Artigo Original

COHORT STUDY TO EVALUATE NURSING TEAM PERFORMANCE IN A THEORETICAL TEST AFTER TRAINING IN CARDIOPULMONARY ARREST

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Objectives: To evaluate nursing professionals' theoretical knowledge of cardiopulmonary arrest (CPA) treatment before specific training, immediately after, and six months later. Methods: Cohort study, performed in a cardiology hospital in Porto Alegre, Rio Grande do Sul (November/2005 to May/2006), Brazil. Nurses, nursing technicians and assistants were included. A questionnaire was administered in the three periods, and 75% of correct answers was considered a satisfactory result. Results: Thirty-five nurses participated in the pre-test, and 34 in the immediate and 6-month tests. Among technicians and assistants, 232, 227, and 104 participated in the pre-test, immediate, and 6-months tests, respectively. Among nurses, 62.9% achieved an adequate percentage of correct answers in the pre-test, 94.1% in the immediate, and 64.7% in the 6-months test; for nursing technicians and assistants, these values were 36.2%, 79.3%, and 62.5%, respectively. Conclusion: Training in CPA improved the nursing professionals' knowledge immediately after its administration, with a reduction in the rate of correct answers after 6 months.

DESCRIPTORS: heart arrest; nursing; education

ESTUDIO DE COHORTE PARA EVALUAR EL DESEMPEÑO DEL EQUIPO DE ENFERMERÍA EN UNA PRUEBA TEÓRICA, DESPUÉS DE RECIBIR ENTRENAMIENTO EN PARO CARDIORRESPIRATORIO

El objetivo de este estudio fue evaluar el conocimiento teórico del equipo de enfermería en lo que se refiere a la atención de víctimas de paro cardiorrespiratorio (PCR) antes, inmediatamente después y transcurridos seis meses después del entrenamiento. Se utilizó el método estudio de cohorte, conducido en un hospital especializado en, Porto Alegre, RS (de noviembre/2005 a mayo/2006). Se incluyeron enfermeros, (35 en la pre-prueba, 34 en la post prueba y el mismo número después de seis meses), técnicos y auxiliares (232 en la pre, 227 en la post y 104 después de seis meses). Se aplicó un cuestionario en los tres períodos; se consideró 'conocimiento satisfactorio' a 75% de aciertos. Los resultados mostraron, en la pre-prueba, que 62,9% de los enfermeros alcanzaron el porcentaje considerado satisfactorio, en la post 94,1% y transcurridos seis meses, 64,7%. Entre los técnicos y auxiliares, en la pre, 36,2% alcanzaron el porcentaje considerado satisfactorio, en la post 79,3% y 62,5% después de transcurridos seis meses. Se concluye que el entrenamiento en PCR mejora el conocimiento del equipo inmediatamente después del entrenamiento, habiendo una reducción del puntaje de aciertos después de 6 meses.

DESCRIPTORES: paro cardíaco; enfermería; educación

ESTUDO DE COORTE PARA AVALIAR O DESEMPENHO DA EQUIPE DE ENFERMAGEM EM TESTE TEÓRICO, APÓS TREINAMENTO EM PARADA CARDIORRESPIRATÓRIA

O objetivo deste estudo foi avaliar o conhecimento teórico da equipe de enfermagem quanto ao atendimento a vítimas de parada cardiorrespiratória (PCR) antes, imediatamente após e decorridos seis meses de treinamento. Usou-se o método estudo de coorte, conduzido em um hospital especializado em cardiologia, Porto Alegre, RS (novembro/2005 a maio/2006). Incluíu-se enfermeiros (35 no pré-teste, 34 no pós e o mesmo número após seis meses), técnicos e auxiliares (232 no pré, 227 no pós e 104 após seis meses). Aplicou-se um questionário nos três períodos, considerando-se 'conhecimento satisfatório' 75% de acertos. Os resultados mostraram, no pré-teste, que 62,9% dos enfermeiros atingiram o percentual considerado satisfatório, no pós, 94,1% e decorridos seis meses, 64,7%. Entre os técnicos e auxiliares, no pré, 36,2% atingiram o percentual considerado satisfatório, no pós, 79,3% e 62,5% decorridos seis meses. Conclui-se que o treinamento em PCR melhora o conhecimento da equipe logo após o treinamento, havendo redução do escore de acertos após 6 meses.

DESCRITORES: parada cardíaca; enfermagem; educação

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INTRODUCTION

Cardiopulmonary arrest (CPA) care is considered successful if there is early diagnosis of the heart arrest signs, fast activation of emergency care, immediate use of basic support and life assessment, including electric defibrillation, and the early use of pharmacological agents. These stages are all linked and are indispensable to obtain completely successful cardiopulmonary resuscitation. CPA care outcome is directly related to the team's speed, and the chance of recovery depends on the immediate, competent and safe application of resuscitation measures [1].

In this setting, several studies have addressed the performance of patient care teams assisting CPA victims. For instance, a cohort study published in 2000 sought to determine the survival rate of intra-hospital post-CPA patients, related to the identification of CPA and care performance by nurses trained in Advanced Cardiac Life Support (ACLS), and by untrained nurses. That study showed a post-CPA survival rate of 38% for patients who received care from trained nurses, while the rate for patients who received care from nurses without ACLS[2] was 10%.

A recent study, which aimed to evaluate the human factors that could affect the quality of cardiopulmonary resuscitation care, found that health professionals fail to provide basic life support and defibrillation within an appropriate minimum period of time. In addition, lack of leadership and inadequate task distribution were associated with the team's poor performance[3]. Other studies have also evaluated how well the professionals maintain the knowledge and skills learned during CPA training courses. Those studies report that, if the skills are not systematically practiced or reviewed after training, the professionals' performance diminishes proportionally with time[4-5].

The scientific board of the institution addressed in the present study recently established the goal that the whole nursing team would be trained in cardiopulmonary resuscitation. The present study was designed based on that institutional strategy, with a view to following the effectiveness of the training program. The purpose is to evaluate the nursing team's theoretical knowledge regarding patient care during CPA before training, immediately after the course and six months later.

METHODS

This is a cohort contemporaneous study, performed at a cardiology hospital located in the city of Porto Alegre, in the state of Rio Grande do Sul, Brazil, from November, 2005 to May, 2006. Subjects were nurses, nursing technicians and assistants who were regular workers at the hospital during the data collection period, had been trained in CPA and were willing to take part in the study. Any employees on probation were excluded, as well as the nurses responsible for the training. Data collection was done using three closed questionnaires: one for nurses (nine questions), and another for nursing technicians and assistants (12 questions). Both questionnaires contained questions that addressed the care delivered to CPA patients, from the first detection measures to defibrillation and administering drugs in cases of CPA, according to the new guidelines[1]. These questionnaires were administered at three points in time: before training, immediately after, and six months later. The project was approved by the institution's Research Ethics Committee, and the participants were included in the study after having read and signed the free and informed consent term.

The training course was carried out from November, 2005 to February, 2006. The program was coordinated by nurses certified in ACLS and the groups consisted of one nurse and five nursing technicians or assistants. The training time was two hours, divided into the theoretical portion, based on the knowledge regarding basic and advanced life support, and a practical component, based on adequate cardiopulmonary resuscitation, from monitoring the patient up to and including advanced support. The course was held at a place equipped with a mannequin and CPA simulations. Although the team responsible for the training course did not establish parameters with correctness percentages to evaluate the team's performance after the test, previously published data state that 75% of correctness after training programs is considered to be satisfactory[6].

Statistical analysis

The analyses were done using *Statistical Package for Social Sciences* (SPSS) 12.0. The categorical variables were expressed in percentages or absolute value, as continuous variables, and as means ± standard deviation. To compare continuous

variables between groups, Student t and ANOVA tests were used for the parametric values and Kruskall-Wallis for non-parametric values. The Chi-square test was used to understand the categorical values, considering values significant for $p<0.05$.

RESULTS

Sample characteristics

Of all the nurses working at the institution (n=52), 35 took part in the pre-test, and 34 in the post-test and in the test six moths later. They answered the questionnaire in the three evaluation periods. These professionals' average age was 32±7.3 years. Of all nursing technicians and assistants (n=362) working at the institution, 232 took part in the pre-test, 227 in the post-test, and 104 in the test held six months after the training course. These professionals' average age was 35.6±8.2 years. There were more women than men. Among the nurses working in clinical and surgical hospitalization units during the training period (n=32), 17 answered the pre-test, 18 the post-test, and 12 answered the test six months after the training course. Of all nurses from the intensive care unit (n=20), 14 participated in the pre-test, 13 in the post-test, and 19 in the test held six months later. In terms of the total number of nursing technicians and assistants working at the institution (n=362), 167 worked in clinical and surgical hospitalization units, 106 of which answered the pre-test, 98 answered the post-test, and 57 answered the test six months later. Of the 195 professionals working in intensive care units, 125 participated in the pre-test, 129 in the post-test, and 47 in the test six months after training.

Nurses' performance on the theoretical test

In the nurse group, the questions that showed different frequencies of correct answers in the theoretical test held before training, after training, and six months later referred to the joules load in the first defibrillation, the compression/ventilation ratio, and the number of compressions per minute. For the other questions, the performance on the theoretical test did not differ between evaluation periods. Other data are shown in Table 1.

Table 1 - Nurses' performance in the theoretical test before training, after training, and six months later. Porto Alegre, November 2005 to February 2006

Questions	Correct answers			* p
	Pre-test (n=35)	Post-test (n=34)	Six months (n=34)	
First procedure in case of CPA	24 (68.6)	28 (82.4)	21 (61.8)	0.16
Joules of the 1st defibrillation	18 (51.4)	31 (91.2)	16 (47.1)	<0.001
Types of CPA	30 (85.7)	32 (94.1)	31 (91.2)	0.49
Location on the thorax/compressions	28 (80)	32 (94.1)	27 (79.4)	0.16
Number of compressions/ventilation	32 (91.4)	34 (100)	27 (79.4)	0.016
Number of compressions /minute	20 (57.1)	32 (94.1)	26 (67.6)	0.002
1st procedure when patient is being monitored	24 (68.6)	15 (44.1)	19 (55.9)	0.12
Rhythm to apply defibrillation	31 (88.6)	34 (100)	31 (91.2)	0.14
Recognizing CPA signs	34 (97.1)	32 (94.1)	33 (97.1)	0.76

* Pearson's Chi-square test presented with n (%); CPA (cardiopulmonary arrest)

Nurses were expected to give 75% of correct answers in the theoretical tests. In the pre-test 22/35 (62.9%) reached that percentage. After the training course, 32/34 (94.1%) reached the performance level of 75%, and 22/34 (64.7%) six months later.

Comparing nursing technicians and assistants in terms of their performance on the theoretical test, it was observed that there was a significant difference in the frequency of correct answers to every question was observed in the pre-test, post-test, and in the test six months later. The team's performance immediately after the training course was better in ten out of twelve questions. Six months later, six questions showed a reduction in the score compared to the post-training period and, in six others, the percentage with 75% was greater. The other data are shown in Table 2.

Table 2 – Nursing technicians' and assistants' performance on the theoretical test before training, after training, and six months later. Porto Alegre, November, 2005 to February, 2006

	Correct answers			
	Pre-test (n=232)	Post-test (n=227)	Six months (n=104)	* p
Material from the first drawer of the CPA cart	139 (59.9)	177 (78)	62 (59.6)	<0.001
CPA definition	216 (93.1)	196 (83.3)	99 (95.2)	0.01
First procedure in case of CPA	93 (40.1)	149 (65.6)	66 (63.5)	<0.001
Types of CPA	103 (44.4)	143 (63)	78 (75)	<0.001
Location on the thorax/compressions	134 (57.8)	140 (61.7)	81 (77.9)	0.002
Number of compressions/ventilation	145 (62.5)	221 (97.4)	83 (79.8)	<0.001
Number of compressions /minute	87 (37.5)	199 (87.7)	68 (65.4)	<0.001
Thorax compression (centimeters)	126 (64.3)	193 (85)	62 (59.6)	<0.001
Keeping the airway open	215 (92.7)	225 (99.1)	104 (100)	<0.001
First attitude when the CPA car arrived	132 (56.9)	210 (92.5)	85 (81.7)	<0.001
Drugs used in case of CPA	227 (97.8)	216 (95.2)	104 (100)	0.034
Basic support	143 (61.6)	104 (45.8)	72 (69.2)	<0.001

*Pearson chi-square test. Data presented with n (%); CPA (cardiopulmonary arrest)

Considering the expected 75% performance for nursing technicians and assistants in the theoretical test, 84/232 (36.2%) achieved that goal in the pre-test. In the test immediately after training, 180/227 (79.3%) achieved the expected 75% and, in the test six months later, 65/104 (62.5%) reached that index.

Mean correct answers in the test before, after and six months after training

For nurses, the mean score was 6.8±1.6 in the pre-training test, 7.9±0.9 in the post-test, and 6.7±1.6 after six months, from a total of 9 points (p=0.001). This difference was significant between the pre and post periods (p=0.006), and between the post-test and six-month test period (p=0.001). Data are shown in Figure 1.
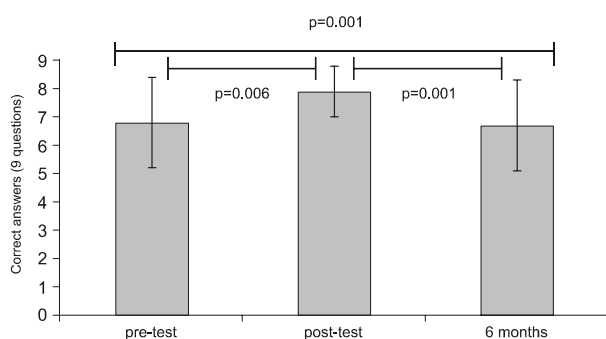

Figure 1 – Mean correct answers among nurses in the theoretical test before training, after training, and six months later (ANOVA)

In terms of the nurses' average score on the test and their work unit (hospitalization or intensive care units), it was observed that professionals working in the intensive care unit had a higher mean score than the mean score among nurses working in the hospitalization unit in the test before (7.6±1.1 vs 6.2±1.8; p=0.013) and after (8.3±0.8 vs 7.7±0.8; p=0.046) training. There was no difference in the test performed six months after training.

As for technicians and assistants, the mean score in the pre-test was 7.6±1.8, against 9.6±1.5 in the post-test, and 9.3±1.8 (p<0.001) after six months, out of a total 12 points. This difference was significant between the pre and post (p<0.001) periods, and between the pre-training and six-months-later periods (p<0.001), as shown in Figure 2.
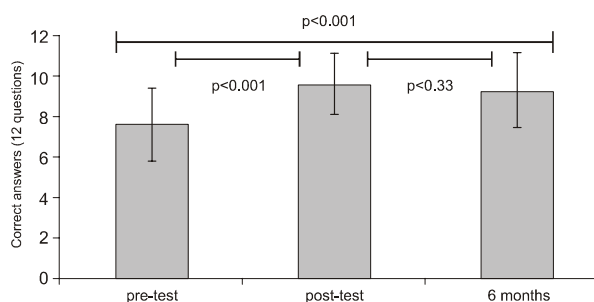

Figure 2 – Mean score among technicians and assistants in the theoretical test before training, after training, and six months later (ANOVA)

In terms of the mean score and the work unit of nursing technicians and assistants, there was no difference in the pre and post period. In the period after six months, the professionals working in intensive care units had the highest mean score (10.2±1.4 vs 8.4±1.7; p<0.001).

DISCUSSION

This study showed that the knowledge of the nursing team as measured by a theoretical test was lower before training. Among the nurses, slightly over 60% achieved a satisfactory percentage. As for the team of technicians and assistants, this percentage was even lower (36.2%). Immediately after training, 94.1% of the nurses and 79.3% of the other professionals achieved the percentage recommended as "satisfactory knowledge". In the theoretical test evaluation, after six months of training, every professional showed a lower score. As to the participation of nurses, assistants and technicians working in the institution when the training occurred, proportionally higher participation by those working in the intensive care unit was observed. This may be related to the fact that the more people realize the possible practical application of the knowledge, techniques, and attitudes learned in a training course, the stronger their participation[7].

As to the performance in the theoretical test, the literature has presented similar results. A study that evaluated the knowledge and practical skills in basic life support of 19 nurses, after three hours of a recycling course, showed an initial improvement, with a significant reduction in knowledge after 10 weeks. The findings were attributed to the fact that, if the skills are not practiced or used regularly, there is a decrease in what was learned[4]. Another study, which tested a similar strategy, investigated at what point nursing students acquired and assimilated knowledge in cardiopulmonary resuscitation. Tests were performed before a four-hour training course about cardiopulmonary resuscitation, and two and a half months after the course.

The results showed better performance shortly after the training course, but a significant reduction in performance two and a half months later; nevertheless, there were improvements in the results compared to the pre-test, which suggests a positive knowledge assimilation[5].

Although only the theoretical knowledge of the nursing team was evaluated, this study's findings are in agreement with these and other studies that show that the professional's knowledge retention is harmed in a three-month period, significantly decreasing within 6 to 12 months after the training course. Hence, it is stressed that the knowledge and skills acquired during a training program reduce with

time[6,8-9]. On the other hand, perhaps the team that attended the training course did not seek, on its own, strategies to maintain the skills acquired in the training course.

Authors of a 2004 study evaluated if the frequency of an Immediate Life Support course affected the nurses' performance. In this study, the authors collected data in every instance of CPA care over the preceding twelve months, before and after implementing the course. The study results showed that the nurses felt confident during the CRA care delivered shortly after the course but that, with time, they felt incapable of performing the competencies without supervision[10]. These results reinforce the need for systematic and more frequent training since, in fact, the acquired knowledge is reduced and abilities are lost if they are not practiced.

Among the nurses from intensive care units, the mean score in the pre- and post-training period was significantly higher compared to those working in hospitalization units. This difference did not occur after six months of training. Among technicians and assistants, the professionals from intensive care units only had a higher mean score than those working in hospitalization units in the test held six months after the training course ($p < 0.001$). These data suggest that professionals from critical units work with more unstable patients and that, therefore, there is a greater chance of being involved in CPA situations. In this environment, these professionals can practice their abilities and competencies.

Study limitations

Some limitations should be highlighted in the present study. Since the training course was a goal established by the studied institution's scientific nursing commission, there was no interest in identifying the team that answered the questionnaire. This made it less feasible to perform individual analyses during the studied periods.

CONCLUSIONS

This study showed that the nurses' performance on the CPA theoretical test was worse than before the training course. After training, 90% of those professionals achieved the recommended score for a satisfactory performance, but the score

reduced after six months. The nursing assistants had a similar performance to that of nurses in the tests before training, after training, and six months later.

These results support the data from the literature, showing there is a need to maintain continuous training in cardiopulmonary resuscitation. Institutions should invest in regular training programs, implementing theoretical and practical sessions, with an increased exposure to possible CPA cases. Furthermore, professionals should seek research strategies with a view to improving and maintaining their own performance over time. It is believed that additional studies, comparing different time periods after the training course and evaluating individual performances, if necessary, would provide valuable information.

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