

Impact of A designed Teaching Protocol about Advanced Cardiac Life Support (ACLS) On Critical Care Nurse's Knowledge and Practices at Benha University Hospital, Cairo, Egypt.

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Abstract: In sudden death situations prompt and high quality ACLS is vital for patient survival. This can only be achieved by ensuring that nurses, and by extension, other health care professionals acquire the requisite ACLS knowledge and skills through training. **The aim of this study** was to examine the impact of a designed teaching protocol on nurse's knowledge and practices as regards the advanced cardiac life support at the intensive care & critical care units at Benha university hospital. Quasi-experimental **design** (pre-test/post-test) was used in this study; The critical care **staff nurses [40]** working with critically ill patients in both intensive care & critical care units at Benha university hospital were included in this study. Data were obtained through three main **tools**; A constructed interviewing questionnaire sheet, observational checklist and hospital resuscitation policy assessment sheet. **Method**; the program was divided into 23 sessions; it was given in an average of three days per week for eight months with pre-post implementation evaluation. **Results** of the study revealed the following: (a) The mean knowledge scores of nurses are increased immediately after implementation of the program with a significant statistical difference. This increased level slightly decreased post three months of program implementation. (b) As well, the mean practice scores of the study group subjects was higher immediately after the implementation of the program with a high significant statistical difference compared to the pre program implementations, this increased level slightly decreased post three months of program implementation. (c) Also, a positive correlation was found between knowledge and practice scores of the study subjects therefore the 3 stated research hypothesis were supported. **In conclusion**, empowerment of critical care nurses knowledge and practices would have a positive impact upon their knowledge and performance. This could be of great importance upon patients' condition and is a cost effective. **The study recommended that** continuous In-service training programs for the purpose of updating the knowledge and skills of nurses working with cardiac arrest patients.

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1. Introduction

Cardiac arrest results in immediate interruption of blood flow to vital organs. The primary goal of cardiopulmonary resuscitation (CPR) is to re-establish blood flow, and hence oxygen delivery, to the heart and brain. Despite the advances in CPR during the last decades, the outcome after cardiac arrest remains unsatisfactory. Even if spontaneous circulation is initially restored, the early mortality and morbidity are high, as result of ischemic injury to the heart and brain. The cerebral injury that occurs during and after cardiac arrest is believed to evolve during three different phases: first, the non-intervention period from cardiac arrest to the initiation of CPR, with no circulation; secondly, the resuscitation period with oxygen delivery to the brain; and thirdly, the reperfusion phase (*Jahansson, 2010*).

The survival rates following cardiac arrest are poor. In approximately 80% of cases, there is deterioration in clinical signs during the few hours

before the cardiac arrest. Early recognition of the critically ill patient and appropriate immediate response will hopefully prevent some cardiac arrests, deaths and admissions to intensive care units. Track and trigger systems are useful in identifying changes in vital signs and alerting staff to a deterioration in a patient's condition. This may prompt staff to call an identified medical emergency team (MET) or critical care outreach team or the most appropriate expert help. The use of the ACLS approach provides a systematic tool for assessing and treating all critically ill patients and should be used for all patients (*Moule & Albarran, 2009*).

Nurses are generally the first responders to a cardiac arrest and initiate basic life support while waiting for the advanced cardiac life support team to arrive. Throughout the years, as CPR guidelines are altered, the roles of the multidisciplinary team members are also subjective to change. Factors such as improvement in nursing education. Increased needs for expert nurses due to the requirements of

specialized fields of medicine, and an increase noted in the autonomy of the nursing role have led to a change in nurses' responsibilities during CPR. Some of these new roles include: the rapid response nurse, the initiation of external defibrillation, the involvement in CPR decision making, the understanding of the use of resuscitation drugs and the family support in the cases of witnessed resuscitation (*Terzi, 2008*).

Modern cardiopulmonary resuscitation has been divided into basic life support (BLS) which includes airway control, rescue breathing and external chest compression; and advanced cardiac life support (ACLS) which consists of BLS, use of adjuncts for oxygenation, ventilation and airway control, cardiac monitoring and arrhythmia recognition, drug and electrical therapy, post-resuscitation care, and management of acute myocardial infarction and special resuscitation situations.

Advanced cardiac life support (ACLS) is a treatment consensus for cardiopulmonary resuscitation in cardiac arrest and related medical problems. It is practiced by in-hospital cardiac arrest teams, which generally consist of junior doctors from various specialties (anesthetics, general or internal medicine) and qualified nurses (*American Heart Association Guidelines, 2005*). ACLS (in most cases) refers to the skills and knowledge that the healthcare providers possess and uses. The ACLS provider may perform advanced procedures and skills on a patient involving invasive and non-invasive procedures including; Cardiac monitoring, Cardiac defibrillation, Intravenous cannulation (IV) and Advanced medication administration through parenteral and enteral routes and Following algorithms as set forth by AHA Advanced Cardiac Life Support (ACLS). ACLS training focuses on a broad range of skills, from airway management to pharmacology to leadership during emergency situations. Chances are, you feel more familiar with some areas than with others (*American Heart Association, 2008*).

Significance of the study:

Sudden cardiac arrest is associated with a high rate of morbidity, accounting for over 300,000 deaths annually. It is estimated that the morbidity rate in Egypt as result of cardiovascular diseases (5.6%) and by 2015 over million people will suffer serious cardiac arrest in Egypt. It has been documented that 33% to 40% of cardiac arrests in developed countries occur in the hospital setting, and of the arrests that occur in the hospital setting more than 60% are first recognized by nurses (*WHO, 2009*). Therefore in order to ensure patient survival, nurses who are often the first responders in resuscitation should be adequately prepared to provide effective ACLS. ACLS provides a systematic approach for timing and

selection of management strategies in the setting associated with cardiac arrest. ACLS training is now a requirement in all hospitals/universities that offer health related courses.

It has been observed over a period of four years working as a private critical care nurse practitioner and a clinical instructor teaching second year students in critical care units at Benha University Hospital that many patients admitted to the critical care unit developed sudden cardiac arrest. Most of them were died as a result of resuscitation outcomes which are based upon sound knowledge and skilful practices. In addition to a conducive work atmosphere.

Provision of such knowledge and efficient practices related to the advanced cardiac life support would be beneficial for health professionals in different ways: **first**, it could have a direct positive reflection upon the quality of patient care, **second**, it could support the important role of the nurse related to the resuscitation care of cardiac arrest patients, **third**, It could help other health professionals in planning and implementation of the future care plan for such group of patients, **fourth**, it could provide data base to be utilized by health professionals in this respect, **fifth and last**, it might generate an attention and motivation for further researches into this area.

Aim of the Study

The aim of the current study is to examine the impact of a designed teaching protocol on critical care nurse's knowledge and practices as regards the advanced cardiac life support patients in critical care areas at Benha University Hospital.

Research Hypothesis

- H1:** The post mean knowledge scores of critical care nurses who are exposed to a designed teaching protocol about advanced cardiac life support will be higher than their pre knowledge mean scores.
- H2:** The post mean practice scores of critical care nurses who are exposed to a designed teaching protocol about advanced cardiac life support will be higher than their pre practice mean scores.
- H3:** There will be a positive correlation between nurse's knowledge and practices scores.

2. Subjects & Methods

Research design:

A quasi experimental research design was used in the current study (pre-test/post-test design).

Variables:

The independent variable is the designed teaching protocol while the dependant variables are nurse's knowledge and practices related to advance cardiac life support.

Sample:

Convenience sample of 40 critical care nurses with different educational background who are willing to participate in the study working in the

critical care and intensive care units of Benha University hospital constituted the study sample.

Setting:

The study was conducted at the critical care and intensive care units of Benha University Hospital. The critical care unit equipped by 22 nurse (9 diploma degree nurses, 6 technical nursing school nurse and 7 baccalaureate degree nurses), the admission rate to CCU in 2011- 2012 was (1905 patient) (*Benha hospital statistics, 2012*). The intensive care unit equipped by 23 nurse (10 diploma nurses, 8 technical nursing school nurse and 5 baccalaureate degree nurses). The setting resuscitation policy: All clinical staff when called on will act rapidly to resuscitate any such persons, should alert emergency services and carry out basic life support and ensuring it is safe to do so.

Procedure:

The study was conducted on 3 phases (preparatory phase, implementation phase and evaluation phase).

1- The Preparatory phase:

The researcher reviewed the related materials and literature extensively. Assessment of the nurse's knowledge and practical skills were made. The educational program was developed by the researcher: detected needs, requirements and deficiencies were translated to aims and objectives of the program. Moreover, teaching materials were prepared i.e. audiovisual materials on electrocardiogram recording and rhythm interpretation, central venous pressure administration and care related to it, and effective technique of performance of cardio pulmonary resuscitation, together with handouts that covered theoretical and practical information. The three study tools are:

1) knowledge questionnaire sheet:

It was utilized for testing theoretical information related to all aspects of advanced cardiac life support for cardiac arrest patients. It consists of 8 items

* Scoring system:

Each right answer was given one or more scores with total scores of 74. As follows: Those who obtained less than 50% are considered having an unsatisfactory knowledge level and from 50% to 70% are considered satisfactory and above 70% are considered good.

2) Second tool:

Observational checklist: Was utilized to assess nurses' performance level. It comprised 9 procedures

Scoring system: Each item was scored as follow

Zero = Not done or done incorrect.

1=Incomplete. And **2** = Done correctly.

The total scores were 430 as follows:

- Less than 50% is considered unsatisfactory, from 50% to 70% are considered satisfactory and above 70% is considered good.

3) Third tool :

1- **Hospital Resuscitation Policy Assessment sheet:** Was utilized to assess nurses' performance regarding hospital resuscitation policy. It comprised 6 items.

Scoring system: Each item was scored as follows:

Zero = Not done or done incorrect.

1= Incomplete. And **2**= Done correctly.

The total scores were 33 as follows:

- Less than 50% is considered unsatisfactory, from 50% to 70% are considered satisfactory and above 70% is considered good.

Tool validity:

Tool validity was checked by a group of 6 experts who were specialized in critical care nursing, critical care medicine, and medical surgical nursing. The necessary modifications were done.

Tool Reliability:

The reliability of the tool was tested by Alpha Cronbach.

Pilot study:

This phase was ended by conduction of the pilot study. The pilot study was carried out on 5 nurses. This was done to test clarity, applicability, feasibility & relevance of the tools used, to estimate the length of the required time for data collection. A modification on tools was made based on the results of the pilot study. Hence, pilot study sample was excluded from the final sample.

2- The Implementation & evaluation phase:

Data were collected from January, 2011 till January, 2012. (8 weeks) for pre-test and 4 weeks for the post-test and 4 weeks post three months post-program implementation. This is in order to ensure the exposure of all nurses to same learning experiences. All members received the same program content using the same teaching methods, discussion, videotape and same handouts.

The total number of sessions was (184/31 weeks). It divided as follows: A total of (8) sessions for theoretical part (1 hour for each), and (15) sessions (2 hours for each) for the practical part. The total number of group was (8 groups) (for each 5 nurses) and the total time for achieving the program was 8 months given in an average of three days (two session in day) per week.

The program consisted of two parts:

The first part: Theoretical part:

For theoretical contents, a teaching sessions were conducted, each session takes around 60 minutes. The number of sessions (8) sessions for each group (5 nurses) to acquire the related information. Each nurse was supplemented with the knowledge

booklet, ahead and utilized each session to assure understanding and clear any misconception or misunderstanding. The researcher continued to reinforce the gained information, answer any raised questions and gave feedback. Communication channel was kept open between the researcher and the study group subjects. Then, immediately post, and after three months, knowledge tests were carried out.

The second part: The practical part

For practical contents, each nurse's performance as regards the pre determined procedure was evaluated before provision of any information (pre-test) utilizing the formulated checklists (second tool) and (third tool). Then subjects were divided into the small groups (5) nurses in each group). Demonstrations and redemonstration were carried on (15) sessions for each nurse. Practical booklet was given to each nurse and the immediate post practice test was done. Then after three months tests were carried out. Each skill was evaluated 3 times and the mean was calculated. Theoretical part was achieved in the head of the department office and practical part in clinical area. Teaching methods were lectures, small group discussion, and problem solving situations. Teaching aids were utilized, algorithm posters about ACLS, videotape, handouts, pen & paper test. The setting was equipped and prepared to be used.

Ethical Considerations:

An official and non official Permission for data collection and implementation of ACLS protocol in Critical Care areas of Benha University Hospital was obtained from the heads of the Critical Care Department and from all health personal who will be included in the conduction of the study. The researcher emphasized that the participation is voluntary. As well anonymity and confidentiality were assured through coding the data. As well, these data will used for the purpose of this research only and if it will be reused another agreement will be sought. The reactions of the administrative personnel were very supportive for the program and they offered all available facilities that might help in the success of the program.

Data Analysis:

Upon completion of data collection each sheet was manually scored. The background data sheet was coded and listed into numbers for calculation. Calculations were made manually. The following tests for significance were used: Means and standard deviation as well percentage, frequency, correlation coefficient, and t-test. Probability level of 0.05 was adopted as the level of significance for testing hypothesis.

Limitations of the Study:

- Dropout of some nurses from the study group because of long term leaves e.g. sick-leaves or rotating-shifts.
- Insufficient equipments, especially the disposable items.
- Lack of access to the Egyptian studies regarding advanced cardiac life support.

3. Results

Finding of the present study revealed that the majority of nurses are between (25-30) years old (55%), married (77.5%), having offspring (70%), with secondary school education (47.5%) and not receiving any previous training (92.5%).

Hypothesis (I) state: The post mean knowledge scores of critical care nurses who are exposed to a designed teaching protocol about advanced cardiac life support will be higher than their pre knowledge mean scores. Table (1) is related to this hypothesis.

Table (1) demonstrated that a general improvement in knowledge scores of nurses in all items of the study during different assessment periods as compared to pre-program mean scores. However, a slight decline occurred after three months of program implementation. A statistical significant differences were observed at p-values of <0.005. All through the three assessments except in knowledge of nurses related cardiac arrest and regulation of heart rhythm with t-test (1.209&1.216). Thus hypothesis (I) was supported.

Hypothesis (II) state: The post mean practice scores of critical care nurses who are exposed to a designed teaching protocol about advanced cardiac life support will be higher than their pre practice mean scores. Table (2) is related to this hypothesis.

Table (2) illustrated that a general improvement in practice scores of nurses in all items of the study during different assessment periods as compared to pre-program mean scores. However, a slight declinment occurred after three months of program implementation. A statistical significant differences were observed at p-values of <0.005. Thus hypothesis (II) was supported.

Table (3) documented that a general improvement in practice scores of nurses related to hospital resuscitation policy in all items of the study during different assessment periods as compared to pre-program mean scores. However, a slight decline occurred after three months of program implementation. A statistical significant differences were observed at p-values of <0.005. all through the three assessments except in knowledge of nurses related to general checks,suction,oxygen and drug checks with T- value of (1.190, 0.396, 1.948 & 0.896, Respectively) &p-value of >0.005.

Hypothesis (III) state: There will be a positive correlation between nurse's knowledge and practices scores. Table (4) is related to this hypothesis.

Table (4) shows that, there was a positive correlation between pre program, immediately post and three months of study group subjects knowledge, practice, hospital policy with age and years of experience. With significant statistical difference at p values of <0.001. Thus hypothesis (III) was supported.

Table (5) shows that a general improvement in nurses knowledge during the different assessment periods as compared to pre-program mean scores. But specifically as seen from above table that, the bachelor degree educational nurse, married, with offspring, and has a previous training obtained a high mean scores in different assessment periods as compared to pre-program mean scores. A statistical significant differences occurred at P- values of < 0.005.except related to bachelor degree, head nurse, single, and received a previous training with t value (1.73,1.73,0.85 & 1.17, Respectively) with p- value of >0.05.

Table (6) illustrated that a general improvement in nurses practice during the different assessment periods as compared to pre-program mean scores. But specifically as seen from above table that, the bachelor degree educational nurse, married, with offspring, and has a previous training obtained a high mean scores in different assessment periods as compared to pre-program mean scores. A statistical significant difference occurred at P- values of < 0.005. Except related to secondary school educational nurse, single, and has a previous training with t value (1.48, 1.9 3 & 1.53, respectively) with p- value of >0.05.

Table (7) shows that a general improvement in nurse's practice related to hospital resuscitation policy during the different assessment periods as compared to pre-program mean scores. But specifically as seen from above table that, the bachelor degree educational nurse, married, with offspring, and has a previous training obtained a high mean scores in different assessment periods as compared to pre-program mean scores. A statistical significant difference occurred at P- values of < 0.005.

Table (1): The mean total & subtotal knowledge scores of study group subjects all through the study periods.

Assessment periods Knowledge items	Before program	Immediately after			After three months		
	$\bar{X} \pm SD$	$\bar{X} \pm SD$	Paired t	P value	$\bar{X} \pm SD$	Paired t	P Value
Cardiac arrest	3.82±0.80	5.4 ±0.7	9.43	<0.001***	4.05±0.86	1.209	ns
Cardiac arrest in special circumstances	3.35± 0.881	4.825± 0.771	8.016	<0.001***	3.825±1.20	2.030	<0.005*
CPR	5.72± 1.884	10.77±2.423	10.455	<0.001***	6.8± 2.410	2.230	<0.005*
Improvement of blood circulation	5.3± 1.249	7.45±1.094	8.269	<0.001***	6.075±1.104	2.958	<0.01**
Defibrillating the heart	5.77± 1.33	9.25±0.82	14.089	<0.001***	6.375±1.41	1.98	<0.005*
Regulation of the heart rhythm	6.475± 1.117	8.975±1.332	9.124	<0.001***	6.875±1.763	1.216	ns
Oxygenation	6.25 ± 1.259	8.92±1.38	9.067	<0.001***	7.025±1.635	2.384	<0.005*
Total	36.75± 7.158	55.575±8.823	10.481	<0.001***	40.95±9.159	2.285	<0.01**

n.s = no statistical significance. * = statistical significant at 0.05 ** = statistical significant at 0.001

Table (2): The mean total & subtotal practice scores of study group subjects all through the 3 assessments.

Assessment periods Practice items	Before program	Immediately after			After three months		
	$\bar{X} \pm SD$	$\bar{X} \pm SD$	Paired t	P value	$\bar{X} \pm SD$	Paired t	P Value
Cardiopulmonary resuscitation	22.9±3.527	49.75±16.623	9.996	<0.001***	25.9±6.858	2.463	<0.005*
Defibrillation	22.625±2.486	37.1±7.722	11.290	<0.001***	24.9±6.256	2.140	<0.005*
Emergency medication	32.675±6.889	56.875±13.132	10.324	<0.001***	34.875±9.453	1.189	ns
ECG monitor	33.95±2.012	42.65±5.807	8.959	<0.001***	35.5±3.478	2.444	<0.005*
12- lead ECG	22.3±4.007	34.6±4.288	13.268	<0.001***	24.4±5.923	1.858	ns
oxygenation	16.7±3.363	29.875±7.184	10.514	<0.001***	18.5±3.873	2.222	<0.005*
Endotracheal intubation	32.425±1.093	41.5±5.417	10.407	<0.001***	33.5±3.248	1.990	<0.005*
Suctioning the airways	21.8±3.132	37.725±7.372	11.789	<0.001***	25.475±6.359	3.281	<0.01**
Central venous pressure (CVP)	18.1±3.793	23.05±3.247	6.281	<0.001***	18.2±3.634	0.120	ns
Total	223.725±25.385	353.475±67.746	11.343	<0.001***	245.175±43.919	2.674	<0.01**

n.s = no statistical significance. * = statistical significant at 0.05; ** statistical significant at 0.01; *** = statistical significant at 0.001

Table (3): The mean total & subtotal practice scores of study group subjects related to hospital resuscitation policy all through the study periods.

Assessment periods Hospital policy items	Before program	Immediately after			After three months		
	$\bar{X} \pm SD$	$\bar{X} \pm SD$	Paired t	P value	$\bar{X} \pm SD$	Paired t	P Value
General checks about hospital equipment	3.175±0.891	4.45±1.244	5.357	<0.001***	3.4±0.830	1.190	ns
Specific checks							
Suction	1.95±0.218	2.05±0.218	2.272	<0.01**	1.975±0.352	0.396	ns
Oxygen	2.025±0.352	2.575±0.494	5.851	<0.001***	2.175±0.379	1.948	ns
Drugs	3.1±0.916	4.125±1.452	3.824	<0.001***	3.3±1.1	0.896	ns
Crash Cart	2.95±0.947	4.925±1.170	8.368	<0.001***	3.575±0.997	2.920	<0.01**
Defibrillator	2.575±0.802	4.5±1.162	8.75	<0.001***	3.65±0.988	5.375	<0.001***
Total	15.775±3.460	22.625±4.968	7.157	<0.001***	18.05±3.694	2.843	<0.01**

n.s = no statistical significance. *= statistical significant at 0.05; ** statistical significant at 0.01; *** = statistical significant at 0.001

Table (4): Correlation coefficient for nurses' knowledge, practice, hospital resuscitation policy, age and years of experience

r-\ p values - Variables	r	p
Age with knowledge		
Pre -program	0.4405	< 0.001***
Immediately post	0.6331	< 0.001***
after three months	0.6125	< 0.001***
Age with practice		
pre - program	0.7098	< 0.001***
immediately post	0.4461	< 0.001***
after three months	0.6621	< 0.001***
Age with hospital resuscitation policy		
pre - program	0.7053	< 0.001***
immediately post	0.6240	< 0.001***
after three months	0.6586	< 0.001***
years of experience with knowledge:		
pre – program	0.6035	< 0.001***
immediately post	0.5639	< 0.001***
after three months	0.6252	< 0.001***
years of experience with practice:		
pre - program	0.7514	< 0.001***
immediately post	0.3918	< 0.001***
after three months	0.6843	< 0.001***
years of experience with hospital policy:		
pre - program	0.6914	< 0.001***
immediately post	0.5704	< 0.001***
after three months	0.6171	< 0.001***

*** = indicates statistical significance at 0.001

Table (5): The relationship between nurse's knowledge and selected sociodemographic variables all through the 3 assessments

Assessment periods items	Before program	Immediately after			After three months		
	$\bar{X} \pm SD$	$\bar{X} \pm SD$	Paired t	P value	$\bar{X} \pm SD$	Paired t	P value
Knowledge with							
Marital status							
Married (n=31)	37.677±7.381	57±7.955	9.92	<0.001	42.355±9.434	2.17	<0.005
Single (n=7)	35.285±4.589	53.857±5.488	6.87	<0.001	37.714±5.897	0.85	ns
Divorced (n=2)	27.5±0.5	34.5±0.5	14.31	<0.001	30.5±0.5	6.13	<0.001
job							
Nurse (n=30)	33.433±3.084	51.766±7.297	12.71	<0.001	36.6±3.971	3.46	<0.001
Head nurse (n=10)	46.7±6.664	66±1.612	8.91	<0.001	53±9.391	1.73	ns
Offspring's							

Present (n=28)	37.071±7.968	55.107±9.726	7.60	<0.001	41.678±10.268	1.87	ns
Absent (n=12)	36±4.672	56.666±6.087	9.34	<0.001	39.25±5.433	1.57	ns
Previous training							
Yes (n = 3)	48.666±8.178	66±2.160	3.54	<0.01	56±7.118	1.17	ns
No (n =37)	35.783±6.125	54.729±8.616	10.92	<0.001	39.729±8.169	2.35	<0.005
Education							
Secondary school (n=19)	32.368±3.064	49.210±7.911	8.66	<0.001	35.684±3.947	2.90	<0.01
Technical school (n=11)	35.272±2.093	57.091±1.239	30.24	<0.001	39.091±3.824	2.91	<0.01
Bachelor degree (n=10)	46.7±6.664	66±1.612	8.91	<0.001	53±9.391	1.73	ns

n.s = no statistical significance.

Table (6): The relationship between nurse's practices and selected sociodemographic variables all through the 3 assessments.

Assessment periods items	Before program	Immediately after			After three months		
	$\bar{X} \pm SD$	$\bar{X} \pm SD$	Paired t	P value	$\bar{X} \pm SD$	Paired t	P value
Practice with							
Marital status							
Married (n=31)	227.903±27.224	359.516±62.079	10.81	<0.001	250.290±46.045	2.32	<0.005
Single (n=7)	211±6.392	366.857±56.392	7.26	<0.001	233.857±30.647	1.93	ns
Divorced (n=2)	203±1	212.5±0.5	12.07	<0.001	205.5±0.5	3.17	<0.01
job							
Nurse (n =30)	215±15.874	337.9±71.827	9.15	<0.001	225.333±18.726	2.30	<0.005
Head nurse (n =10)	249.9±30.134	400.1±2.662	15.70	<0.001	302.7±47.098	2.98	<0.01
Offspring's							
Present (n=28)	226±28.473	348.393±71.336	8.43	<0.001	248.607±49.452	2.09	<0.005
Absent (n=12)	218.416±14.699	365.333±56.776	8.67	<0.001	237.166±25.139	2.23	<0.005
Previous training							
Yes (n = 3)	263.333±31.594	398.666±1.885	7.40	<0.001	316±50.484	1.53	ns
No (n = 37)	220.513±21.867	347.108±69.172	10.61	<0.001	239.432±37.934	2.62	<0.01
Education							
Secondary school (n=19)	213.052±15.056	329.263±75.710	6.56	<0.001	221.263±18.828	1.48	ns
Technical school (n=11)	218.363±16.669	352.909±61.584	6.99	<0.001	234.182±16.392	2.24	<0.01
Bachelor degree (n=10)	249.9±30.134	400.1±2.662	15.70	<0.001	302.7±47.098	2.98	<0.01

n.s = no statistical significance.

Table (7): The relationship between nurses practice related to hospital policy and selected sociodemographic variables all through the assessments.

Assessment periods items	Before program	Immediately after			After three months		
	$\bar{X} \pm SD$	$\bar{X} \pm SD$	Paired t	P value	$\bar{X} \pm SD$	Paired t	P value
Hospital resuscitation policy with							
Marital status							
Married (n=31)	16.258±3.609	23.387±4.722	6.69	<0.001	18.322±3.449	2.30	<0.005
Single (n=7)	14.428±2.321	20.857±5.139	3.01	<0.001	17.428±4.716	1.51	ns
Divorced (n=2)	13±1	17±2	2.53	<0.005	16±2	1.89	ns
job							
Nurse (n =30)	14.3±2.178	20.8±4.377	7.36	<0.001	16.7±3.012	3.58	<0.001
Head nurse (n =10)	20.2±2.749	28.1±1.135	8.47	<0.001	22.1±2.343	1.67	ns
Offspring's							
Present (n=28)	16.071±3.702	22.607±4.930	5.64	<0.001	18.035±3.427	2.07	<0.005
Absent (n=12)	15.083±2.691	22.666±5.055	4.59	<0.001	18.083±4.251	2.07	<0.005
Previous training							
Yes (n =3)	21.333±3.299	28.666±0.942	3.70	<0.001	23.333±2.357	0.85	ns
No (n = 37)	15.324±3.058	22.135±4.838	7.26	<0.001	17.621±3.443	3.03	<0.01
Education							
Secondary school (n=19)	13.526±1.601	17.789±2.066	7.20	<0.001	15±2.077	2.48	<0.01
Technical school (n=11)	15.636±2.384	26±1.477	12.39	<0.001	19.636±1.919	4.36	<0.001
Bachelor degree (n=10)	20.2±2.749	28.1±1.135	8.47	<0.001	22.1±2.343	1.67	ns

n.s = no statistical significance

4. Discussion

Modern resuscitation has been divided into basic life support (BLS) which includes airway control, rescue breathing and external chest compression; and advanced cardiac life support (ACLS) which consists of BLS, use of adjuncts for oxygenation, ventilation and airway control, cardiac monitoring and arrhythmia recognition, drug and electrical therapy, and management of special resuscitation situations. In sudden death situations prompt and high quality ACLS is vital for patient survival. This can only be achieved by ensuring that nurses, and by extension, other health care professionals acquire the requisite ACLS knowledge and skills through training (*Roger et al., 2011*).

To fulfill the aim of this study, three hypotheses were formulated and tested. Findings of this study supported the three started hypothesis.

Hypothesis (I), in which the knowledge scores of the study group subjects related to ACLS at ICU&CCU post a designed teaching protocol improved significantly especially in the immediate post test.

An obvious improvement in nurses post assessment total and subtotal knowledge scores were documented as compared to there pre assessment knowledge with highly significant statistically differences. This improvement might be related to the fact that majority of them are young, secondary school nurse, not receiving any previous training about ACLS and have 5-10 year of experience. And are enthusiastic to learn. In addition to, the highly expressed need of this group of nurses to learn more about certain areas like arrhythmia interpretation, managing patient airways, and technique of correct resuscitation. Supporting to this findings of *Hamed, (2009)* who studied "Nurse's performance during cardiopulmonary resuscitation in intensive care unit and cardiac care unit at Benha University Hospital", master thesis, Benha university. Revealed that less than half of nurses were in the age group (20 – 26years old). Also, the majority of nurses in both units had secondary diploma degree and more than one third were (>4 years of experience), the result of study also indicated that most of nurses in both units had not trained.

On the same line *Sheta, (2006)* in a study entitled as "effect of an educational program on the performance of nurses working with cardiac patients at Benha University Hospital". Stated that, the majority of nurse's were a secondary diploma nurse, there age group between (20 – 30 years), With years of experience nearly three quarter were $5 \leq 7$ years and the majority of nurses had no training programs (78.6%). Also *Mahrous, (2003)* who stated that more than half of the nurses had a diploma degree with age

(20 – 29) years and less than one quarter of nurses did not receive a training course.

I- Nurse's knowledge related to ACLS:

Findings of the current study showed that, the majority of the study nurses had unsatisfactory knowledge level about advanced cardiac life support. This is in agreement with *Sandroni et al. (2007)* and *Murphy & Fitzimons (2004)*. Reported that ACLS training is insufficient at various levels of care and that health care professionals have difficulty in following ACLS guidelines. The ACLS knowledge of both physicians and nurses has proved inadequate. A study conducted by *Gombotz et al., (2006)* about the effective management of in- hospital cardiac arrest by the nursing staff. The study supported the role performed by the nursing staff and concluded that patient may die unnecessarily due to sudden cardiac arrest if proper in- hospital resuscitation programmes are not available.

This agree with *Christoffer (2007)* in his study "Aquasi- experimental study to assess the effectiveness of structured teaching programme on knowledge and skill of cardiopulmonary resuscitation among staff nurses working in selected hospitals" Rajiv Gandhi University, Master thesis. Concluded that the programme was very effective in increase the knowledge and skills of staff nurses. In addition, *Potter et al., (2008)* in the study "A controlled trial of prehospital advanced life support in trauma" found that patients who received ALS care had a lower mortality rate in the first 24 hours than did patients who received BLS care (36% vs. 73%, $p < 0.05$). ALS care significantly reduced the incidence of pulmonary failure in trauma patients.

Also *Chan et al., (2010)* & *Pau, (2007)* reported ACLS is equipping nurses with knowledge and practical resuscitation skills. This disagreement with *Isenberg and Bissell (2005)* in a recent literature review comparing BLS to ACLS, demonstrated that, in cardiac arrest studies, ACLS does not provide additional benefits over BLS. As well, *Shuster et al (2008)* prospectively studied 3,000 patients with acute cardiac illness that were treated by either BLS crews or ALS crews. They found no difference in length of hospital stay or mortality. The authors concluded that ALS care provided no benefit to patients in an urban setting with average transport times of <10 minutes.

Nurse's knowledge scores regarding cardiopulmonary resuscitation (CPR) was significantly improved post a designed teaching protocol than pre-Implementation. This might be due to the majority of professional curriculum materials does not taught enough to health professionals during their study years at school, health professionals had extremely poor knowledge about CPR technique as

well as inability to remember the exact sequences of the procedure.

This is in agreement with *Hamed, (2009)* who found the majority of the study nurses had unsatisfactory knowledge level about cardiopulmonary resuscitation. This is in line with *Berdowski et al., (2009)* who stated that nurses play a key role in the management of cardiac arrest in hospital. Often they are first on the scene of an arrest – initiating cardiopulmonary resuscitation (CPR) as well as summoning assistance from the “advanced life support/ arrest” team.

As regarding the nurse’s knowledge scores about defibrillation, the present study documented a significant increase in nurse's knowledge post program implementation. These findings were consistent with *Taha, (2006)* who studied Emergency nursing care for critically ill patients: impact of a designed teaching protocol on nurse's knowledge and practices in ICU at Benha University and Benha Teaching Hospital. Documented that, knowledge of nurses about defibrillator are significantly increase post program implementation. On the contrary, *Hamed, (2009)* revealed that the majority of nurses had satisfied knowledge about nursing care for external defibrillator, uses and complications.

Regarding to nurses knowledge about improvement of blood circulation through emergency medications. The study finding a significant increase in nurse's knowledge post program implementation. In agreement with this finding *Mostafa, (2000)* who studied " assessment of nurse’s medication errors and factor’s causing them in the critical care unit at El-Manial University Hospital", reported in her study that lack of nurse’s knowledge about drug action, interaction and side effect are from the factors that influence nurse’s medication errors.

In accordance with this result (*Jahansson, 2010; Nursing and Midwifery Council, 2007 & Taha, 2006*) reported that Nurses must be aware of the need to be guided by the Standards for medicines management.

- As regarding nurse's knowledge about oxygen therapy, the current study showed an improvement in nurse's knowledge scores post designed teaching protocol. These findings are in agreement with *Taha, (2006)* who reported that there was highly significant difference between pre-and immediately post program implementation. This is in line with *Taha, (2004)* who studied "The impact of a training program provided for nurses working with the comatosed patients in the critical care units, zagazig university hospitals on nurse’s knowledge and performance levels as well on patient’s outcome". Illustrated that nurse’s performance of

administration of oxygen, was improved significantly post program than pre-program implementation.

Regarding nurse's knowledge about tracheobronchial suctioning. The current study showed that the level of nurse's knowledge was inadequate pre-program, while after program implementation, an improvement recorded with significant statistical difference. These findings are supported by *Taha, (2004)* who reported that knowledge of participating subjects regarding oral and naso-pharyngeal suctioning, was high with a significant statistical difference between pre-and immediate post-and after 8 weeks.

The importance of providing nurse with such knowledge was highlighted by *Zahran, (2001)* who studied the effect of using ventilator versus manual resuscitation bag on post suction-Hypoxemia in critically ill patients on 30 patients on mechanical ventilator who were in need for suctioning, as she reported that the critical care nursing managers should be responsible for planning educational program for the critical care nurses to teach the critical care nurses how to perform tracheal suctioning accurately without complications.

On the other hand, findings of the current study reported a gradual decrement in nurse's knowledge by time all over after three months post program implementation. In this respect *Taha, (2004)* emphasized the result reporting a decline with limited value in nurses knowledge level after 2months period, than immediately after the program implementation. As well *Seada, (2003)* studied the effect of a training program on staff nurses performance and empowerment in the emergency unit at El-manial university hospital. Reported that the nurses knowledge scores were slightly decreased 4- months after implementation of the program.

Nurse’s Knowledge scores about recording a 12-lead ECG and dysrhythmias interpretation were high post program with a statistically significant difference between pre- and immediate post scores. This might be due to nurses did not receive ECG in curriculum. The findings of this study supported by *Taha, (2006)* who demonstrated that lack of nurse's knowledge about ECG and its interpretation was documented by the results of the pre test. It was hypothesized that the knowledge scores of the subjects who participated in the teaching program will be higher post program implementation, this hypothesis was supported by the results as the mean scores of study group post program implementation indicated a knowledge gain

II- Nurse’s practice about advanced cardiac life support:

The findings of the present study supported hypothesis (II), in which the practice scores of the

study group subjects at the ICU & CCU post program improved significantly especially in the immediate post test. The current study showed a highly significant differences between pre-and immediate post- and post three months as regarding nurses practice. Training in ACLS should be compulsory in all nurse training institutions through an organized program.

This finding is supported by *Mekinen, (2010)*: who illustrated that overall level of performance was significantly improved after program implementation. As well, *(Herlitz et al., 2006 and Seada, 2003)* who stated that the result of the present study also revealed an improvement in nurse's performance scores as the majority of them received an above average score immediately after implementation of the program and in the follow up period relative to the satisfactory score in the pre program phase.

However, findings of the current study reported a gradual decrement in nurse's practice by time all over the after three months post program implementation. In this respect *(Taha, 2004 and Seada, 2003)* reported that the results of the test were declined with limited value after 2 months period, than immediately after the program implementation.

Nurse's performance about effective cardiopulmonary resuscitation (CPR) and Defibrillation: the present study showed that there was a highly significant improvement post implementation than pre implementation. In agreement with these findings of the present study *(Ramsay, 2009; Hamed, 2009; AL-Kanday, et al., 2007 & Seideline, 2006)* found that nurses working in intensive care unit and cardiac care unit had unsatisfactory practice about cardiopulmonary resuscitation, emergency drug and defibrillator. This means that nurses who are working in both units area were in need for an educational program to review and refresh their practice and knowledge.

Also *Castrén, et al (2009)* reported that negative beliefs and attitudes towards defibrillation affected the nurses' attitudes towards resuscitation. Too many nurses felt that defibrillation could do more harm than good. They stated that they hesitated to defibrillate for fear of injuring the patient or because the patient might die and the nurse would feel guilty. After the training intervention, fewer nurses felt that only a physician should perform defibrillation, and the majority felt competent to perform defibrillation themselves. Moreover, *Moule, (2009)* reported in his study that the critical care nurses play an important role in management of cardiac arrest patients and should be permitted to use defibrillator.

Regarding nurse's performance about emergency medications, in the present study, it was

found that there was a highly significant improvement of the nurse's performance after program implementation. In agreement with these findings of the present study, *Seada, (2003)* stated that administration of medication was another area of nurses performance that was improved immediately after implementation of the program with further slight increase in the follow up period (4-months after the program). In the same line, *Lacy et al., (2008) & Gallimore, (2006)* added that during cardiac arrest the survival of the patient depends on a rapid response that provides high- quality treatment based on the latest guidelines. Administration of the correct drugs is an important aspect of this process and one in which nurses are taking an increasingly important role.

As regarding nurse's performance about cardiac monitoring. The present study showed that there were a highly significant improvement of nurses performance. In agreement with these findings of the present study, *Taha, (2006)* reported that when comparing the three mean observations of the connection of patient to monitor among both group, the results revealed that there is highly significant statistical differences among them. So the study group obtained higher mean scores in three observations.

Nurse's performance about recording a 12-lead ECG and dysrhythmia interpretation. The present study showed that there was a highly significant improvement of nurse's performance. After program implementation, the nurse's performance scores were satisfactory. In agreement with findings of the present study, *Sheta, (2006)* reported that it was hypothesized that the performance score for the subjects of the study group who will participated in the teaching program will be higher than the control group. The results supported the stated hypothesis emphasizing improvement practice among the study group as a result of exposure to the teaching program.

As regarding to nurse's performance about administration of oxygen, there was highly significant difference between pre-and immediately post program implementation. This is in line with *Taha, (2004)* who illustrated that nurse's performance of administration of oxygen, was improved significantly post program than pre-program implementation.

As regarding to nurse's performance related to suctioning the airways, there were highly significant difference between pre-and immediately post mean scores. In agreement with findings of the present study *Zevitz (2008)* emphasized that suctioning is imperative to promote patient airway, thus preventing the development of hypostatic pneumonia and

preventing stasis of pulmonary secretion. It is the responsibility of the nurse.

Regarding to nurse's performance for measurement of central venous pressure, the present study revealed that, there was a highly significant difference between pre-and immediately post and post three months. In agreement with these findings, *Abd – El-hamid, (2005)* explained that although direct measurement of CVP has been performed by physicians since the early 1900's. Today, CVP measurement is a nursing responsibility. Also, *Deakin et al., (2006)* added that critical care nurses should be able to measure the CVP competently and identify the factors affecting it.

III- As regarding nurse's practices related to hospital policy checks

Such the current study demonstrated a high statistically significant difference between pre-and immediate post knowledge scores. This finding is in agreement with *Frascone and Kaye (2009)* who reported that the coronary care nurse is responsible for preparing the resuscitation equipment before patient admission as well as the mobile crash cart containing all supplies, equipment, and drug needed emergencies.

This is in line with *Heng et al., (2011)* who stated that it is necessary that nurses should be held knowledgeable for checking emergency equipment for delivery of quality nursing care to critically ill patients.

IV- Relationship between knowledge and practice among the study group

The findings of this study supported the hypothesis III that there will be a positive correlation between nurse's knowledge and practice scores. This reflects the importance of integration between theory and practice providing an optimum learning environment; play an important role in developing relationships by positive regard for the individual and structure learning experiences, which facilitate the acquisition of the clinical skills of nursing. In the same vein, *Taha, (2006)* illustrated that nurses should attain and maintain a high level of nursing knowledge and nursing practice but to be effective in practice, nurses must gain knowledge before they enter practice. These findings contradicted *Mahrous, (2003)* reported that there is no correlation between knowledge and practice of diploma nurses.

Regarding correlation between knowledge, practice scores, nurses' age, and experience. The current study showed a positive correlation between knowledge, practice and age with a highly statistical significant along different assessment periods of program implementation. This agrees with *Christoffer, (2007)* who found that there were a positive correlation between age, years of experience,

knowledge and skills. In contradict *Hamed, (2009)* revealed that there is no statistical significant in relation between level of education and practice.

Regarding correlation between years of experience, knowledge and practice. In the present study, years of experience were positively correlated with knowledge and practice scores of nurses with highly statistically significant differences immediately post- and after three months post program implementation. These findings are supported by *Seloma, (2003)* in her study about hemodynamic monitoring: a relationship of nurses knowledge and practices to patient's outcome on sixty nurses working in ICUs and three hundred patients connected with central venous and arterial lines, reported that the more the years of working in ICUs and years of experience the higher efficiency of nurses clinical practices. As years of experience were positively correlated to their knowledge and performance.

This disagree with *(Sheta, 2006; Shalby, 2005 and Osman, 2001)* who mentioned that the relationship between knowledge and years of experience, was found to be not significantly changing in pre-, immediate post- and follow- up of the program implementation. In addition, reported that there is no significant correlation between nurse's years of experience and their knowledge and practice.

As regarding to relation between practice and level of education, this result revealed that, the bachelor degree nurse, married and received a previous training obtained a high mean scores without statistical significant difference. These findings supported by *Taha, (2006)* Who found that, bachelor degree nurses received significantly better scores than diploma nurses because they are more involved and more responsible for checking apparatus such as pacemaker, defibrillator, O2 availability suction machine, record and report any changing in rhythm, and diploma nurses being responsible for other duties outside the units most of the time, such as receiving lab and x-ray record, receiving supplies and medication from the pharmacy and transfer patient to the ward and soon. These duties must be done by clerks to achieve better patient care by diploma nurses.

On the contrary, *Hamed, (2009)* reported that, the bachelor degree nurses obtained a low mean scores than others regarding knowledge items. This possibly because they didn't receive any knowledge related to this topic during their academic preparation on the under graduate level.

Conclusion and Recomm-entations:

Conclusion

It can be concluded from this study that the designed teaching protocol could be beneficial in preparing the critical care nurses to assume their responsibilities toward cardiac arrest patients at critical care units.

Results of the present study indicated that:

Nurses' knowledge and practices were improved significantly concerning one of the most important areas of nursing care to provided for the cardiac arrest patients at the critical care areas. This improvement was reduced by time.

Knowledge and practice was improved parallelly. Sociodemographic and knowledge scores of nurses was found to be improved among those with bachelor degree nursing education, Head nurse, married, with no off springs, and has obtained a previous training course.

Sociodemographic and practice scores of nurses was found to be improved among those single, Head nurse, and those obtained a previous training courses.

Recommendations

Continuous In–service training programs for the purpose of updating the knowledge and skills of nurses working with cardiac arrest patients.

A periodic evaluation of the critical care nurses knowledge and skills as regards different nursing procedures at the intensive care unit must be carried out in order to obtain data which determine the level of knowledge and skills in order to exclude low level nurses before giving them direct patient care responsibilities.

During academic studies, the students should have course outline about advanced cardiac life support involving updating knowledge and guidance for what to know and how to do.

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