

An Educational Program Impact on Nurses' Knowledge and Performance Concerning Cardiopulmonary Resuscitation

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Abstract

Background: An educational program for nurses about cardiopulmonary resuscitation is important and obligatory in-hospital and out-hospital where a qualified nurse can open airways, resuscitate, massage a heart and involve help to save a life by sustaining an ailing individual's heart and brain for a brief time. **So the study aimed to** evaluate an educational program impact on nurses' knowledge and performance concerning cardiopulmonary resuscitation. **Design:** A quasi-experimental research design. **Setting:** The study was applied in El-Tadamon Hospital. **Subjects:** This study was carried out on thirty-two nurses recruiting in an intensive care, emergency care, theater room, internal medicine, and surgery departments of El-Tadamon Hospital at Port Said City. **Two tools were used for data collection;** The "Structured questionnaire sheet" which consisted of twenty-one questions related to socio-demographic characteristics, knowledge about sudden cardiac arrest, sudden pulmonary arrest, and CPR. "Observation checklist" was concerned with performance in cardiopulmonary resuscitation. **Results:** This study indicated that there are statistically significant ($P < 0.001$) improvements immediately after program implementation and throughout follow-up concerning nurses' knowledge and performance about cardiopulmonary resuscitation. Moreover, it had been also found that there is a statistically significant ($P < 0.001$) relation between nurses' knowledge and performance, and there are no statistically significant associations between the changes in the scores of their knowledge and performance and socio-demographic characteristics. The program had succeeded in inducing statistically significant improvements in nurses' knowledge and performance about cardiopulmonary resuscitation (CPR). **Conclusion:** An educational program for nurses had a positive impact on their knowledge and performance concerning CPR. **Recommendations:** development and implementation of educational programs in all other Port Said Hospitals annually.

Keywords: An educational program, impact, nurses' knowledge, performance, cardiopulmonary resuscitation.

Introduction

Cardiopulmonary resuscitation (CPR) is a critical part of the management of cardiac arrest and the prevention of sudden cardiac death. CPR must be started as soon as possible and without interruption as possible. It is a combination of rescue breathing and chest compressions that are delivered to the victims who are thought to be in cardiac arrest (Mutchner, 2010 & American Heart Association, 2010). Cardiac arrest is best-known as cardiopulmonary arrest or circulatory arrest, which is the stopping of normal circulation of the blood due to heart failure to contract effectively. An unexpected cardiac arrest may be referred to by medical personnel as a sudden cardiac arrest (Thom, 2015).

Modern published studies reported that about 1,000,000 people die of the arrest of the heart annually as in the United States and Europe, almost one every 30 seconds with approximately 200,000 treated cardiac arrests among the United States hospitalized patients every year. Cardiopulmonary resuscitation (CPR) will be administered by emergency medical services to some of them. Unfortunately, only one in five adults survive in-hospital cardiac arrest (Demestih, et.al., 2010).

In addition, CPR is a critical component of basic life support and the established first line of response to an arrest of the heart in the interim before defibrillation and advanced life support are available, it is crucial for life-saving first-aid skill and an effective method of keeping someone who is experiencing a cardiac arrest alive long enough for definitive treatment to be delivered (Bullock, 2000).

CPR cannot usually restart the heart, but it makes sure that blood and oxygen continue to circulate through the body, keeping the patient active until help arrives (Weil & Tang, 2010). The aim of CPR is to ensure that functions of the body are maintained so that the brain and other vital organs receive a sufficient supply of oxygen and nutrients to maintain their functions and that the waste products of metabolism are removed (Gallagher, et.al., 2002). CPR might almost double the chance of survival; the probability of survival from cardiac arrest falls by 10–15% per minute without treatment, and well-performed CPR likely changes this curve towards a higher probability of survival. The first minutes of CPR significantly improved patient survival (Shiraki, 2009, Young & King, 2000).

CPR measures vary according to the patients' needs and the nurse's knowledge of giving the

treatment. Knowing what to do in an emergency situation is as important as knowing what not to do because CPR measures misapplied might lead to serious complications such as ineffective lung inflation and cardiac output resulting in brain damage or death, and broken ribs. The importance of performing CPR immediately after cardiac arrest has been demonstrated in numerous studies around the world (**Sudden Cardiac Arrest Foundation, 2012**)

The CPR quality is often poor in the clinical setting and the lack of resuscitation skills of doctors and nurses in basic life support (BLS) and advanced life support (ALS) has been identified as a contributing factor to poor outcomes of the arrest of the heart for victims. CPR skills improvements should therefore have a considerable impact on mortality. The ability to respond effectively and quickly and to arrest the heart situation rests on the competence of the nurses in the procedure of the emergency life-saving for cardiopulmonary resuscitation (CPR) (**Dwyer, et.al., 2002, and Sandroni, et.al., 2007, Broomfield, 2007**).

So, CPR training for nurses is mandatory and is very important as nurses often discover the patients of in-hospital cardiac arrest. Moreover; nurses are perceived to be knowledgeable in providing institutional care to the patients and are an integral part of the healthcare system. The nurses take care of the patients when the physician isn't present in the department and also in the community settings, the nurses have to play a major role in the emergency handling of the patients, thus, CPR becomes a fundamental requirement of any nurse (**Hamilton, 2005 & Madden, 2006**). Therefore the need to develop a training program for nurses about successful CPR was suggested. Such a program was expected to improve nurses, knowledge, and performance about CPR. So this study aimed to evaluate an educational program impact on nurses' knowledge and performance concerning cardiopulmonary resuscitation

Significance of the Study:

Sudden cardiac arrest is still a significant cause of death and proceeds to be a major public healthcare problem. Cardiovascular diseases have the second-ranking leading cause of death after HIV in South Africa, CPR has become a broadly utilized and standard treatment for the management of cardiac arrest. Even though out-hospital cardiac arrest happens more commonly, in-hospital cardiac arrest is still a major issue. A study that centered particularly on in-hospital heart care in developing countries reported that for all the patients who had endured cardiac arrest and gotten CPR, there was the return of

spontaneous circulation (ROSC) in as it were 7.4% ($n=14$) of the patients. As it were 1.6% ($n:3$) of all patients who endured cardiac arrest survived for 24 hours (**Ocen, et.al., 2015, and Schultz, et.al., 2015**).

Previous studies' results concluded that the low performance of CPR is alarming and a contributing factor to the mortality rate. It was recommended that the quality of hospital nurses' training can influence rates of ROSC (**Schultz, et.al., 2015**). Nurses are usually the first to reckon the need for and initiate CPR on patients with cardiopulmonary arrest in the hospital setting. Receiving adequately trained health care professionals with CPR has shown decreasing in-hospital deaths (**Meaney, et.al., 2012**). Hence, the researcher carried out this study to evaluate an educational program impact on nurses' knowledge and performance concerning cardiopulmonary resuscitation.

Aim of Study:

The study was aimed to evaluate an educational program impact on nurses' knowledge and performance concerning cardiopulmonary resuscitation.

Problem Statement:

There is an urgent need to evaluate an educational program impact on nurses' knowledge and performance concerning CPR due to the importance of education on providing high-quality CPR and thus improving survival from cardiac arrest and survival rate (**Hemming, et.al., 2003 & Smith, and Hatchett, 1992**).

Research questions:

How does an educational program concerning CPR improve nurses' knowledge and performance?

Is there a significant statistical relationship between the nurses' knowledge and performance and their sociodemographic data?

Does an educational program make positive improvements in nurses' knowledge and performance after attending an educational program concerning CPR?

Hypothesis Research:

H1: There will be positive improvements after an educational program impact on nurses' knowledge and performance concerning cardiopulmonary resuscitation.

H2: There will be a relationship between the nurses' knowledge and performance and their sociodemographic data.

Subjects and Methods:

Research Design:

The design of this study was a quasi-experimental design done to evaluate an

educational program impact on nurses' knowledge and performance concerning cardiopulmonary resuscitation.

Setting:

The study was carried out in emergency care, an operating theater room, intensive care units, an internal medicine, and surgery departments of El-Tadamon hospital at Port Said, using An Adult CPR Training Manikin.

Subjects:

The population of this study consisted of all nurses (32) providing direct care to patients in the above-mentioned areas for six months from the beginning of July to the end of December 2015.

The inclusion criteria for nurses were included:

- ❖ All nurses were on duty during the period of the study.
- ❖ Agree to participate in the study.

The exclusion criteria included:

- ❖ Refusal to participate.
- ❖ Incomplete or duplicate answers.
- ❖ No existence on duty at the time of the study.

Tools for data collection:

Two tools were used in the study for data collection. The first tool is the "structured questionnaire sheet" and the Second tool "An observation checklist

The first tool, "structured questionnaire sheet" was developed and constructed by the researcher based on the review of related literature to evaluate nurses' knowledge about sudden cardiac arrest and CPR (Pre and post-knowledge questionnaire). It is comprised of two parts.

Part I:

It included items related to socio-demographic characteristics of the studied nurses as a professional qualification, working area, age, years of experience, and CPR taught in school and attendance courses in CPR.

Part II:

It included questions related to nurses' knowledge regarding sudden cardiac arrest, and CPR (definition, causes, signs & symptoms, prevention, complications, and actions to prevent sudden death).

Second tool "An observation checklist ":

The second tool "An observation checklist "was developed by American Heart Association, 2010. It is used to evaluate nurses'

performance related to cardiopulmonary resuscitation.

Method of the Study:

Validity of the tool:

The content validity of the tool was tested by a board of 9 experts in Medical-Surgical Nursing and professors specialized in cardiovascular diseases in clinical settings to ensure that the questions were clear, relevant, applicable, understandable, and complete and appropriate modification was done accordingly.

Reliability of the tools:

Test-retest reliability was used. The internal consistency of the tools was calculated using Cronbach's alpha coefficients. Study tools revealed reliability at Cronbach's alpha 0.84 for the tool (I), 0.87 for the tool (II).

Pilot study:

A pilot study was conducted after the development of the tools. It was carried out on 10 % of nurses in recruiting in internal medicine, operating theater, an intensive care unit, emergency, and surgery departments to test the reliability and applicability of the tools of the study. The radical modifications were done based on the pilot study result. Those nurses were excluded from the subject of research work to assure the answers' stability and performances.

Administrative design:

The official letters were obtained from the Dean of the faculty to the directors of each study setting to take cooperation and permission.

Ethical Considerations:

This research was approved by the faculty of nursing ethics committee, Permission to conduct the study was obtained from the responsible authorities after explaining its purpose. Data was obtained from every nurse prior to their inclusion in the study after explaining its importance and purpose. The researcher informed the nurses that the study was voluntary, they were allowed to refuse to participate and they had the right to withdraw from the study at any time, without giving any reason. The researcher presented himself to each nurse and obtained oral consent from each nurse. Moreover, nurses were assured that nurses' information would be confidential and utilized for research purposes only.

Data collection procedure:

The researcher used scientific books, papers, periodicals, and the internet to analyze current local and international related literature to gain a better understanding of the problem, create the study measures, and complete them. The actual fieldwork

took place at the chosen setting from the beginning of July to the end of December 2015. In the previously described scenarios, the researcher presented himself to the medical and nursing staff. The researcher explained the study's nature and goal and requested cooperation.

Process of Study:

This study was conducted in **four phases**

1. Phase I (Assessment phase): to evaluate nurses' knowledge about CPR. The researcher interviewed the nurses on an individual basis the researcher introduced the sheet (**First Tool**) to each nurse and asked them to complete it and each nurse was observed by the researcher during the procedures. Their performance was evaluated by using an observational checklist (**Second Tool**).

2. Phase II (program planning): The educational program was developed based on the identified needs and demands of nurses gathered in phase I, and the light of the most recent pertinent literature.

3. Phase III (program implementation): The nurses were divided into 5 groups according to their working areas in the hospital. The educational program was implemented for each group of nurses. It lasted for twelve weeks, one session per week. The twelve educational sessions were given for six hours, each session took about 30 minutes using participating lecture, data show, discussion, videotapes, and handout which was given to all nurses included in the study and demonstration and redemonstration CPR procedure on manikins. The Arabic CPR handout was constructed and developed to be easily understood by all nurses. Researcher attended the previously mentioned setting 5 days per week (Sunday and Thursday), from 9 am to 12 pm for educational sessions and data collection. Data Collection was within six months from the beginning of July to the end of December 2015.

4. Phase IV (Evaluation phase): The program outcome were evaluated by using the first and second tools. Two times; first preprogram, second immediately after the implementation of the program.

Scoring system:

The total score of nurses' knowledge against the 22 basic items were calculated to be 100. The respondent was given one point for each correct answer and zero for an incorrect one. For each part, the item's scores were summed up. These scores were turned into a percent score. The total score of 75% and more was considered

satisfactory in knowledge while scores below 75% were considered unsatisfactory.

Whereas the performance total scores were calculated to 85 steps. The possible choice for each item was done or not done. Each nurse was given one degree for each step done correctly, and zero for that was not done. For each category of the performance, the scores of the items were summed-up and the total divided by the number of items, giving a mean score for the part. These scores were converted into a percent score, and means and standard deviation were computed. The total score of 75% and more was considered satisfactory in performance while scores below 75% were considered unsatisfactory.

Statistical analysis

After data were collected, they were coded and transformed into a specially designed format suitable for computer feeding. All data were verified after entering data for any errors. Data were analyzed using a statistical package for social sciences (SPSS) windows 18.0 version and were presented in tables.

Data were presented utilizing descriptive statistics in the form of frequencies and percentages for qualitative variables, ranges, means and standard deviations. Qualitative variables were compared utilizing the Chi-Square test. For quantitative variables, mean and standard comparison deviation was calculated the difference between two methods was made using student test(t). For multiple group comparisons of quantitative data, a one-way analysis of variance test (ANOVA) was used. Pearson correlation analysis was utilized for the assessment of the interrelationships among quantitative variables. Statistical significance was considered at P-value<0.05.

Results:

Table (1): showed the socio-demographic characteristics of studied nurses. About one-third of the nurses (37.5%) recruited in an intensive care department, 18.8% of them were in an operating theater, 15.6% & 15.6% of them were in internal medicine and surgery departments respectively, and 12.5% of them were in an emergency room. As regards age, less than half of the nurses (46.8%) were 30 years and less than 40 years. As regards their qualification all nurses graduated from secondary nursing school. About less than of them (43.7%) had less than 20 years of experience, and 34.4% of them had more than 20 years of experience. All of the studied nurses taught CPR in school and attended one course in CPR for a long time.

Table (2): demonstrated the differences in nurses' knowledge concerning CPR throughout

the program intervention. The results indicated that there are statistically significant nurses' knowledge improvements in the definition of CPR, causes of CPR, complications of CPR, and survival chain at p-value ($p < 0.001$). The most prominent improvement was in the knowledge scores concerning definition, and survival chain for CPR reaching 100.0%, 93% respectively in the immediate post-test. Their levels were significantly higher than the pre-program levels.

From **Table (3)**: differences in nurses' knowledge Concerning sudden cardiac arrest were observed throughout the program intervention. The results indicated improvements in nurses' knowledge in various areas of sudden cardiac arrest. These improvements were statistically significant at a p-value ($p < 0.001$). The most prominent improvements were in the scores of knowledge about the definition of sudden cardiac arrest. They reached 100.0% in the immediate posttest. Moreover the percentages of satisfactory level in all knowledge areas improved in the posttest. The nurses' knowledge levels were significantly higher than the preprogrammed level (pretest).

Table (4): Showed the differences in nurses' knowledge Concerning pulmonary arrest throughout the program intervention. The results indicated improvements in nurses' knowledge in various areas of pulmonary arrest and their total score. These improvements were statistically significant ($p < 0.001$). The most prominent improvements were in the scores of knowledge about the definition of pulmonary arrest. They reached 100.0% in the immediate posttest. Moreover, the percentages of satisfactory levels in all knowledge areas improved in the posttest. The nurses' knowledge levels were significantly higher than the preprogrammed level (pretest).

Table (5): Demonstrated the differences in nurses' performance Concerning CPR throughout the program intervention. The results indicated improvements in nurses' performance in various areas of the pulmonary arrest. These improvements were statistically significant ($p < 0.001$). The most prominent improvements were in the scores of performance about rescue breathing. They reached 100.0% in the immediate posttest. The nurses' performance levels were significantly higher than the preprogram level (pretest).

Table (6): illustrated the percent changes in the total scores of nurses' knowledge regarding CPR throughout the program intervention. The highest percentages of improvement were in

nurses' knowledge, between the immediate posttest and the pre-program level (190.1 ± 31.5).

Table (7): showed the percent changes in the total scores of nurses' performance concerning CPR throughout the intervention program. The highest percentages of improvement were in performance, reaching ($1470.1 \pm 110.2\%$) between the immediate posttest and the pre-program level.

Table (8): demonstrated a Comparison between nurses' mean score and standard deviation of studied nurses concerning CPR throughout the program intervention according to their working area. It indicated no statistically significant associations between the changes in the scores of their knowledge or performance and working areas.

Table (9): declared Comparison between nurses' mean score and standard deviation of studied nurses concerning CPR throughout the program intervention according to their age. No statistically significant difference was found between nurses' knowledge or performance and their age groups. Nurses of the age category 30 years to less than 40 years had the highest percent change in their score of knowledge between the immediate post-program and the preprogram levels (199.0 ± 32.0). Meanwhile, nurses in the 20 to less than 30 years old group had the highest performance score percentage. This gain was between the immediate post-program and the pre-program levels (1614.1 ± 96.5).

Table (10): Showed Comparison between nurses' mean score and standard deviation of studied nurses concerning CPR throughout the program intervention according to their experience. As evident in this table, no statistically significant associations could be revealed between changes in nurses' knowledge and performance scores and their years of experience at p-value $p > 0.05$. Meanwhile, the most prominent improvements were mostly in the nurses' scores of those with 5 to less than 10 years experience.

Table (11): illustrated partial correlation of nurses' knowledge and performance scores related to CPR adjusted for the effect of the program intervention. It demonstrated a statistically significant positive correlation between nurses' knowledge and performance, irrespective of the effect of the intervention program. Significant correlations were found concerning knowledge and practice about rescue breathing ($r = .440$) and total knowledge and performance.

Table 1 Socio-demographic characteristics of nurses.

Items	N	
	n= (32)	%
Working areas:		
- Internal medicine	5	15.6%
- Intensive care	12	37.5%
-Operating theater	6	18.8%
- Emergency room	4	12.5%
- Surgery	5	15.6%
Age:		
<20 years	2	6.3%
20-<30 years	5	15.6%
30-<40 years	15	46.8%
40-<50 years	6	18.8%
50+ years	4	12.5%
Qualification:		
- Secondary nursing school	32	100.0
- Nursing technical institute	0	0.0
Years of Experience:		
<1 years	0	0.0%
1-<5 years	3	9.4%
5-<10 years	4	12.5%
10-<20 years	14	43.7%
20+ years	11	34.4%
CPR Taught in school and attendance courses in CPR:		
Yes	32	100.0
No	0	0.0

Table 2 Differences in nurses' knowledge concerning CPR throughout the program intervention.

Nurses' knowledge about	Time				X ²	P-value
	Pre test		Immediate post test			
	N	%	N	%		
- Definition	25	78.1%	32	100	115.604	<0.001*
- Causes	12	37.5%	27	86.7	93.463	<0.001*
-Complications	4	12.5%	25	79.0	62.047	<0.001*
-Survival chain	1	3.1%	29	93	81.735	<0.001*
-General right instructions for CPR	3	9.3%	26	83.7	79.455	<0.001*

Table 3 Differences in nurses' knowledge concerning sudden cardiac arrest (SCA) throughout the program intervention.

Nurses' knowledge about	Time				X ²	P-value
	Pre test		Immediate post test			
	N	%	N	%		
- Definition	20	62.5	32	100	120.412	<0.001*
- Causes	3	9.3	30	94	59.814	<0.001*
- Risk factors	1	3.1	32	100	62.754	<0.001*
- Signs and symptoms	7	21.8	27	85	60.822	<0.001*
- Preventive measures	10	31.2	31	99	75.208	<0.001*
- Complications	19	59.3	28	90	97.117	<0.001*

Statistically significant (*)

Table 4 Differences in nurses' knowledge concerning pulmonary arrest throughout the program intervention.

Nurses' knowledge, about	Time				X ²	P-value
	Pre test		Immediate post test			
	N	%	N	%		
- Definition	19	59.3	32	100.0%	101.362	<0.001*
- Causes	1	3.1	24	78.0%	58.851	<0.001*
- Signs and symptoms	15	46.8	29	91%	94.352	<0.001*

(*) Statistically significant

Table 5: Differences in nurses' performance concerning CPR throughout the program intervention.

Nurses' performance about	Time				X ²	P-value
	Pre test		Immediate post test			
	N	%	N	%		
Primary survey	4	12.5%	29	91.0%	72.367	<0.001*
Chest compressions	2	6.2%	25	78.1%	67.498	<0.001*
Rescue breathing	9	28.2%	32	100.0%	94.735	<0.001*

Table 6 Percent changes in the total scores of nurses' knowledge regarding CPR throughout the program intervention.

@ % Change in score	Minimum	Maximum	Mean	SD
Post-Pre	111.45	217.66	190.1	31.5

@ % Change post Pre= 100 X (Post – Pre) / (Pre).

Table 7 Percent changes in the total scores of nurses' performance concerning CPR throughout the intervention program.

@ % Change in score	Minimum	Maximum	Mean	SD
Post-Pre	1263.30	1552.0	1470.1	110.2

@ % Change post Pre= 100 X (Post – Pre) / (Pre).

Table 8 Comparison between nurses' mean score and standard deviation of studied nurses concerning CPR throughout the program intervention according to their working area.

% Change in score	Working areas					ANOVA (F)	P-value
	Internal medicine	Intensive care	Operating theater	Emergency Room	Surgery		
Knowledge:							
Post-Pre	173.1±23.2	186.5±43.2	189.3±27.8	130.5±20.7	189.8±33.6	1.878	0.158
performance:							
Post-Pre	1400.3±59.3	1261.3±122.5	1210.0±70.7	1298.5±64.2	1303.2±75.8	1.556	.78

Table 9 Comparison between nurses' mean score and standard deviation of studied nurses concerning CPR throughout the program intervention according to their age

% Change in score	Age (years)					ANOVA (F)	P-value
	<20	20-<30	30-<40	40-<50	50+		
Knowledge:							
Post-Pre	107.3±0	185.7±29.3	199.0±32.0	191.7±13.4	189.3±13.1	2.786	.083
performance:							
Post-Pre	1192.1±0	1614.1±96.5	1354.7±114.3	1311.9±69.4	1363.2±25.3	1.595	.354

Table 10 Comparison between nurses' mean score and standard deviation of studied nurses concerning CPR throughout the program intervention according to their experience .

% Change in score	experience					t-test	P-value
	<1	1-<5	5-<10	10-<20	20+		
Knowledge:							
Post-Pre	110.9±0	184.1±22.7	199.1±27.8	188.6±27.5	176.1±26.5	1.734	.200
performance:							
Post-Pre	1242.1±0	13880.0±84.1	1365.3±110.2	1390.0±126.4	1375.5±74.3	1.088	.464

Table 11 Partial correlation of nurses' knowledge and performance scores related to CPR adjusted for the effect of the program intervention.

Knowledge and performance scores in	Pearson partial correlation coefficient	P-value
-Primary survey	.240	.132
-Chest compressions	.380	.051
-Rescue breathing	.440	.042
Total knowledge and performance	.432	.007*

Discussion:

CPR is part of the survival chain, which incorporates early access to emergency medical services, early CPR, early defibrillation, and early advanced care. Nursing professionals are usually the first to witness a cardiac stop at the hospital and are those who frequently call the assistance team. Thus, these professionals have to be compelled to have updated technical knowledge and practical skills developed to contribute more efficiently to cardiopulmonary arrest maneuvers. Some studies have an indicator as to the presence of at least one professional trained in ALS to increase the survival of cardiac arrest victims. The increase of survival was about four times when the nursing professional was trained in Advanced Life Support (ALS) (Gombotz, et.al., 2006, and Moule & Albarran, 2002, Dane, et. al., 2007). So the study aimed to evaluate an educational program impact on nurses' knowledge and performance concerning cardiopulmonary resuscitation.

The results of the present study revealed that all studied nurses were secondary nursing school graduates, most of them were in the age group 30 years and less than 40 years and had experience more than 20 years. Hassain & Lyneham (2009) found that the majority of the study sample were female, with ages ranged from 20-50 years while the majority had a general diploma in nursing with average years of experience of 12 years. The results of the present indicated that all studied nurses taught CPR in their school and attended one course in CPR for a long time. This result was disagreement with Nagashema et al.(2012) who found that most of the nurses are much curious about CPR, and most of them had received education and training in CPR as students or after graduation.

The assessment of the nurses' knowledge and performance concerning CPR before program implementation, in the current study, has shown that almost all studied nurses had statistically significant lacking in the basic knowledge and performance about CPR. This result may be due to the fact that most of the studied nurses were diploma graduates, working since 20 years ago, poor theoretical knowledge and demonstrated willingness and motivation for courses on basic life support, and their knowledge during school study years might be insufficient for such a specialized service or forgotten. Moreover, there is a lack of supervision and evaluation systems for nurses during nurses' work. These points to an area of deficient continuing nursing education.

These results were in agreement with Sandro et. al.,(2009) who stated that the score before course evaluation was low (4.1 points). However, this low percent is partly attributable to the average time of

completion of educational qualification of studied sample was superior to five years; that the average time of professional activity was relatively low; and that a significant percentage of these professionals couldn't have had the chance to refresh their knowledge on cardiac arrest since completion of educational qualification. Besides this, there is a lack of permanent education schemes in most health institutions.

In addition, Mokhtari, et.al., (2012) reported that psycho-motor skills for nurses in CPR before training courses were low because the average score of psycho-motor skills in the pretest was four points eighty-six (about 18.7%). In the previous study, the practical ability of CPR for nurses was 17% (Davies & Gould, 2000). Furthermore, even the nurses who had work authorization, and have insufficient competence in skills of CPR (Broomfield and Devlin, 2000). A study by Greig and colleagues reported that the majority of the personnel had weak differences of competence levels and competence in CPR skill ranged from zero percent to one hundred percent and the scores of CPR skill in "performance of heart compression" was low. Moreover, the ability of nurses in CPR also be weak in other researchers (Handley & Handley, 2003, and Broomfield & Devlin, 2000).

Concerning the intervention program effect, the findings of the present study have shown statistically significant improvements in nurses' knowledge and performance concerning CPR. This was noticed immediately after program implementation in comparison to pretest. This improvement may be due to the in-service educational program which did not only stress the acquisition of knowledge of CPR but also stresses practical training to gain information and change work performances using adequate courses or sessions, increased motivation which is needed for the achievement of the desired objectives, availability of sources of information as booklet, pamphlets as well as provision of sufficient materials and supplies needed for the achievement of the work. For the training program, all nurses who participated have taken booklet, pamphlets, and handouts for the program objectives and content as well as sufficient materials and supplies were provided for the training and not provided at the actual work situation

These results are in the same line with Moser and Coleman,(1992) who reported that The degree of CPR skill and knowledge immediately after training indicated that the degree of awareness immediately after re-test increased considerably. In several studies, the increase of nurses' knowledge after retaining was emphasized too Psychomotor skills scores immediately after education increased

from 18.7 to 93.9 (Pottle & Brant, 2000, Smolarek, 2008, Madden, 2006)).

As for the percent changes in the scores of nurses' knowledge and performance throughout the program according to their age, experiences, and work areas, the present study revealed no association of statistical significance. This finding points to the successful effect of the educational program about CPR on all nurses, irrespective of their age, experiences, and work areas. Nonetheless, nurses in the age group had higher scores in their total performance, although not reaching statistical significance. In the same line, Wong and Lee (2000), and Lee-Hsieh et al.(2008) stated that younger nurses were more motivated to achieve acquire knowledge and technical skills. Moreover, Aly(2010) supported this result and mentioned that there was a significant negative correlation between age and total cardiopulmonary resuscitation performance score, also Moule et al.(2002) stated that the level of performance appeared to decrease in those greater than fifty years of old. The result of the present study was contradicting with Gohary(2001)who stated that there was an improvement in the level of nurses' performance with the increase in the years of experience. Regarding the correlation between nurses' knowledge and performance and their workplace, the present study proved that there was no statistically significant. A correlation could be detected between nurses' knowledge and performance pre and post the program and their workplace, in this context, Hussain & Lynham(2009)and Parajulee & Selvaraj (2011) detected significant differences between the knowledge and working area of the respondents.

Conclusion:

The results of the present study revealed that there statistically significant improvements immediately a program implementation regarding nurses' knowledge and performance about cardiopulmonary resuscitation. Moreover, it was also found a statistically significant relationship between nurses' knowledge and performance and there are no statistically significant association between the changes in the scores of their knowledge and performance and socio-demographic characteristics.

Recommendations:

Based on the current study results, the following recommendations are proposed:

- ❖ Designing and implementing regular continuous educational programs about CPR for enhancing nurses' knowledge and performance to achieve high quality care.
- ❖ Periodic refreshing courses about CPR should be planned and implemented for nurses every six months to one year.

- ❖ Upgrading nurses' knowledge and performance concerning CPR and cardiac and pulmonary arrest according to updating AHA.
- ❖ Replication of the current study with a larger sample of nurses in different settings is required for generalizing the results.

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References:

- Aly A. (2010):** Impact of a basic life support training program on nurses' knowledge and performance at the emergency room. Doctorate thesis, Faculty of nursing, Suez Canal University.
- American Heart Association, (2010):** American Heart Association. Impact of AHA Guidelines for CPR and ECC, Nov 2, 67 pages
- Broomfield R. A, (2007):** .quasi-experimental research to investigate the retention of basic cardiopulmonary resuscitation skills by qualified nurses following a course in professional development. *Journal of Advanced Nursing*, 23: 1016–1023.
- Bullock, I., (2000):** Skill acquisition in resuscitation, *Resuscitation.*, 45:139–143
- Dane FC, Russell-Lindgren KS, Parish DC, Durham MD, Brown TD.(2000):** In-hospital resuscitation: association between ACLS training and survival to discharge. *Resuscitation.* 47: 83-7.
- Davies N, Gould D. (2000):** Updating cardiopulmonary resuscitation psychomotor skills: a study to examine the efficacy of self-instruction on nurses' competence. *J ClinNurs.* 9:400–10. doi: 10.1046/j.1365-2702.2000.00389.x. [PubMed] .
- Demesthiha D, Pantazopoulos N, Xanthos T.,(2010):** Use of the impedance threshold device in cardiopulmonary resuscitation. *World Journal of Cardiology*, 2; (2) : 19– 26.
- Dwyer N, Mosel W, Dwyer L., (2002):** Nurses' behavior regarding CPR and the theories of reasoned action and planned behavior. *Resuscitation*, 52 (1)85–90.
- Gallagher E, Lombardi G, Gennis P., (2002):** Effectiveness of bystander cardiopulmonary resuscitation and survival following out-of-hospital cardiac arrest. *Journal of the American Medical Association*, 274: 1922–1925.
- Gass DA, Curry L. (1983):** Physicians and nurses' retention of knowledge and skill after training in cardiopulmonary resuscitation. *Can Med Assoc J.* 128:550–1.
- Gohary A. (2001):** Nurses' performance concerning control of patients with pulmonary tuberculosis. Master thesis. Faculty of Nursing, Ain Shams University.
- Gombotz H, Weh B, Mitterndorfer W, Rehak P. ,(2006):** In-hospital cardiac resuscitation outside the ICU by nursing staff equipped with automated external defibrillators - the first 500 cases. *Resuscitation.* 70 (3): 416-22.
- Handley AJ, Handley SA. (2003):** Improving CPR performance using an audible feedback system suitable for incorporation into an automated external defibrillator.

Resuscitation. 57:57–62. doi: 10.1016/S0300-9572(02)00400-8.

Hamilton R., (2005): Nurses knowledge and skill retention following cardiopulmonary resuscitation training: a review of the literature. *Journal of Advanced Nursing*,; 51: 288-97.

Hemming T, Hudson M, Durham C, Richuso K., (2003): Effective resuscitation by nurses: Perceived barriers and needs. *Journal for Nurses in Staff Development*, 19: 254–259.

Lee-Hsieh, T., Kuo, C.L., and Tseng, H.F. (2008): Application and Evaluation of a Caring Code in Clinical Nursing Education. *J. Nurs. Educ.*, 44 (4): p.p. 177-184.

Madden C., (2006): Undergraduate nursing student's acquisition and retention of CPR knowledge and skills. *Nurse Education Today*, 26:218-27.

Meaney, P. A., Sutton, R. M., Tsimia, B., Steenhoff, A. P., Shilkofski, N., Boulet, J. R., ... & Nadkarni, V. M. (2012). Training hospital providers in basic CPR skills in Botswana: acquisition, retention and impact of novel training techniques. *Resuscitation*, 83(12), 1484-1490.

Mokhtari, N. J., Saghafinia M, Kalantar M., Khademol H. S M, (2012): CPR Training for Nurses: How often Is It Necessary? *Iran Red Crescent Med J.* Feb; 14(2): 104–107.

Moretti MA. (2001): Eficácia do treinamento suporte avançado de vida e resultados das manobras de ressuscitação cardiopulmonar [Tese]. São Paulo: Faculdade de Medicina, Universidade de São Paulo.

Moser DK, Coleman S. (1992): Recommendations for improving cardiopulmonary resuscitation skills retention. *Heart Lung*. 21:372–80.

Moule P, Albarran JW., (2002): automated external defibrillation as part BLS: implications for education and practice. *Resuscitation*. 54 (3): 223-30.

Moule P, Knight C. (1997): Emergency, cardiac arrest! Can we teach the skills? *Nurse Educ Today*,; 17(2):99–105. [PubMed]

Mutchner, L., (2010): "The ABCs of CPR -- Again ". *AM J Nurs*, 107 (1): 60 - 95. Cardiopulmonary resuscitation. American Heart Association. Available at <http://www.americanheart.org/present>.

Nagashima K, 25.Takahata O, Fujimoto A, Iwasaki H. (2012): Investigation of nurses' knowledge and experience in cardiopulmonary resuscitation. *Resuscitation*, 14(2):104-107.

Ocen, D., Kalungi, S., Ejoku, J., Luggya, T., Wabule, A., Tumukunde, J., & Kwizera, A. (2015). Prevalence, outcomes and factors associated with adult in hospital cardiac arrests in a low-income country tertiary hospital: a prospective observational study. *BMC emergency medicine*, 15(1), 1-6.

O'Donnell, S. Kittner, D. Lloyd-Jones, D.C. JGoffandY. Hong, (2015): Heart disease and stroke statistics: update.a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. *Circulation*, 113: e85–e151.

Parajulee S, Selvaraj V. (2011): Knowledge of nurses towards cardiopulmonary resuscitation in a tertiary care teaching hospital in Nepal. *Journal of Clinical and Diagnostic Research*; 5(8): 1585- 1588

Pottle A, Brant S. (2000): Does resuscitation training affect outcome from cardiac arrest? *Accid Emerg Nurs*,; 8:46–51. doi: 10.1054/aaen.1999.0089. [PubMed]

Sandro, G.L, Larissa A. M.I; Marcela L. V. Michel P. B. O. S., (2009): Permanent education in BLS and ACLS: impact on the knowledge of nursing professionals, Arquivos Brasileiros de Cardiologia, Print version ISSN 0066-782X, Arq. Bras. Cardiol. vol.93 no.6 São Paulo Dec.

<http://dx.doi.org/10.1590/S0066-782X20090012000>

Sandroni T, Sandroni, J. Nolan F., (2007): . In-hospital cardiac arrest: incidence, prognosis and possible measures to improve survival *Intensive Care. Medicine*, 33 (2): 237–245.

Schultz, A. M., McCoy, M. A., & Graham, R. (Eds.). (2015). *Strategies to Improve Cardiac Arrest Survival: a time to act.* National Academies Press.

Shiraki T, Osawa K, Suzuki H, Yoshida M, Takahashi N et al., (2009): . Incidence and outcomes of out-of hospital cardiac arrest in the eastern part of Yamaguchi prefecture. *International Heart Journal*, 54:489-500

Smith S., Hatchett R., (1992): Perceived competence in cardiopulmonary resuscitation, knowledge and skills, amongst 50 qualified nurses. *Intensive & Critical Care Nursing*, 8(2):76–81.

Jump up ↑ Chain of Survival Institute. Retrieved on 2007-06-12.

Smolarek RT, Solomon DK, Powell MF, Roffe BD. (2008): Evaluation of a cardiopulmonary-resuscitation training manual for pharmacists. *Am J Hosp Pharm*,; 40:403–5.

Thom ,T., N.Haase, W. Rosamond, V.J. Howard, J.Rumsfeld, T. Manolio, Z.J. Zheng, K. Flegal, C. Weil M, Tang W., (2010): Resuscitation of the Arrested Heart.4th ed, Philadelphia, Saunders Co; 533-40.

Wik L, Brennan R, Braslow A., (1995): . A peer-training model for instruction of basic cardiac life support. *Resuscitation*,; 29: 119–128.

Sudden Cardiac Arrest Foundation, 2012 .To save one life is as if to save the world.

Wong, K., and Lee, W. (2000): A Phenomenological Study of Early Nursing Experience in Hong Kong. *Journal of Advanced Nursing*; 31: 1509-1517.

Woollard M, Whitfield R, Smith A, Colquhoun M, Newcombe RG, Vetteer N, Chamberlain D.(2004): Skill acquisition and retention in automated external defibrillator (AED) use and CPR by lay responders: a prospective study. *Resuscitation*.60:17–28. doi: 10.1016/j.resuscitation.2003.09.006. [PubMed]

Young R, King L., (2000): . An evaluation of knowledge and skill retention following an in-house advanced life support course. *Nursing in Critical Care*,; 5: 7– 13.