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BASIC LIFE SUPPORT TEACHING FOR UNDERGRADUATE NURSING STUDENTS

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ABSTRACT

Objective: To elaborate, implement and evaluate a Basic Life Support education program for undergraduate Nursing students using a virtual technology of learning and traditional teaching and to compare the performance between two groups (Control Group-CG and Group Intervention Group-IG/experimental).

Method: This was a descriptive, interventionist and comparative study, with a quantitative approach, developed at a Higher Education Institution, public in Belém, State of Pará, from March to April 2017.

Results: The study population consisted of 28 participants, 14 students in the IG (experimental) and 14 in the CG, selected through randomization. An instrument developed and validated by Bellan, 2006 was used for data collection. 100% of the sample never performed BLS training or any training on the subject, leading to the understanding that the positive student performance in this research was directly related to the training program offered. It was possible to reinforce the idea of the importance and benefits gained from the realization of a BLS education program. The behavior of performance of the IG in relation to the CG differed in the form of presentation. It was verified that the performance of the GI participants was greater than CG in both domains. There was a real difference in knowledge and practical skills between groups, but this difference was most noticeable in the practical skills of "Check responsiveness," "Quality chest compressions," and "Use of AED".

Conclusion: The contents addressed and the instruments used for the evaluation, favorably supported the execution and evaluation of the training program developed and offered. Given these results, it is believed that the training program elaborated can be widely used in the institution studied and also adapted for use in others.

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INTRODUCTION

Nursing students have been the subject of discussions and research on their knowledge about cardiopulmonary resuscitation (CPR) maneuvers.

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Nursing's academic preparation demands the need for a conceptual and methodological theoretical training that enhances competencies for the integrality of care. Thus, among the essential competences for nursing practice in emergencies, the clinical reasoning for decision making and the ability to perform interventions are emphasized (Salvador *et al.* 2012). Nursing professionals are usually the first to respond to a cardiac arrest and they initiate basic life support maneuvers

(BLS), while waiting for the advanced support team. The immediate, competent and safe application of resuscitation maneuvers by the team that first intervenes are factors that contribute to the success of the care and, consequently, to neurologically intact survival in this context (Nogueira *et al.* 2017). Much of the success of Cardiopulmonary Resuscitation (CPR) is due to the rapid recognition, activation of the emergency department, immediate onset of high quality CPR maneuvers and early defibrillation, requiring the knowledge and skills of health professionals to act qualitatively in this situation. Thus nurses need to know how to act efficiently in the face of these occurrences, since this professional acts in the direct care of the patient, and is usually the first to identify this condition (Silva *et al.* 2015). Basic Life Support consists of a set of sequentially executed steps and maneuvers, which include evaluation and immediate intervention at each stage of CPR. These recommendations are based on the guidelines of the *International Liaison Committee on Resuscitation* (ILCOR) and the international scientific consensus of the *American Heart Association* (AHA) (Silva *et al.* 2015; Nogueira *et al.* 2017).

Cardiopulmonary Arrest remains a major public health problem, gaining a worldwide dimension, despite advances in recent years related to prevention and treatment, many lives are lost annually in Brazil related to CPR, although we do not have the exact dimension of the problem due to lack of reliable statistics in this regard (Gonzalez *et al.* 2013). Although the potential beneficial effect of CPR is already well established in the scientific community, less than one in three victims of cardiac arrest outside of the hospital environment, and witnessed, receives rescue assistance from a spectator. Approximately 200,000 cases of cardiopulmonary arrest per year in Brazil are estimated, with half of the hospital occurrences, and the other half in settings such as residences, malls, airports, stadiums, and others (Fernandes *et al.* 2014). When a cardiorespiratory arrest occurs, the chances of survival for the person affected vary according to the time and quality of the interventions. The current resources allow to recover the neurologically intact spontaneous circulation and the quality of life with a lower degree of sequelae, provided that adequate procedures are ensured in a timely manner (Belém *et al.* 2013). A qualitative outcome of CPR depends on a logical sequence of procedures that can be synthesized in the concept of survival chain. This chain consists of links that reflect fundamental actions to be developed, whose impacts on the survival of a person who suffered a cardiopulmonary arrest are significant (Field *et al.* 2010; Neumar *et al.* 2015). The survival chain emphasizes the need for rapid response through surveillance and prevention, early recognition of cardiorespiratory arrest and triggering of emergency services, high quality and immediate CPR, early defibrillation, advanced immediate life support and post-cardiac arrest care initiated immediately after the return of the spontaneous circulation (Canova, 2012; AHA, 2015; Nogueira *et al.* 2017).

Cardiorespiratory arrest was synonymous with death, as approximately 2% of individuals survived this dramatic event. Today the survival rate reaches more than 70% if the care is early and effective and is substantially related to the time between the incident and the beginning of the resuscitation, and the technical effectiveness of performing CPR maneuvers. However, during the care of patients in cardiorespiratory arrest it is frequent to encounter nursing professionals who have difficulties in performing basic emergency care (Menezes;

Rocha, 2013; Nogueira *et al.* 2017). Care for the person who has suffered a cardiorespiratory arrest must be performed quickly, firmly, safely and calmly, in order to avoid panic and mismatch between professionals. But what has been observed, most of the time, is that resuscitation efforts are tumultuous, with non-systematized actions that lead to overlapping tasks, culminating in repetitive acts that lead to a loss of time, crucial for patient survival (Nogueira *et al.* 2017). Cardiorespiratory arrest is a dramatic event, responsible for high morbidity and mortality, even in situations of optimal care. Time is an important variable; it is estimated that each minute of permanence of this event decreases in 10% the probability of survival of the individual (Tourinho *et al.* 2012). Professionals and graduates of the health area do not possess satisfactory scientific knowledge, both theoretical and practical, in cardiorespiratory arrest and CPR. The lack of knowledge about this theme is in part a consequence of the academic formation, in which the approaches on the subject, when they exist, are punctual and superficial, therefore, insufficient to provide the acquisition of the solid knowledge necessary for the action. In front of the person who suffered cardiopulmonary arrest (Neves *et al.* 2010; Gomes; Braz, 2012).

Several Nursing Schools include content in their curricula with learning objectives focused on Basic Life Support (BLS) and Advanced Life Support (ALS). However, most nurses do not feel able effectively to act in emergency Situations, especially in Cases of cardio respiratory arrest (Sardo; Sasso, 2008; Nogueira *et al.* 2017). One of the objectives in graduation is the proficiency in BLS skill. However, there is a great diversity in the form and in content related to the theme, among the different schools, so that the training offered does not meet the criteria described in the consensus of the science of resuscitation for undergraduate education (Ruijter *et al.* 2014). According to Silva and collaborators (2015), although the subject matter is discussed at undergraduate level, it has not been enough to build a solid knowledge. Thus, it is believed that it is necessary to think about the training of professionals able to deal with situations of cardio respiratory arrest, which is essential to improve the quality of care, increasing the chances of survival of the patients assisted.

For the authors Kawakame and Miyadahira (2015) it is notorious the lack of knowledge and skill of the majority of the students of the area of health related to this subject, becoming a matter of concern. Thus, the literature points out that it would be pertinent to expose students early to this procedure, that is, to promote these skills early in the course, which can be reinforced in the following years. The training should include students in realistic contexts, which provides the acquisition of knowledge and skills with innovative methodological proposals. Among the trainings, those that are theoretical-practical present better results, since they offer better return on the construction of knowledge and skills (Tavares *et al.* 2015). American Heart Association (AHA), based on the assumption that teaching is a planned experience that facilitates learning, affirms that targeting education to the appropriate public is essential and that a training program represents an ideal opportunity to reach a large number of individuals with CPR maneuvers and other BLS interventions (AHA, 2015). Therefore, the study has generated reflections with potential to fill gaps in undergraduate education, in order to contribute and show to managers in higher education the importance of including the BLS theme in the curricular components of Nursing Undergraduate courses in a more consistent way,

which allows to attend a current epidemiological reality, in an innovative methodological perspective, favoring the development of sufficient skills to make the students capable of assuming such an important task, which is to contribute to the survival of patients with minimal sequelae. Thus, it is fundamentally important to understand the learners within their context, considering them as active participants in the teaching-learning process, so that effective methodological strategies can be devised that meet their demands and needs. The results of the study could be used as a methodological subsidy for the future elaboration of a BLS training program, as well as to promote changes in the curricula with the objective of training qualified individuals in both qualitative and BLS teaching, taking into account that the Nurse is the leader of the Nursing team, and among other assignments he/she is responsible for the permanent education of the team. In view of the above, the main objectives of this study were to design, implement and evaluate a Basic Life Support education program for undergraduate Nursing students using a traditional Virtual Learning and Teaching Technology.

METHODS

It was a descriptive, interventionist and comparative study, with a quantitative approach carried out in a Public Higher Education Institution of Belém, State of Pará, Brazil, from March to April 2017. The population was represented by students of the 1st year of the Undergraduate Nursing course (Group A-morning and B-afternoon group), both genders, morning and afternoon shifts, totaling 28 participants, 14 students in the experimental group (Intervention Group - IG) and 14 in the control group (Control Group - CG) representing 56% of the total sample. For selection of participants and allocation in the groups (control and intervention) was used to randomization (simple draw), which is a selection process in which each research participants have the same probability of being drawn to form the sample or to be allocated in one of the study groups (Kara-Junior, 2014). The randomization was done in such a way that there was no combination and mixing of the classes, with the remaining A and B groups separated, only allocating to the groups (intervention and control), based on the frequency of the class. Inclusion criteria for the study were: Students of both genders, enrolled in the 1st year of the Nursing Undergraduate course in the morning and afternoon shifts in the first semester of 2017. The exclusion were: Students not enrolled in the course, students enrolled in the subsequent years of the course, students enrolled but coming from selective internal or external transfer processes, since these students had already studied curricular components that included BLS knowledge, underage students who did not bring the Free and Clarified Consent Form signed by those responsible; and students with other higher education in the area of health.

The discontinuity criterion was: students who for some reason were absent from any of the research stages. There was a loss of the sample, which consists of 28 individuals. The decrease was due to reasons such as the abandonment of enrollment, sick, and others. Because of this theoretical and practical contents, two data collection instruments were used: a questionnaire with closed questions elaborated and validated by Bellan (2006) and adapted by the researcher to the objectives of this study, applied after the educational interventions, and based on the AHA 2015 guidelines. For data collection, an instrument containing two parts was used: Part 1

- identification and characterization data of participants and information about participation in BLS updates. Part 2 - questionnaire addressing the content on cardiorespiratory arrest and CPR focused on BLS, adapted from the instrument elaborated and validated by Bellan (2006), totaling six questions. The questions were arranged in a logical sequence and compatible with the current guidelines for cardiorespiratory arrest care of the AHA 2015. For the practical evaluation, an instrument consisted of a checklist of the conducts / actions during cardiac arrest and CPR with a focus on the BLS, developed to verify, step by step, the practical performance of the participants. An explanatory guide of the instrument with description of the items, questions and content of the answers was created for the researcher's use. The training program was carried out in three stages: Stage I - Theoretical-practical training; Stage II - Recent theoretical and practical evaluation of students. Steps I and II were performed in sequence, no gaps. The theoretical training contemplated three moments, namely: 1st moment (Sensitization) Demonstration of maneuvers of detection of the Cardiopulmonary arrest (check responsiveness, check breathing and check absence of central pulse); activation of the emergency service according to the chain of survival and high quality CPR. 2nd Moment: Demonstration of materials and equipment (AED, airway material, others.) and 3rd Moment: Practical test. Control group participated in a traditional expository class with data show, paintbrush and bench frame, using dummy / puppet, airway devices and AED, demonstrating and applying high quality CPR techniques and activation of the emergency system (survival current).

The experimental group participated in an educational intervention using a virtual learning environment, as proposed by the Consensus on the Science of Resuscitation, involving the skills in CPR, with the help of an Information and Communication Technology (ICT) - Website, using a dummy, airway devices and AED simulator, with demonstration and application of high quality CPR techniques and activation of the emergency system (survival current). For the compression frequency domain recommended by the AHA 2015 guidelines, a musical mnemonic (Stayin 'Alive - Bee Gees music) was used, which has a frequency of 103.6 beats per minute. The theoretical content approach followed the sequence of the cardiorespiratory arrest, to facilitate the comprehension, presented with multimedia resource, that had as titles the topics referring to each question. The answers obtained were considered correct, when all the minimum contents were indicated; partially correct when one or more minimum contents have not been marked; and incorrect, when none of the minimum contents were marked, according to guidelines of the explanatory script. Each point was assigned the value of a point. Each point was given the value of a point, totaling six points. In the questions with more than one correct alternative, the value one was divided by the number of alternatives, excluding the alternatives "do not know" to obtain the value of each one of them. For the questions with only one correct alternative was also established the value one.

The evaluation of the theoretical knowledge of the participants regarding the six items that composed instrument I, was carried out by measuring the responses issued on a scale from 0 (zero points to worst score) to 100 (one hundred points to best grade). For the practical evaluation, the logical sequence of the cardio respiratory arrest treatment was also used, and one of the following items was marked: the maneuver was

performed correctly (YES), the maneuver was performed partially, and the maneuver was not performed (NO). The maneuvers that had all the items marked by the researcher were considered correct; partially correct when seventy percent (70%) of the alternatives were pointed out; and not carried out when no alternative was indicated. The practical activities of the Basic Life Support maneuvers were divided into five items. For each item was assigned the value of a point, which was divided by the number of sub items to obtain the value of each sub-item indicated. With the sum of the values of the sub items the total value of the items was obtained. These points, from a rule of three, were converted into a grade from zero to ten. With this note, the attendance performance of each participant was classified as: qualified - for the student who received a grade of 7.1 to 10.0; poorly qualified - for the student who received a grade of 5.0 to 7.0; and unqualified - for the student who received the grade between 0 and 4.9.

The assessment of the practical skills related to the five items that composed the instrument II - evaluation of the practical activities of the BLS maneuvers was performed by measuring the responses issued on a scale from 0 (zero points to worst score) to 100 (one hundred points to best notice). The application data of the instruments were tabulated. In the comparison of the categorical variables between the groups Chi-Square and Fisher's exact tests were used. For the continuous variables the Mann-Whitney test was applied. In order to evaluate the knowledge and practical skills on BLS in the two groups GI (n = 14) and CG (n = 14), descriptive and inferential statistical methods were applied. The variables of identification and characterization of the participants were presented in the form of absolute and relative frequencies. The variables on knowledge and practical skills were presented by measures of central tendency and variation and had normality assessed by D'Agostino-Pearson's test (D'Agostino, 1970 cited by Ayres *et al.*, 2007). The comparison between the dichotomous variables was evaluated by Fisher's exact test. The comparison between the variables was performed by the Mann-Whitney U test (Ayres *et al.*, 2007, p.135).

To describe the profile of the sample according to the variables under study, frequency tables of the categorical variables (answers of the questions), with the absolute frequency (n) and percentage (%) values, and descriptive statistics of the continuous variables (age, gender, others.), with mean values, standard deviation, minimum, maximum, and median values. In the comparison of the categorical variables between the groups, the Chi-Square test and Fisher's exact test were used (Fleiss, 1981, cited by Ayres *et al.*, 2007). To compare the continuous variables between the two groups, the Mann-Whitney test (Conover, 1971; Siegel, 1975 cited by Ayres *et al.*, 2007). The significance level adopted for the statistical tests was 5%, that is, $p < 0.05$. The project was approved by the Research Ethics Committee Research Ethics Committee of the Undergraduate Nursing Course of the State University of Pará, Brazil, CAAE: 62000616.2.0000.5170, number 1.897.505, on 01/25/2017. All students signed the Term of Free and Informed Consent and Term of Assent before participating in the study. All information was used for scientific purposes and there is no conflict of interest related to the study. The research was carried out following the norms that regulate research involving human beings contained in the resolutions nº 466/12 and 510/16 CNS / CONEP.

RESULTS

Female gender was predominant in both groups (10/14, 71.4% in GI and 13/14, 92.9% in CG, $p = \text{NS}$), Fisher's exact test, $p = 0.3237$. Regarding the nature of the study participants, in GI 7 (50%) they are from Belém capital, 5 (35.7%) from other regions of the State and 2 (14.3%) from other federative units (Pernambuco and Mato Grosso do Sul). In GC 11 (78.6%) they are from Belém capital and 3 (21.4%) from other regions of the State. The groups were composed of students aged between 17 and 45 years. The predominant age group was between 17 and 19 years (13/14, 92.9% in IG and 11/14, 78.6% in CG, $p = \text{Ns}$) (Table 01). About the age of the participants, in both groups the median was 18 years. The mean age in years in the GI was 19.7 and in GC 18.5 ($p = \text{Ns}$) (Table 02). On the forms of updating of the BLS, with regard to the information sources of the groups were: television IG 5, 35.7% and CG 3, 21.4% ($p\text{-value} = 0.6575 \text{ Ns}$), newspaper IG 1, 7.1% and GC 3, 21.4% ($p\text{-value} = 0.5892 \text{ Ns}$), internet IG 12, 85.7% and GC 10, 71.4% ($p\text{-value} = 0.6541 \text{ Ns}$) and other IG 3, 21.4% and GC 4, 28.6% ($p\text{-value} = 0.9998 \text{ Ns}$).

About BLS update, total of 28 students in both groups (100%) reported not having participated in updates on the topic. In relation to the work, only 1 (7.1%) of the participants of IG reported to carry out formal activity. The participants' theoretical knowledge on the six items that composed instrument I, it was measured by measuring the answers issued on a scale from 0 (zero points to worst score) to 100 (one hundred points to best grade). In question 2.1, on the detection of cardiorespiratory arrest, the groups presented equal performances, IG (100 points) and CG (100 points), $p\text{-value} = 0.5201$. Regarding the immediate behaviors to be taken after the detection of an unconscious person, question 2.2, the groups had the following performance IG (100 points) and CG (90.4 points), $p\text{-value} = 0.5004$. Regarding the immediate behaviors to be taken after the detection of a nonresponsive and non-breathing person, question 2.3, the groups obtained the following performance IG (100 points) and CG (82.1 points), $p\text{-value} = 0.1078$ which indicates that the difference was not statistically significant in the three items.

Regarding the minimum frequency of chest compressions per minute according to current resuscitation guidelines, question 2.4, the groups also presented non-statistically significant performance, IG (100 points) and CG (64.3 points), $p\text{-value} = 0.1078$. Regarding chest compressions and ventilation, question 2.5, the groups presented the following IG (100 points) and CG (100 points), $p\text{-value} = 0.9999$, which indicates that the difference was not significant. In the item on immediate actions / attitudes before cardiopulmonary arrest in which there is an AED, question 2.6, there was also no significant difference between groups, IG (100 points) and CG (90.4 points), with $p\text{-value} = 0.9998$ (Mann-Whitney U-Test). Table 03 shows the behavior of the answers of the questions of Instrument I - theoretical knowledge of both groups. When the sum of all knowledge items was calculated and the medium and median values of each student were calculated, it was verified that in the IG the median was 100 points and in CG the median was 78.4 points. In this way it was verified that in the evaluation of the set of all the items, the IG group presented better performance in relation to the CG. Table 04 presents the evaluation of the set (medium of six questions) showing a highly significant difference between the two groups, $p\text{-value} < 0.0001$ *.

Table 1. Characterization of two groups formed by students of the Undergraduate Nursing Course Group IG (n = 14) and CG (n = 14), Belém, Pará, 2017

Characterization	IG		CG		p- value	
	N	%	n	%		
Gender					0.3237	
	Male	4	28.6	1	7.1	
	Female	10	71.4	13	92.9	
Age					0.5892	
	17 to 19 years	13	92.9	11	78.6	
	20 years and over	1	7.1	3	21.4	
Naturalness					0.1865	
	Belém/PA	7	50.0	11	78.6	
	Regions/PA	5	35.7	3	21.4	
	Other Federative Unit	2	14.3	0	0.0	
Source of information						
	TV	5	35.7	3	21.4	0.6575
	Newspaper	1	7.1	3	21.4	0.5892
	Internet	12	85.7	10	71.4	0.6541
	Others	3	21.4	4	28.6	0.9998
Job					0.9922	
	Yes	1	7.1	0	0.0	
	No	13	92.9	14	100.0	
Update on BLS					1.0000	
	Yes	0	0.0	0	0.0	
	No	14	100.0	14	100.0	

Source: Field research, 2017.

Table 2. Description of age (years) in two groups formed by students of the Undergraduate Nursing Course. Group IG (n = 14) and CG (n = 14), Belém, Pará, 2017

Age (years)	IG	CG
Minimum	17.0	17.0
Maximum	45.0	24.0
Median	18.0	18.0
Arithmetic Medium	19.7	18.5
Variance	53.3	4.3
Standard deviation	7.3	2.1

Source: Field research, 2017. Ns - Not significant.

Table 3. Performance in the answers about the theoretical knowledge in both groups (IG n = 14) and (CG, n = 14), Belém, Pará, 2017

Knowledge items	IG	CG	p-value
2.1 Cardiorespiratory arrest detection	100	100.0	0.5201 (Ns)
2.2 Attitudes toward the unconscious person	100	90.4	0.5004 (Ns)
2.3 Attitudes towards the person who does not respond and does not breathe	100	82.1	0.1078 (Ns)
2.4 Minimum frequency of chest compressions	100	64.3	0.1078 (Ns)
2.5 Relation between chest compressions and ventilation	100	100.0	0.9999 (Ns)
2.6 Actions in the cardiorespiratory arrest, in which there is a (AED)	100	90.4	0.9998 (Ns)

Source: Field research, 2017. * Mann-Whitney U-Test. Ns - Not significant.

Table 4. Evaluation of the set of answers about knowledge of undergraduate Nursing students (IG n = 14) and (CG, n = 14), Belém, Pará, 2017

	IG	CG
Knowledge	(n=14)	(n=14)
Minimum	100.0	54.3
Maximum	100.0	83.3
Total Amplitude	0.0	29.0
Median	100.0	78.4*
First Quartile	100.0	73.7
Third Quartile	100.0	83.3
Interquartile Deviation	0.0	9.6
Arithmetic Medium	100.0	76.2*
Variance	0.0	80.3
Standard deviation	0.0	9.0
Standard error	0.0	2.4
Variation Coefficient	0.0%	11.8%

Source: Field research, 2017. p-value <0.0001 *, Mann-Whitney U-test.

Table 05 presents the five items in the practical evaluation of BLS. For each item, the correct (C), partially correct (PC) and unrealized (UR) responses were considered. In the item "Check responsiveness", question 1, the groups had the following performance, IG (91.1 points) and CG (58.9 points),

p-value = 0.0051 * indicating a highly significant difference. In the item "Emergency service activation", question 2, the groups had a performance that indicated a non-statistically significant difference, IG (92.9 points) and CG (60.7 points), p-value = 0.0628.

Regarding the item "Quality chest compressions", question 3, the groups obtained the performance, IG (81.4 points) and CG (41.4 points), with p-value = 0.0012 * indicating a highly significant difference.

(79.7 points), p-value = 0.0009 * (Mann-Whitney U test). Table 06 shows the behavior of the answers of the questions of instrument II - evaluation of the BLS practical maneuvers of

Table 5. Distribution of BLS maneuvers comparisons in the practical evaluation between the two groups, Belém, Pará, 2017

Variables	Groups		p-value	
Maneuver	Answer	IG n (%)	CG n (%)	0.0641(Ns)
Item 1	Correct	10 (71.4%)	4 (28.6%)	0.0094*
	Partially Correct	4 (28.6%)	9 (64.3%)	
	Unrealized (UR)	0 (0.0%)	1 (7.1%)	
Item 2	Correct	14 (100.0%)	7 (50.0%)	0.0429*
	Partially Correct	0 (0.0%)	6 (42.9%)	
	Unrealized (UR)	0 (0.0%)	1 (7.1%)	
Item 3	Correct	7 (50.0%)	1 (7.1%)	0.4724(Ns)
	Partially Correct	7 (50.0%)	13 (92.9%)	
	Unrealized (UR)	0 (0.0%)	0 (0.0%)	
Item 4	Correct	13 (92.9%)	11 (78.6%)	0.0023*
	Partially Correct	1 (7.1%)	2 (14.3%)	
	Unrealized (UR)	0 (0.0%)	1 (7.1%)	
Item 5	Correct	13 (92.9%)	4 (28.6%)	0.0009*
	Partially Correct	1 (7.1%)	10 (71.4%)	
	Unrealized (UR)	0 (0.0%)	0 (0.0%)	

Source: Field research, 2017. * Chi-square of independence. Ns - Not significant.

Tabela 6. Assessment of BLS practical maneuvers, carried out with students of the Undergraduate Nursing Course. (IG, n = 14) and (CG, n = 14), Belém, Para, 2017

Practical evaluation items	IG	CG	p-value
Q1 - Check responsiveness	91.1	58.9	0.0051*
Q2 - Emergency service activation	92.9	60.7	0.0628 (Ns)
Q3 - Quality chest compressions	81.4	41.4	0.0012*
Q4 - Compression / ventilation ratio	92.9	78.6	0.5201 (Ns)
Q5 - Use of AED	99.0	79.7	0.0009*

Source: Field research, 2017. * Mann-Whitney U-Test. Ns - Not significant.

Table 7. Evaluation of the BLS practical maneuvers, performed with students of Nursing Undergraduate Course, (IG, n = 14) and (CG, n = 14), Belém, Pará, 2017

	IG	CG
Practical Maneuvers	(n=14)	(n=14)
Minimum	54.3	16.4
Maximum	83.3	83.3
Total Amplitude	29.0	66.9
Median	78.6	49.0
First Quartile	73.7	45.5
Third Quartile	83.3	61.6
Interquartile Deviation	9.6	16.1
Arithmetic Medium	76.2	53.2
Variance	80.3	291.6
Standard deviation	9.0	17.1
Standard error	2.4	4.6
Variation Coefficient	11.8%	32.1%

Source: Field research, 2017. p-value = 0.0007 *, Mann-Whitney U-Test.

Table 8. Ratings of participants in both groups, compared to the performance in the evaluation of practical activity, Belém, Pará, 2017

Variables	BLS		p-value
Unqualified	IG	CG	0.0013*
Low qualified	0	2 (14.3%)	
Qualified	0	7 (50%)	
Total	14 (100%)	5 (35.7%)	
	14 (100%)	14 (100%)	

Source: Field Research, 2017. * Chi-Square Test; ** Test G.

In the item "Compression / ventilation ratio", question 4, the p-value = 0.5201 indicates that the difference is not significant, IG (92.9 points) and CG (78.6 points). Regarding the item "Use of AED", question 5, the groups presented performance with a highly significant difference, IG (99.0 points) and CG

both groups. About evaluation of BLS maneuvers, the analysis of the set items showed that there was a highly significant difference between the two groups p-value = 0.0007 *. When the sum all the items of the practical maneuvers was calculated and the medium and median of each student were calculated, it

was verified that in the IG the median was 78.6 points and in CG the median was 49.0 points. In this way, it was verified that, *set all* items, the IG group presented better performance when compared to CG (Table 07). Table 08 presents the classification of participants, both groups, in relation to their performance in the practical activity. Considering the practical activities developed on BLS, we observed a statistically significant difference in the qualified classification of the IG in relation to the CG (*Chi-Square Test ** G Test).

DISCUSSION

Characteristics of Participants

The characterization of the studied nursing students demonstrated that this population is predominantly female and young. This result is in agreement other studies, in which the percentage of women was predominant (Bublitz *et al.*, 2015). Even with so many changes, nursing is still a profession mainly performed by women (Carrijo, 2012). Before the 1970s, when women's participation in the labor market was more limited, nursing was among the professions with the highest number of women employed. Care as life-sustaining conditions has always been attributed to the female gender throughout history, from the pre-patriarchal eras to the present (Leite *et al.*, 2011). Nursing is characterized by being a female profession, as it is related to its object of work, care, which is historically attributed as a feminine characteristic. However, a gradual increase of male students has been identified. Thus, we infer that nursing courses are undergoing transformations, leaving the idea of an exclusively female profession, although still predominant (Bublitz *et al.*, 2015). Related to the age range, in a survey conducted in 2012 by the National School of Public Health, in partnership with the National Federation of Nurses, the Brazilian Nursing Association and the Federal Nursing Council, characterized that nursing professionals focus on the range age group of 26 to 55 years old, and that the great majority is in the range of 26 to 35 years, which represents 35.98% of the total nursing professionals in Brazil (Silva; Nogueira; SÁ, 2016).

Results similar to the present study were found in a survey conducted in four Brazilian higher education institutions, three public and one private, one from the south region and three from the southeast region of the country, in which a young profile of the students was identified in the age group between 20 and 24 years old (50%), with a mean age of 24.21 years (Bublitz *et al.*, 2015). The presence of young academics in nursing courses may be related to the Brazilian government's incentive to enter higher education. However, as a young population, the choice of profession may be immature, which may lead to higher dropout rates in the course of the course (Freitas *et al.*, 2012, Bublitz *et al.*, 2015). On the forms of updating, it was observed that the internet was the most cited by the participants in both groups, allowing to infer that knowledge about the subject has a tendency to establish more in the theoretical scope than in practice when participating in the courses of BLS, which offer a technical-practical basis for the development of the skills and competences necessary to attend the cardiorespiratory arrest, since the courses offered approximate the theory of practice. A study carried out with 84 students of the undergraduate course in health showed that only the theoretical class with demonstration of the practice was not enough for the development of the psychomotor skills used in the CPR, being extremely necessary the practical

training, so that the success rate reached 90%. Simulation strategies are more realistic and meaningful learning, because they allow students to get in touch with the practice. Both knowledge (theory) and ability (practice) are essential in the construction of the teaching-learning process. Both of them complement each other and become inseparable in the conception of the final product, evidencing the importance of the theoretical classes associated to the practical classes (Kawakame; Miyadahira, 2015). It was demonstrated that only 01 (3.6%) of the students develop work activity. This result is in agreement with a study carried out with nursing students from four higher education institutions in the South and Southeast of Brazil, where 74.2% of the students do not develop any work activity (Bublitz *et al.*, 2015). 100% of the sample never performed training in BLS or any other training on the subject, leading to the understanding that the positive results in the students' performance in this research, compared to the BLS maneuvers using the AED was directly related to the training program offered.

Theoretical Knowledge about BLS

Since 1960, the main associations of specialists have shown concern and interest with issues of dissemination, standardization of training of health professionals and population in general to attend to cardio respiratory arrest. Since then international meetings have been held to review and update the guidelines (Gonzalez *et al.*, 2013, AHA, 2015). CPR training is recommended on a periodic basis, in order to train the teams for a fast, safe and effective service, within what is recommended by the AHA, as well as to maintain the homogeneity of the conduits (Soar *et al.*, 2010; Soar *et al.*, 2015). The Inter-American Heart Foundation recommends that health professionals receive constant training that focuses on attending a patient in a cardiorespiratory arrest, and recommends that these be disseminated in a uniform manner through the standardization of procedures and techniques. This recommendation emphasizes that training improves the quality of the victim's care in cardiorespiratory arrest, since the procedure will be performed in a faster, organized, calm and effective way (Citolino Filho *et al.*, 2015). The nurse, for assisting the patient for 24 hours a day and possessing technical skills and scientific knowledge is, in most cases, the first professional to detect this event in the hospitalization units, initiating CPR through BLS (Citolino Filho *et al.* 2015). The success of cardiorespiratory arrest depends on continuous training of professionals, with the acquisition of sufficient knowledge, skills and competences to initiate effective CPR maneuvers (Källestedt *et al.*, 2012).

These factors, associated with the organized work environment and, above all, the harmony and synchronism of the whole multiprofessional team contribute to the excellence of the patient care in cardiorespiratory arrest (Sjöberg; Schönning; Salzman-Erikson, 2015). Nursing students have been the subject of discussions and research that have demonstrated their knowledge about CPR maneuvers. A study carried out with nursing undergraduates from the 8th period found that few students had enough knowledge to act in cardiorespiratory arrest. This lack of knowledge, among other reasons, may be linked to academic training, which leads to reflection on the teaching-learning process related to the approach of this content in the undergraduate course (Gomes; Braz, 2012). The academic preparation of nurses demands the need for conceptual and methodological theoretical training that

enhances competencies for completeness. Thus, among the essential competences for the practice of nursing practice in emergencies, clinical reasoning for decision making and the ability to perform interventions are emphasized (Salvador *et al.*, 2012). In this context, a training program was developed and applied to the students of the Undergraduate Nursing Course. Through this study it was possible to reinforce the idea of the importance and benefits gained from the realization of an education program in BLS, as shown in the following data. The diagnosis of cardiorespiratory arrest is confirmed when there is unconsciousness, apnea or (*gasp*) and absence of pulses in the large arteries (Nolan *et al.* 2010; Nolan *et al.* 2015; Hazinski *et al.* 2015). Considering that the adequate resuscitation performed by the nurse is a determining factor in the survival rates of the cardiorespiratory arrest episodes, and that it is usually the first professional to encounter such an event (Bertoglio *et al.* 2008), knowledge about the initial maneuvers will favor the success of resuscitation. In this study, we observed that both groups obtained correct and partially correct answers on BLS questions, and there was no statistically significant difference. However, the behavior of the performance of the IG in relation to those of the CG differed in the form of presentation. A better IG performance was observed, which, although not statistically significant, maintained a higher level of knowledge than CG.

According to the data obtained it can be observed that both groups presented similar results in relation to knowledge about BLS. This fact may be related to the content addressed in the training program, which followed the standardizations present in the AHA 2015 guideline for BLS, which brings an easily applicable approach, with emphasis on the principles of resuscitation education. Corroborating the findings, in a study carried out in a public university located in the Recôncavo Sul region of the State of Bahia, considering that the first step to initiate the CPR maneuvers in the BLS is the recognition of the victim in a cardiorespiratory arrest, the graduates were asked about the clinical signs of a cardiorespiratory arrest, and 87.5% of nursing students were able to correctly answer this question (Silva *et al.* 2015). The results from the students' performances in this research lead to the conclusion that there was student learning, as opposed to the BLS maneuvers using the AED. It should be emphasized that in the evaluation of the set (medium of the six questions) a highly significant difference between the two groups was found, p -value < 0.0001 . When the sum of all knowledge items was calculated and the medium and median of each student was calculated, it was verified that in the IG the median was 100 points and in the CG the median was 78.4 points. Thus, in the set of all items, the IG group presented better performance when compared to the CG.

Performance of BLS practical activities

Much of CPR's success is due to nurses' ability to perform qualitative care in this context. Thus, nurses need to know how to act effectively in the face of these occurrences (Silva *et al.*, 2015). Practical BLS maneuvers basically correspond to the primary CABD and should be well disseminated among health professionals both intra- and pre-hospital, and also for society (AHA, 2015). Authors have been unanimous in referring to cardiorespiratory arrest as an extreme emergency, the results of which may lead to irreversible sequelae and death, if adequate measures are not adopted in a timely manner (Gonzales *et al.*, 2013). In the event of a cardiorespiratory arrest, the diagnosis should be rapid and precise, the emergency service should be activated immediately, and high-

quality CPR procedures should be started early, considering that the correct execution of CPR is listed among the factors determinants for survival during the first 24 hours, and also one of the main determining factors for patient survival (Silva *et al.*, 2016). It was verified in the analysis of set items that the IG participants presented better performance in the items "Check responsiveness", "Quality chest compressions" and "Use of AED" respectively, highly significant difference between the two groups, p -value = 0.0007 * (Mann-Whitney U-Test). A statistically significant difference was observed in the "qualified" classification of IG in relation to CG. The IG presented 100% of the qualified participants. Differently, in the CG, the percentages of "unqualified" and "low qualified" were around 14.3% and 50%, respectively, demonstrating that these students were unprepared for BLS maneuvers. In the evaluation of all the BLS maneuvers, the IG and CG groups showed that more than 50% of the participants are partially prepared to perform the safe approach to the scene, to detect the clinical signs of cardiorespiratory arrest, to call for help and to position themselves, as a first responder as recommended by the international guidelines (AHA, 2015).

Comparative analysis among groups

The medium and median grades of the IG were above those of the CG in both the theoretical activities and the BLS practices, demonstrating that the training program applied with the use of the Virtual Learning Environment had a positive influence on the participants submitted to it in relation traditional teaching method. The retention of cognitive knowledge and psychomotor skills become significantly impaired around four or six months after completion of the training programs (Soar *et al.*, 2010; Soar *et al.*, 2015). In the practical activities of the BLS, 14 (100%) participants of the IG were considered "qualified", while in the CG we obtained 5 (35.7%) participants. According to the AHA, those individuals who obtain 84% or more of use in a standard structured questionnaire used for the evaluation of the training are considered qualified (AHA, 2015). Of concern, in a survey carried out in the State of São Paulo-Brazil through the application of 664 questionnaires on BLS, answered by students of higher education in the health area, similar to that used by the AHA in the BLS course, only one participant reached an equal score or greater than 84% (Tavares *et al.*, 2015). These data are in agreement with the present study, where the IG obtained a percentage of 100% of the qualified participants. The experience of the execution of this work allowed to observe and relate what has been described in the national and international literature that the realization of training programs with theoretical teaching strategies with practical application has a real and significant impact on the knowledge and skills of the participants and should be applied to all health professionals, beginning in the early years of graduation and being improved in the subsequent years of the course, preferably at intervals not exceeding three to six months, and that retention of theoretical knowledge and maintenance of technical skills are related to experience and application in daily practice. The course scenarios should approach the reality of the situation of cardiorespiratory arrest care in which professionals experience it, since the nurse is essential in this process (Soar *et al.*, 2010; Soar *et al.* 2015).

Conclusion

Many reflections were made during this study. It is more than seeking explanations of the facts, shared ideas, that throughout

the research were possible to think about the process of teaching learning and the strengthening of the processes that permeate the training of the Nurse. The objectives proposed for this study were reached and reinforced the thesis that adequate knowledge, attitudes and practices are fundamental elements in the qualitative formation in health. The results obtained in the present study allow us to conclude that the content addressed and the instruments used for the evaluation, favorably supported the execution and evaluation of the training program developed and implemented for BLS attendance, for undergraduate students in Nursing. It was verified that the performance of the IG participants was superior to the CG. There was real difference in knowledge and practical skills between groups. However, this difference was most noticeable in the practical skills of "Check responsiveness", "Quality chest compressions" and "Use of AED" questions. Considering these results, it is believed that the training program developed and offered with the use of a Virtual Learning Environment in a complementary way, which provided significant learning and better performance, could be used in the institution that was the scenario of this study, with the possibility to be adapted for use in other institutions, and also updated every publication of new Consensus. It is suggested that the training program should be applied regularly, quarterly or semiannually, since literature shows that there is a significant decline in knowledge and skills over time. Finally, despite the research question, this study had the following limitation: the involvement of undergraduate Nursing students in only one Higher Education Institution and the absence of follow-up and evaluation of the participants in later stages with the objective of evaluate the retention of knowledge and skills, which makes it difficult to generalize the results. Therefore, it is recommended to carry out similar research in other institutions, both nationally and internationally.

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