospitals^{22,23} and the fact that it is often the result of the degeneration of ventricular tachycardia⁶ requires that Nursing professionals know how to identify them, in such a way patients are provided prompt assistance and, as a result, present better prognosis. In the pre-examination, the asystolia,

for being the easiest identifiable pace^{22,24}, was more easily recognized by assistants and technicians (47.5% and 52.5% respectively) than the VF (28.9% and 46.5%, respectively) and the pulseless VT (10.5% and 29.3%, respectively).

In our study, a low level of knowledge of nursing professionals on defibrillation indications (37,3%) and of defibrillator handling (38.2%) was found. After the course, these percents increased to 77.8% and 57.6%. Such percents were not satisfactory in view of the importance of defibrillation to the success of CPR.

In 1983, the American Nurses Association (ANA) set out standards for the professional practice in emergencies which determine that nurses are responsible for preparing intubation, aspiration, cardiac monitoring and defibrillation instruments, helping the medical staff in the performance of procedures. Thus, according to the ANA, Nursing professionals are not authorized to perform early defibrillation with conventional defibrillator in the absence of a physician²⁵. Granitoff²⁶, while assessing 68 nurses who mainly acted in critical areas of private hospitals, most of them having completed the ACLS (Advanced Cardiac Life Support) course more than 18 months before the study, observed that most of them (91.2%) never, or barely ever, performed the defibrillation procedure, keeping only the basic CPR until the physician's arrival. The author concluded that only 17.5% of the nurses demonstrated favorable conditions to the practice of early defibrillation²⁶. Defibrillation in Brazilian hospitals is almost always performed by physicians and this justifies the low percents found in this research.

Most of the professionals of the sample did not recognize the importance of seeking for the cause of a cardiac arrest ad a way to not only restore spontaneous circulation, but also as a way to prevent other events. These date point to the lack of integration among health teams to know the clinical history of patients, their diagnosis already given and the therapeutic measures been applied. Knowledge of all these aspects, not only by the team's physician, would also help to identify the possible cause of the cardiac arrest and use the proper treatment as consequence.

Berden et al²⁷ recommend six-month intervals as the optimum time for new training of professionals in CPR. Broomfield²⁸ assessed the retention of skills and theoretical knowledge on CPR in a group of 19 nurses and concluded that there was initial improvement of the items assessed. However, after 10 weeks of the end of training, both the retention of skills and theoretical updatings underwent statistically significant deterioration ($P= 0.000$).

Madden²⁹ demonstrated that, after 10 weeks, there was deterioration in knowledge and skills in reanimation among nursing students which had 4 hours of training in CPR. Although this study did not target on the assessment of retention of the training content – nor the time interval in which drop in level of knowledge begins to take place –, the statistically significant correlation ($p=0.011$) between the time interval since the completion of undergraduate course, or of technical course, and the score in pre-examination, indicating an inverse relation, as well as of the lack of higher score among professionals with previous CPR training, imply that, in this sample, the knowledge retention suffers deterioration, as well

as reported in literature. Thus, continued efforts in updating of theoretical knowledge and BLS skills³⁰ are advisable.

External validity of this study, besides being limited due to a sample from a health private institution, is not significantly reduced, as 42% of the professionals of the research worked in more than one hospital, considering that an expressive percent (42.9%) worked in health public institutions. Some studies that assessed the level of theoretical knowledge and the practical skills of professionals who work at public and private institutions have not found statistically significant difference^{1,31}. Although the post-training assessment method was exclusively theoretical, 50% of the course's hour load was destined to practical activities.

Conclusion

We verifies a significant impact on the level of knowledge of Nursing professionals after the training in BLS and ALS, as

can be seen by the percentage gain of knowledge of 91% in the total sample, achieving 131% in the group of Nursing assistants. These data confirm the need for structuring continuing education in health as a tool which will contribute to improve the CPR success rates.

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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