

An *In Loco* Theoretical and Practical Training Program for Nursing Professionals Regarding the Basic Maneuvers in Cardiopulmonary Resuscitation

Programa de Treinamento Teórico/Prático *In Loco* para Enfermagem Acerca das Manobras Básicas em Ressuscitação Cardiopulmonar

Programa de Formación Teórico/Práctico *En Loco* de Enfermería Sobre las Operaciones en Reanimación Cardiopulmonar Básica

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ABSTRACT

Objective: The study's purpose has been to evaluate an *in loco* theoretical and practical training program for nursing technicians and auxiliaries regarding the basic maneuvers in cardiopulmonary resuscitation. **Methods:** It is a quasi-experimental study that was carried out from August to October 2015. The study's participants were 96 nursing technicians and auxiliaries from a public hospital in the metropolitan region of São Paulo State. An instrument with twenty closed questions was applied before and immediately after the training. The results were analyzed by the Wilcoxon signed-rank test. **Results:** The nursing technicians and auxiliaries showed better performance in the post-test, respectively, 161% and 180%. The greatest performance was in the recognition of cardiorespiratory arrest (CRA), 83.3% for auxiliaries and 83.6% for technicians. One of the main limitations of the study is that there has been no data collection regarding the professional practice before and after the training. **Conclusion:** The training program proved to be effective since there was a significant increase in the correct post-test.

Descriptors: Cardiopulmonary Resuscitation, Continuing Education, Nursing.

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RESUMO

Objetivo: Avaliar um programa de treinamento teórico/prático *in loco* para técnicos e auxiliares de enfermagem sobre manobras básicas em ressuscitação cardiopulmonar. **Método:** Estudo quase-experimental desenvolvido de agosto a outubro de 2015. Participaram 96 técnicos e auxiliares de enfermagem de um hospital público do interior de São Paulo. Foi aplicado um instrumento com vinte questões fechadas, antes e imediatamente após a capacitação. Os resultados foram analisados pelo teste de Wilcoxon pareado. **Resultados:** Os técnicos e auxiliares apresentaram melhor desempenho no pós-teste, respectivamente, 161% e 180%. O maior desempenho foi no reconhecimento da parada cardiorrespiratória (PCR), 83,3% para auxiliares e 83,6% para técnicos. Uma das principais limitações do estudo foi não se ter realizado nenhuma coleta de dados em relação à prática profissional antes e após o treinamento. **Conclusão:** A intervenção realizada mostrou-se eficaz, já que houve aumento significativo nos acertos do pós-teste.

Descritores: Ressuscitação Cardiopulmonar, Educação Continuada, Enfermagem.

RESUMEN

Objetivo: Evaluar un programa teórico / práctico en *el lugar* de los técnicos y auxiliares de enfermería en maniobras básicas de reanimación cardiopulmonar. **Método:** Estudio cuasi-experimental de agosto a octubre de 2015. Participó 96 técnicos y auxiliares de enfermería de un hospital público en el interior de Sao Paulo. Se aplicó un instrumento con veinte cuestiones cerrado antes e inmediatamente después se aplicó la formación. Los resultados se analizaron mediante el test de Wilcoxon. **Resultados:** Los técnicos y auxiliares tuvieron mejor desempeño en la prueba posterior, respectivamente, 161% y 180%. La mejor actuación fue en reconocimiento de parada cardiorrespiratoria (PCR), 83,3% de auxiliares y 83,6% para los técnicos. Una limitación importante de este estudio es no haber realizado ninguna recopilación de datos en relación con la práctica profesional antes y después del entrenamiento. **Conclusión:** La intervención realizada fue eficaz, con aumento significativo de éxitos posteriores a la prueba.

Descriptorios: Reanimación Cardiopulmonar, La Educación Continua, Enfermería.

INTRODUCTION

Cardiovascular diseases are among the most frequent diseases in the population. Among them the cases of Cardiorespiratory Arrest (CRA) stand out, just in Brazil they present an estimated 200,000 occurrences per year, half of which in the in-hospital setting and the other half in the out-hospital.¹

CRA is characterized by abrupt loss of cardiac and pulmonary function in individuals affected or not by heart disease. Such dysfunction is triggered by cardiac arrhythmia developed in the stopping process. Arrhythmias are related to any change in the natural conduction of electrical stimuli in the myocardium which can cause the heart rate to increase, decrease or cease, causing ineffective blood pumping to the lungs, brain and other organs.²⁻³

Given the seriousness of the cardiac pump failure, the health team must be alert to the signs that indicate the CRA and are ready to act in an agile and effective way in its reversal. Studies indicate that early defibrillation within 3

to 5 minutes of collapse may produce survival rates of 50-70%.^{4,5} Therefore, it is imperative that professionals must be periodically trained to follow CRA care recommendations and execute with excellence the Cardiopulmonary Resuscitation (CPR).⁵

The importance of training and continuing education is reinforced by the literature in relating the elapsed interval of training with the level of knowledge of the professionals, in other words, the dominance of cardiopulmonary resuscitation maneuvers decreases as the duration of training increases.^{6,7}

Another undoubted advantage of continuing education is the awareness of health professionals when they report the need to keep up to date and train their skills in order to improve the care provided to their patients.^{8,9}

Corroborating the above, some studies demonstrate the low level of knowledge in tests without prior training⁹ and the immediate improvement in the level of professional performance after a training program.¹⁰

The study's goal was to evaluate an *in loco* theoretical and practical training program for nursing technicians and auxiliaries regarding the basic maneuvers in cardiopulmonary resuscitation.

METHODS

It is a quasi-experimental study with non-equivalent groups developed from August to October 2015, which was carried out in a public hospital from the metropolitan region of *São Paulo* State. The intervention was theoretical and practical training, where the outcome was the knowledge level about the guidelines for cardiopulmonary resuscitation.

The methodological development was divided into two stages: the application of a pre-test and an *in loco* theoretical and practical training, and also the application of a post-test, all of them under the responsibility of researchers linked to a public university from the metropolitan region of *São Paulo* State. The schedule for the training was drawn up between the researchers and those responsible for the hospital to meet the demand of professionals from different sectors and shifts, morning, afternoon and evening, with a maximum duration of three hours per session. Therefore, the trainings were performed in the morning, afternoon and night periods.

The sample was randomized. The hospital has 396 employees between nursing technicians and auxiliaries, and the trainings were available to all professionals willing to participate.

All nursing technicians and nursing auxiliaries at the institution were invited to participate in both training and research, and of the total number of practicing professionals, the training sample consisted of 117 professionals, 91 technicians and 26 nursing assistants. Pre and post-

-training data were used for 96 nursing trainees (82.05% of the total training sample), since 21 pairs of tests were excluded because 30% of the questions were not filled out.

The inclusion criteria were: technical professionals or nursing auxiliaries who agreed to participate in the research voluntarily, were in regular exercise in the institution during the collection period and participated in all the steps proposed for the study. The exclusion criterion was: not to answer more than 30% of the questions of the instrument.

The tests were composed of sociodemographic questions and a pre-validated road map based on previous research instruments⁸⁻⁹, with twenty multiple choice questions related to CRA and CPR, according to the proposal of the 2010 CRA Guidelines for American Heart Association, which was in force during the period of training. The subjects covered the subjects related to basic life support, capacity for CPR care, recognition of a CRA, carotid pulse evaluation, request for help, activation of the emergency medical service, positioning of the victim and the patient. The correct sequence and location of CRA maneuvers, specific depth of chest compression, number of compressions per minute during resuscitation, patterns of rhythms found in a CRA, time interval in which heart rate during CPR is evaluated in ventricular fibrillation (VF) and pulseless ventricular tachycardia (PVT), non-shockable cardiac rhythms, airway permeability in a non-traumatic victim, airway opening procedure in a trauma victim, compression/ventilation ratio and correct use of the automatic external defibrillator (AED), electrical charge for defibrillation in an AED monophasic and biphasic.

For the theoretical training, a multimedia was used referring to the expository class of the subject with duration of fifty minutes. The practical training was performed by stations, separately training each block of actions: thoracic circulation/compression and airway opening/ventilation; A simulation of care for a patient with CRA was also performed, counting on the support of appropriate materials for each situation and mannequins adapted for this purpose, as recommended by the guidelines of the European Resuscitation Council.^{11,12}

The research project was approved by the Ethics Committee in Research of the *Universidade Federal de São Carlos*, according to Legal Opinion No. CAAE: 42678915.5.0000.5504 and the participants authorized the use of the data for research through the signing of the Free and Informed Consent Term.

The general evaluation of the behavior of the data sets was made through descriptive and exploratory analysis, with the aid of the Software R. The normality of the data was verified by means of the Kolmogorov-Smirnov test and it was not significant. This certifies that the data did not assume a normal distribution; therefore, it was necessary to apply a non-parametric test for the statistical analysis.

The Wilcoxon signed-rank test was applied in order to evaluate the possibility of a difference between the proportion of correct answers in the pre- and post-training moments. In this sense, the test aimed to show whether or not the intervention was influential in the responses of the individuals who participated in the training, and also to measure this difference.

RESULTS AND DISCUSSION

From a total of 96 professionals, 78 (81.3%) were nursing technical and 18 (18.8%) were nursing auxiliaries. The majority were women (78.1%), with a minimum of 18 years old and a maximum of 56 years old.

The professionals reported a frequency of contact with CRA characterized as “sometimes” (51.0%) or “always” (38.5%) and self-described as poorly trained (46.9%) or trained (46.9%) for the patient care in CRA. Despite the high frequency of contact with CRA, many professionals feel inadequate, confirming the importance of continuing education and training. However, the number of participants calling themselves qualified is still far beyond that of another study in which only 5.9% of the health professionals surveyed felt qualified.¹⁶ On the other hand, this study showed that most participants already had participated in Basic Life Support (BLS) training courses when compared to other studies^{8,10} in which professionals had never participated in similar training.

The other descriptive data are shown in **Table 1**, which also characterizes the professionals in the hospital sector in which they work. The sector may be critical (Intensive Care Unit) where the frequency of CRA cases is generally higher when compared to the frequency of occurrences in the other sectors; or a non-critical sector (wards, maternity, surgical center), where CRA cases are less frequent.

Table 1 – Participants’ characterization in each evaluated subgroup. São Carlos, SP, 2015.

VARIABLE	n	(%)	
Working unit	Critical	35	35.4
	Non critical	58	58.6
	NR*	6	6.1
Have you made course in BLS**	Yes	58	60.4
	No	37	38.5
	NR	1	1.0
Experience time	1 to 3 years	38	39.6
	3 to 5 years	18	18.8
	5 to 10 years	26	27.1
	> than 10 years	11	11.5
	NR	3	3.1
Contact with CRA***	Never	9	9.4
	Sometimes	49	51.0
	Always	37	38.5
	NR	1	1.0
Capable of acting during a CRA event	Untrained	0	0.0
	Poorly trained	45	46.9
	Trained	45	46.9
	NR	6	6.3

Source: Authors.

Note: *NR - No response; **Basic life support; ***Cardiorespiratory arrest

Table 2 shows the overall performance of the participants, including the Wilcoxon test and the p-value, which showed a statistically significant difference in the proportion of correct answers between the two analyzed times, which validates the training. **Table 1** presents the professionals' performance in each question. One can notice an improvement evident in 90% of the questions, those of numbers 3 to 20, in which the number of hits in the post time was superior to the pre-training time. There were exceptions to questions 1 and 2, since the correct answers were superior in the pre-training time and, in the question of number 2, in which the answers were similar in both times analyzed.

Table 2 – Descriptive results and the scores correlation in the pre- and post-training tests. São Carlos, SP, 2015.

TEST	AVERAGE	SD	MEDIAN	MIN	MAX	P-VALUE
PRE	0.428125	0.118945	0.4	0.2	0.75	<0.00001
POST	0.701041	0.137836	0.7	0.35	0.95	

Note: – SD = Standard deviation; MIN - Minimum; MAX – Maximum.

Table 3 – Score percentage in both pre- and post-test. São Carlos, SP, 2015.

Questions' Topics	Relative frequency in the pre-test (%)	Relative frequency in the post-test (%)
1. CRA identification	83	67
2. Positioning of the victim for maneuvers of CPR	92	92
3. Correct sequence of CPR with the use of the AED	56	85
4. Patterns of rhythms found in CRA	37	75
5. Heart rate evaluation interval in VF and PVT	11	59
6. Non-Shockable Heart Rhythms	22	56
7. Artery for pulse check in adult	34	87
8. Emphatic maneuver in BLS	49	76
9. Best way to ventilate the patient	65	82
10. Permeabilization of the airways in victims without trauma	16	55
11. Opening of airways in trauma victims	12	50

12. Ventilation/Rescuers ratio	37	54
13. Location of doing CPR maneuvers	41	48
14. Chest compressions depth	19	42
15. Number of chest compressions by minute	53	88
16. Correct sequence when using the AED	35	44
17. Adequate conduct in case of the AED does not detect rhythm requiring shock	78	86
18. Correct use of the AED in victims at increased risk of CRA	43	89
19. Electric charge for defibrillation in a monophasic AED	18	62
20. Electric charge for defibrillation in a biphasic AED	21	49

Comparing the professional categories, the average of both technical and auxiliary hits increased and the percentage performance gain was, respectively, 161% and 180%. When evaluating the percentage of correct answers in each question, separated by categories, a greater improvement in the performance of the auxiliaries was observed. In the pre-test their general grades were lower in relation to the technicians, but in the post-test they had a better performance evolution when compared to the index of the colleagues.

Finally, by grouping the test questions into themes, namely: Recognition of CRA, Cardiac Rhythms in CRA, Reestablishment of Circulation, Adequate Supply of Oxygenation and Defibrillation, a significant increase of correctness was observed in all topics after training, as can be evidenced in **Table 4**.

Table 4 – Score percentage of the pre and post-training correct answers among the participants according to their professional category and by topic. São Carlos, SP, 2015.

Topic	Professional Category		
	Nursing Auxiliary		Nursing Tech
	% Pre	% Post	% Pre
Recognizing a CRA*	59.7	83.3	68.5
Heart Rhythms	22.2	62.9	24.7
Oxygenation	27.7	62.2	37.4

Circulation	33.3	59.2	38.0
Defibrillation	36.6	66.6	39.7

Source: Authors.

* PCR - Parada cardiorespiratória

The survival rate of patients undergoing CRA is largely related to the professionals' ability to identify it and perform basic and advanced maneuvers for life support, quickly and accurately. Because they are the first to identify a CRA event, the nursing professionals' performance in the hospital environment can be decisive in increasing the likelihood of these patients living.^{5,10}

The Brazilian nursing situation portrayed in this research is mostly carried out by nursing technicians, in detriment of the nursing auxiliaries¹⁰, with a predominance of females^{8,10-13}, young adults¹⁰⁻¹³ and with little experience in their areas¹⁰⁻¹⁴, reflecting the high turnover in the exercise of this profession.

It should be emphasized that the prevalence of nursing technicians within health institutions is supported by legislation, which guarantees to this category a greater diversity of activities when compared to the activities that the nursing assistant is able to perform. However, the legislation does not point out specific differences in the attributions of these professionals in cardiopulmonary resuscitation.¹⁵

The strategy of continuing education in the theoretical and practical model presented here was chosen because it presents better scientific results related to the learning of the BLS maneuvers.^{14,17} The choice of in loco training is justified by the proximity of the worker with the training opportunity, favorable time to enable larger teams without harming the workflow. Thus, it was possible to recruit a larger number of professionals for the project.¹¹ The results showed a low average of correct answers in the pre-training time (42.8%). Considering the fact that the sample was composed of a significant number of professionals who had not been updated on the subject (37%), another part (39.6%) had between 1 and 3 years of work and 58, 6% worked in non-critical units, it is inferred that these factors contributed to the low correct average in the pre-test and reinforce the importance of continuing education for the improvement of professionals.

In a training¹⁰ conducted with nursing professionals from a private institution, the authors observed that the team's BLS pre-training score was low (4.1 points), and indicate factors that may have influenced this result as the time gap in the formation of the professionals and the lack of courses to update knowledge, in the meantime, added to the absence of programs of permanent education in health institutions. Similar findings were found in other studies that also demonstrated a deficiency in pre-training knowledge of professionals, proving the need for constant updates to reduce hospital mortality due to CRA events.^{13,18}

At the post-training moment, the average of hits was increased from 42 to 70%, confirming the effectiveness of the initial training proposal. In a comparative analysis, a study¹³

performed with the nursing team of a hospital specialized in cardiology, established as satisfactory a 75% accuracy index of the questions related to cardiopulmonary resuscitation training. The results of this study indicated an increase in nursing professionals who reached the goal in the post-test, and in the pre-test only 36.3% had obtained the minimum percentage of correct answers.

When comparing the performance (percentage gain) of the nursing technicians and auxiliaries in the two evaluating moments, it was possible to verify that the auxiliaries obtained a higher percentage of correct answers than the technicians in the post-test, corroborating the finding in another study¹⁰, which still is a possible cause to the lower level of knowledge in the training of auxiliaries in relation to the category of technicians.

When analyzing the evolution of participants from question to question, it was observed that in 90% of the questions there was an improvement in the number of correct answers of the post-test; similar to that found in the previous study.¹³

In contrast, the questions of numbers 1 (CRA identification) and 2 (correct positioning of the victim) did not follow this pattern; In the first question the number of hits fell in the post-test, a similar result occurred in another study⁹, while in the second the number of hits remained stable in both the pre and post moments. One limitation of the study was not to use a variable that could explain this finding.

The recognition of the clinical signs of a CRA event is fundamental to initiate the Survival Chain, namely: CRA confirmation, the mobilization of the emergency medical service and maneuvers of CPR, defibrillation and Advanced Life Support (ALS).¹⁹

The ability of nursing professionals in order to recognize a CRA situation is confirmed by studies of other authors.^{10,13} On the other hand, in one of them¹⁰, the results differed from those of this study because they showed that the participants presented greater difficulty in the pre-test questions that addressed the management of the airways. However, it is worth emphasizing that the reestablishment of the circulation appears as a facility at the post-training moment, also distinguishing itself from this study, where the theme is presented as difficulty at the same moment analyzed.

The results presented here reaffirm the need for a greater investment in the education of professionals, who, over time, are subject to knowledge deterioration, as explained in a study that evaluated the knowledge of nursing professionals in attending CRA events related to elapsed time of the training⁶, pointing out an inversely proportional relation between the time elapsed since the training and the number of successes in the knowledge tests.

CONCLUSIONS

Although the importance of the training of nursing professionals in the BLS and ALS maneuvers has been recognized,

training often does not occur due to operational difficulties and lack of a validated training system.

The present study allows to conclude that the intervention performed proved to be effective in its format, demonstrating that there was a significant increase in the percentage of correct answers in the post-test. The professional category with the best performance in the post-test was that of nursing auxiliaries. Most of the participants worked in non-critical units, had already undergone some course on BLS and had up to 3 years of nursing practice. Participants had a greater ability to recognize CRA, both pre- and post-test. The greatest difficulty in the pre-test was the identification of cardiac rhythms in the CRA and in the post-test was the question related to the reestablishment of the circulation.

One of the main limitations of the study is that there has been no data collection regarding the professional practice before and after the training. More than evaluating pre-test and post-test results, the institution's process and outcome indicators should have been evaluated in order to measure how the professionals acted during the care of the cardiorespiratory arrest episodes. Because, even though the professional have had good performance in the post-test, this is not always reflected in normal daily activities.

Another limitation of this study is due to the fact that the CPR maneuvers and the training participants have not been evaluated again after a longer period of time. Therefore, we suggest the development of further studies that can investigate the training intervals, the nursing staff's resourcefulness during episodes of cardiorespiratory arrest and the association of this circumstance with morbidity and mortality.

REFERENCES

- Gonzalez MM, Timerman S, Oliveira RG, Polastri TF, Dallan LAP, Araújo S, et al. I Guideline for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care – Brazilian Society of Cardiology: Executive Summary Arq Bras Cardiol [internet] 2013 [cited 2016 Jan 15];100(2): [about 9 pages]. doi: 10.5935/abc.20130022. Available from: http://www.scielo.br/pdf/abc/v100n2/en_v100n2a01.pdf.
- Deakin CD, Shewry E, Gray HH. Public access defibrillation remains out of reach for most victims of out-of-hospital sudden cardiac arrest. Heart. 2014 Apr [cited 2016 May 9];100(8):619-23. doi: 10.1136/heartjnl-2013-305030. Available from: <http://heart.bmj.com/content/100/8/619.full>. PubMed PMID:24553390; PubMed - indexed for MEDLINE.
- American Heart Association. Guidelines 2015 CPR & ECC. Projeto de Destaques da American Heart Association. Atualização das Diretrizes de RCP e ACE. 2015 [cited 2016 May 9]. Available from: <https://eccguidelines.heart.org/wp-content/uploads/2015/10/2015-AHA-Guidelines-Highlights-Portuguese.pdf>.
- Perkins GD, Handley AJ, Koster RW, Castrén M, Smyth MA, Olasveengen T, et al. European Resuscitation Council Guidelines for Resuscitation 2015 Section 2. Adult basic life support and automated external defibrillation. Resuscitation. 2015 Oct [cited 2016 May 9];95: 81-99. doi: 10.1016/j.resuscitation.2015.07.015. pii: S0300-9572(15)00327-5. Available from: <http://www.sciencedirect.com/science/article/pii/S0300957215003275>. Elsevier B.V.
- Stiell EG, Brown SP, Nichol G, Cheskes S, Vaillancourt C, Callaway CW, et al. What is the optimal chest compression depth during out-of-hospital cardiac arrest resuscitation of adult patients? Circulation. 2014 Nov [cited 2016 May 9];130(22):[about 41 pages]. doi: 10.1161/CIRCULATIONAHA.114.008671. Available from: <http://circ.ahajournals.org/content/early/2014/09/24/CIRCULATIONAHA.114.008671.full.pdf?cited-by=yes&legid=circulationaha;CIRCULATIONAHA.114.008671v1>. PubMed PMID: 25252721; PubMed - indexed for MEDLINE.
- Bertoglio VM, Azzolin K, Souza EM, Rabelo ER. Tempo decorrido do treinamento em Parada Cardiorrespiratória e o impacto no conhecimento teórico de enfermeiros. Rev Gaúcha Enferm [Internet]. 2008 [cited 2016 Jan 15];29(3):[about 7 pages]. Available from: <http://www.seer.ufrgs.br/index.php/RevistaGauchadeEnfermagem/article/view/6774/4077>.
- Ribeiro LG, Germano R, Menezes PL, Schmidt A, Pazin-Filho A. Medical Students Teaching Cardiopulmonary Resuscitation to Middle School Brazilian Students. Arq Bras Cardiol [Internet]. 2013 Oct [cited 2016 May 10];101(4):[about 8 pages]. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0066-782X2013003000007&lng=en&nrm=iso&tlng=en.
- Silva AB, Machado RC. Elaboração de guia teórico de atendimento em parada cardiorrespiratória para enfermeiros. Rev Rene. 2013 [cited 2016 May 10];14(4):1014-21. Available from: http://r.search.yahoo.com/_ylt=A0LEV7.1B3NXXWgANTUf7At.;_ylu=X3oDMTByMG04Z2o2BHNIYwNzcgRwb3MMDMQRjb2xvA2JmMQR2dGlkAw--/RV=2/RE=1467185205/RO=10/RU=http%3a%2f%2fwww.revistarene.ufc.br%2frevista%2findex.php%2frevista%2farticle%2fdownload%2f1517%2fpdf/RK=0/RS=JMCzzXY42MxEn39QaimF5lRjeQA-.
- Moura LTR, Lacerda LCA, Gonçalves DDS, Andrade RB, Oliveira YR. Assistência ao paciente em Parada Cardiorrespiratória em Unidade de Terapia Intensiva. Rev Rene [Internet]. 2012 [cited 2016 Jan 15]; 13(2):[about 9 pages]. Available from: <http://www.revistarene.ufc.br/revista/index.php/revista/article/viewFile/225/pdf>.
- Lima SG, Macedo LA, Vidal ML, Sá MPBO. Permanent Education in BLS and ACLS: Impact on the Knowledge of Nursing Professionals. Arq Bras Cardiol [Internet]. 2009 [cited 2016 Jan 15]; 93(6):[about 7 pages]. Available from: http://www.scielo.br/pdf/abc/v93n6/en_12.pdf.
- Greif R, Lockey AS, Conaghan P, Lippert A, De Vries W, Monsieurs KG, et al. European Resuscitation Council Guidelines for Resuscitation 2015 Section 10. Education and implementation of resuscitation. Resuscitation. 2015 Oct [cited 2016 May 10];95:288-301. doi: 10.1016/j.resuscitation.2015.07.032. pii: S0300-9572(15)00344-5. Available from: [http://www.resuscitationjournal.com/article/S0300-9572\(15\)00344-5/fulltext](http://www.resuscitationjournal.com/article/S0300-9572(15)00344-5/fulltext). Elsevier B.V.
- Sahu S, Lata I. Simulation in resuscitation teaching and training, an evidence based practice review. J Emerg Trauma Shock [serial online]. 2010 [cited 2016 May 09]; 3: 378-84. Available from: <http://www.onlinejets.org/text.asp?2010/3/4/378/70758>.
- Brião RC, Souza EN, Castro RA, Rabelo ER. Cohort study to evaluate nursing team performance in a theoretical test after training in cardiopulmonary arrest. Rev. Latino-Am. Enfermagem [Internet]. 2009 Feb [cited 2016 Jan 15]; 17(1):40-45. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0104-11692009000100007&lng=en.
- Miotto HC, Camargos FRS, Ribeiro CV, Goulart EMA, Moreira MCV. Effects of the use of theoretical versus theoretical-practical training on CPR. Arq Bras Cardiol [internet]. 2010 Set [cited 2016 Jan 15]; 95(3):328-31. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0066-782X2010001300008&lng=pt&nrm=iso&tlng=en. Epub 13-Ago-2010.
- Brasil. Decreto nº 94.406/87 que regulamenta a Lei nº 7.498, de 25 de junho de 1986. Dispõe sobre o exercício da Enfermagem, e dá outras providências. Diário Oficial da União 09 de jun de 1987; seção I – fls. 8.853-8. [cited 2016 Jan 15]. Available from: http://www.planalto.gov.br/ccivil_03/decreto/1980-1989/D94406.htm.
- Owojuyigbe AM, Adenekan AT, Faponle AF, Olateju SO. Impact of Basic Life Support Training on the Knowledge of Basic Life Support in a Group of Nigerian Dental Students. Niger Postgrad Med J [serial online] 2015 [cited 2016 May 9];22:164-8. Available from: <http://www.npmj.org/text.asp?2015/22/3/164/170740>.
- Ludikhuizen J, Brunsveld-Reinders AH, Dijkgraaf MG, Smorenburg SM, de Rooij SE, Adams R, et al. Cost and Outcomes of Medical Emergency Teams Study Group. Outcomes Associated With the Nationwide Introduction of Rapid Response Systems in The Netherlands. Crit Care Med. 2015 Dec [cited 2016 May 10];43(12):[about 8 pages]. doi: 10.1097/CCM.0000000000001272. Available from: https://www.researchgate.net/publication/281552902_Outcomes_Associated_With_the_Nationwide_Introduction_of_Rapid_Response_Systems_in_The_Netherlands. PubMed PMID: 26317569; PubMed - indexed for MEDLINE.

18. Veiga VC, Carvalho JC, Amaya LHC, Gentile JKA, Rojas SSO. Atuação do Time de Resposta Rápida no processo educativo de atendimento da parada cardiorrespiratória. *Rev Bras Clin Med* [Internet]. 2013 Jul-Set [cited 2016 Jan 15];11(3):[about 5 pages]. Available from: <http://files.bvs.br/upload/S/1679-1010/2013/v11n3/a3758.pdf>.
19. Moura LTR, Lacerda LCA, Gonçalves DDS, Andrade RB, Oliveira YR. Assistência ao paciente em Parada Cardiorrespiratória em Unidade de Terapia Intensiva. *Rev Rene* [Internet]. 2012 [cited 2016 Jan 15]; 13(2):[about 9 pages]. Available from: <http://www.revistarene.ufc.br/revista/index.php/revista/article/viewFile/225/pdf>.
20. Chandrasekaran S, Kumar S, Bhat SA, Saravanakumar, Shabbir PM, Chandrasekaran V. Awareness of basic life support among medical, dental, nursing students and doctors. *Indian J Anaesth*. 2010 Mar-Apr [cited 2016 May 10]; 54(2): [about 5 pages]. doi: 10.4103/0019-5049.63650. Available from: <http://www.ijaweb.org/article.asp?issn=0019-5049;year=2010;volume=54;issue=2;spage=121;epage=126;aulast=Chandrasekaran>. PubMed PMID: 20661349; PubMed Central PMCID: PMC2900734.
21. Soar J, Nolan JP, Böttiger BW, Perkins GD, Lott C, Carli P, et al. European Resuscitation Council Guidelines for Resuscitation 2015 Section 3. Adult advanced life Support. *Resuscitation*. 2015 Oct 95: 100-47. doi: 10.1016/j.resuscitation.2015.07.016. pii: S0300-9572(15)00328-7. Available from: <http://www.sciencedirect.com/science/article/pii/S0300957215003287>. Elsevier B.V.

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