Effect of Teaching Program on Knowledge and Skills Regarding Automatic External Defibrillation among Nurses Working In Emergency Unit

Manal Mohammed Abd El naeem, Prof. Dr. Nadia Taha Mohamed, Dr. Mona Aly Mohammed & Dr. Mervet Anwar Abd El-Aziz

Assistant lecturer of critical care nursing department, Professor of Critical Care and Emergency Nursing
Critical Care and Emergency Nursing Department, Faculty of nursing Alexandria University
Lecturer of critical care nursing department. Faculty of nursing, Assiut University
Lecturer of critical care nursing department, Faculty of nursing, Assiut University

Background: *In most cases of cardiac arrest, the chances of a favorable outcome depend not only on efficient BLS, but also on the early use of defibrillation. In a hospital environment, the first responders are most likely to be members of the nursing staff. The potential advantage of these personnel being able to perform early defibrillation, as well as BLS, is considerable.*
Study Objective: *Identify the effect of teaching program on knowledge and skills regarding automatic external defibrillation among nurses working in emergency unit*
Research design: *A quasi experimental.*
Setting of the study: *Emergency care medical department at Assuit University Hospitals.*
Sample: *Nurses working in selected setting and having more than one year clinical experience (about 50 nurses).*
Methods: *Two tools were used for data collection. Tool one is (knowledge assessment tool). Tool two is (skills assessment tool).The current study was carried out on the assessment of the nurses' level of knowledge and skills using tool one and tool two. Followed by implementation where all the groups were exposed to four sessions and assessment carried out. Data was collected by the researcher during approximately six months starting.*
Results*: The study revealed that the majority of nurses had poor knowledge and skills related to AED before teaching program which has been improved after Also, a positive correlation was found between knowledge and skills scores of the study subjects.*
In conclusion*, empowerment of critical care nurses knowledge and skills would have a positive impact upon their knowledge and performance.*
The study recommended *that continuous In–service training programs for the purpose of updating the knowledge and skills of AED for nurses working with cardiac arrest patients.*
Keywords: *Cardiopulmonary resuscitation (CPR); Basic life support; automatic external defibrillation (AED); Knowledge; Skill; Teaching Program*

I. Introduction

Defibrillation is a common treatment for life-threatening cardiac arrhythmias, ventricular fibrillation and pulseless ventricular tachycardia. Defibrillation consists of delivering a therapeutic dose of electrical energy to the affected heart with a device called a defibrillator. This depolarizes a critical mass of the heart muscle, terminates the arrhythmia, and allows normal sinus rhythm to be reestablished by the body's natural pacemaker, in the sinoatrial node of the heart. Defibrillators can be external, trans venous, or implanted, depending on the type of device used or needed. Some external units, known as automated external defibrillators (AEDs), automate the diagnosis of treatable rhythms, meaning that lay responders or bystanders are able to use them successfully with little, or in some cases no training at all.[1]

An automated external defibrillator is a portable, easy-to-operate defibrillator. A systematic review concluded that cardiopulmonary resuscitation plus automated external defibrillator (CPR+AED) significantly offered a survival advantage over cardiopulmonary resuscitation (CPR) alone. Operation of AED starts with applying self-adhesive defibrillator pads or electrodes pads to the right upper chest, below the right clavicle and left below the nipple or left breast laterally according to the diagram provided in the AED kit. It will automatically analyse and interpret the heart rhythms within a minute. Subsequently, through the audible voice, it will recommend the operator to deliver the shock by pushing a button or continue with CPR. Depending on the specification of the AED, some deliver 200 Joules (J) at the first shock followed by maximum of 360J. Some have 150J set as a fixed dose. The AED is highly specific and sensitive in recognizing the shockable and non-

shockable rhythms. The shockable rhythms are ventricular tachycardia (VT) and ventricular fibrillation (VF). The non-shockable rhythms are pulseless electrical activity (PEA) and asystole. Therefore, it is essential to quantify and qualify the cardiac rhythms while patients experience cardiac arrest to further justify the employment of AED in hospital setting.[2]

Delays in defibrillation for in-hospital cardiac arrest are associated with lower survival, with ten percent lower probability of survival for each additional minute of delay. Current guidelines dictate that patients should receive defibrillation within two minutes of recognition of a cardiac arrest. It is essential that all health care professionals are regularly trained in the practice of basic life support (BLS). [3]

Despite the extension of training and the authorization of nurses to perform early defibrillation (advocated by the American Heart Association), such practice has not been widely adopted in hospitals. Inadequate knowledge, lack of skill retention, insufficient organizational support and the passive culture of nurses are barriers preventing the move towards nurse-led defibrillation. It is necessary for nurses to know more regarding defibrillations and the need to extend the registered nurses' role in the early defibrillation of cardiac patients. Current nursing practice in emergency resuscitation care and the hurdles constraining early defibrillation. The successful extension of the registered nurses' role in early defibrillation will enable them to possess broader knowledge to be clinically competent in providing efficient patient care.[4]

II. Significance Of The Study

As one can easily imagine the cardiac arrest is a matter of extreme importance, even from the standpoint of nursing. 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 [5]. It has been documented that33% 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[6]

Earlier defibrillation with AED has significantly improved the survival of the victims who suffer from an out-of-hospital cardiac arrest. The probability of survival drops by 7-10% of every minute delay in defibrillation for shock-able rhythms.[7] As a result, AED is highly recommended to be deployed in the community. The advantages of AED have also extended its application in the hospital setting. To shorten time to first shock within three minutes of collapse, the American Heart Association has recommended use of AED, especially by nurses who are most likely to be the first responding to a cardiac arrest in the hospital. [2]

Taniguchi T, Omi W, Inaba H. found that more than 90% of nurses and medical students declined to perform AED defibrillation because they did not know what an AED is and/or how to use it; 57% refused to defibrillate because they did not know how to use one correctly. [8]

III. Aim Of The Study

The present study aim to identify the effect of teaching program on knowledge and skills regarding automatic external defibrillation among nurses working in emergency unit

IV. Hypotheses
- There is a significant difference between posttest knowledge scores to the pretest knowledge scores following implementation of teaching program.
- There is a significant difference between post test skill scores to the pretest skill scores following implementation of teaching program.
- A positive relation will exist between knowledge and skills score obtained by critical care nurses receiving teaching program.

Research design: A quasi experimental research design with one group pre-test post-test approach was used to assess the effectiveness of structured teaching program for the present study.

Study variables: The independent variable was the teaching program. While the dependent variable was critical care nurses' knowledge and skills.

Setting: The study was conducted in emergency care medical department at Assuit University Hospitals.

Sample: Convenient sample of all nurses working in selected setting and having more than one year clinical experience (about 50 nurses) been included in the study.

Study tools: Two tools were used in this study:

Tool one (knowledge assessment tool): This tool consisted of Structured multiple choice pre/posttest questionnaire tool. This tool was developed by researcher after reviewing literatures [9-17] to assess the knowledge level of critical care nurses regarding automatic external defibrillation. It was in Arabic language. This tool included two parts:

Part I: Scio-demographic data of study sample which include: age, sex, educational level, marital status, years of experience, and previous training program.

Part II: Nurses' knowledge about anatomy and physiology of the heart , cardiac arrest and automatic external defibrillation. It consist of twenty four multiple choice questions covering five main parts:
- Basic knowledge about anatomy and physiology of the heart which included twelve questions.
- Basic knowledge about cardiac arrest which included seven questions.
- External defibrillation (uses &precaution) which included five questions.

Scoring system for nurses' knowledge: All items had three alternative answers. A score value of 1 was awarded to each correct answer and zero was allotted for wrong answer.

The total score of nurses' knowledge was calculated and classified as follows: 75% and more was considered **good**, 74-60 % was considered **fair**, and less than 60% was considered **poor**.

Tool two (skills assessment tool):This tool consisted of observational Checklist sheet. This tool was adopted from2010American Heart Association Guidelines for Cardiopulmonary Resuscitation for assessment of nurse's skills [18, 19]. The tool covered the steps procedure of AED:

Scoring system for nurses' skills : every step was evaluated as follows; correctly done was scored (2), incorrectly done was scored (1) and not done was scored (0).

The total score of nurses' skills was calculated and classified as follows: 75% and more was considered **good**, 74-60 % was considered **fair**, and less than 60% was considered **poor**.

Construction of the teaching program:

The teaching program was developed by the researcher based on the previous assessment of nurses' knowledge and skills, available resources and review of relevant literature. [9-17]

- **General objective of the program:**

The overall objective of the developed teaching program to improve the critical care nurses' knowledge and skills about automatic external defibrillator.

- **Specific objective of the program:**

By the end of the program nurses were able to:

Knowledge And Understanding Skills:
- Identify the anatomy of the heart.
- Identify the physiology of the heart.
- Define cardiac arrest.
- List causes of cardiac arrest.
- Recognize sings that indicate cardiac arrest.
- Define Automated External Defibrillator (AED).
- List component of Automated External Defibrillator (AED).

Intellectual Skills:
- Classify types of cardiac arrest
- Differentiate between cardiac arrest and cardiac attack.
- Summarize Special Considerations during using AED e.g. Implanted Pacemakers and implanted Cardioverter-Defibrillators etc….

Professional Skills:
- Diagnose cardiac arrest patients
- Operate Automated External Defibrillator
- Appraise complication of Automated External Defibrillator.

General And Transferable Skills:
- Communicate effectively with team work.
- Protect the manikin and equipment at the CPR unit.

V. Methods

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

Preparatory phase
- Permission to conduct the study was obtained from the hospital responsible authorities after explanation of the aim of the study.
- Tool one used in this study was developed in Arabic by the researcher based on reviewing the relevant literature. [9-17]

- The tools were tested for content related validity by jury of five specialists in the field of critical care nursing and critical care medicine.
- The reliability was test for tool one (knowledge assessment tool), tool two (skills assessment tool) by using Cronbach's coaefficient alpha (r=0.817, 0.794 respectively) which is acceptable.
- A pilot study was conducted on five nurses to test the feasibility and applicability of the tool and the necessary modification was done.
- Permission for voluntary participation was obtained from nurses after the purpose of the study was explained.
- An approval was obtained from the local ethical committee and the study was followed the common ethical principles in clinical research.
- The researcher obtained was prepared through passing a workshop held by European Resuscitation Council in collaboration with the Egyptian Resuscitation Council a certificate approving that the researcher is capable for delivering and making BLS/AED procedure.

- **Development of the teaching program:**
  The teaching program was developed by the researcher, after reviewing the relevant literature [7-15].The following steps was adopted to develop the program.
- Stating the program general and specific objectives.
- Planning the program: the content of the program were arranged into four teaching sessions in addition to preliminary one. The content of the program covered two parts related to:
- Knowledge about cardiac arrest and automatic external defibrillator.
- Performance of procedure required for automatic external defibrillator.

  Theoretical Part Included:
- Anatomy and physiology of cardiovascular system.
- Definition of Sudden cardiac arrest (SCA), classification, signs and symptoms, causes, and management of cardiac arrest.
- Definition of Automated External Defibrillator, AED features, AED operation, and special Considerations.
  Practical Part Included:
- AED procedure.
  Learning Environment:
  The program was conducted in head nurse's office at hospital and development center (CPR unit) at faculty of medicine.
  Teaching Methods:
- **Lectures and discussion** by using audiovisual aids:
- PowerPoint presentation and booklet which developed in Arabic by the researcher based on reviewing the related literature.[9-17]
- Videos about AED procedure adopted from **CPR Training - ProCPR.org (2010 AHA Guidelines), Mega code from AHA, and Code Blue Simulation**[20,21,22].
- Poster about AED steps.
- **Demonstration and re-demonstration** using manikin **the Ambu Man® CPR Manikin**.[23]
- **Scenarios** for provides AED practice.[24]
  Arranging the subgroup:
- The total sample was divided into ten subgroups included five nurses each session for better performance and understanding.
  Implementation phase and evaluation phase:
- all nurses were interviewed during break time (one hour) in different shifts or before beginning of shift.
- **Assessment of knowledge was done twice as follows:**
- Once at beginning of study was considered as pretest assessment and as base line data for latter comparison with future post test.
- The second administration of questionnaire was carried out after implementation of the teaching program to identify its effect on nurses' knowledge.
- **Assess nurses' skills:**
- The researcher observes the nurses' skills using observational checklist tool twice before and immediately after program implementation.
- The researcher completes the checklist while the nurses demonstrate techniques using **the Ambu Man® CPR Manikin.**

- **Implementation of program:**
  The program was implemented for the ten subgroups of nurses. All groups were exposed to four sessions in-addition to the preliminary one. Preliminary session: In this session the researcher met the participants and explained the objectives, contents, and methods of evaluation of program.
  Session I included: Anatomy and physiology of cardiovascular system. For duration of 30 minutes.
  Session II included: Definition of Sudden cardiac arrest (SCA), classification , signs and symptoms , causes , and management of cardiac arrest. For duration of 30 minutes.
  Session III included: definition of Automated External Defibrillator, AED features, AED operation, and special Considerations. 30 minutes.
  Session IV included: AED procedure demonstration and re-demonstration was performed by researcher using manikin. For duration of 1 hour.
- Group discussion was encouraged with continuous feedback to ensure understanding and achievement of the specific objective of the program.
- An open channel of communication was established between the researcher and nurses to answer any question and reinforce the gained information and correct actions.
- In the last session the researcher summarized and emphasized the important points.
- Each nurse demonstrate and re-demonstrate the steps individually and completely performed the steps using manikin.

  Evaluation of program:
  The evaluation of program was carried out immediately after the application of the program using the pre test study tools one and two in order to test the effectiveness of the program on nurses' knowledge and performance.
  Data was collected by the researcher during approximately six months starting from April 2014 to September 2014.

  Limitation of the study
- Dropout of some nurses from the study group because of long term leaves e.g. sick-leaves or rotating-shifts.
- Lack of Egyptian statistical record about cardiac arrest.

  Statistical analysis:
- The data entry and data analysis were done using (SPSS Ver.19.).
- Descriptive statistics (number, percentage, mean and standard deviation) were done.
- Chi-square test was done to compare qualitative variables between before and after group .
- Pearson correlation between quantitative variables.
- P-value considered statistically significant when $p < 0.05$.
-

VI. Results

Section I: The socio-demographic of studied nurses

Table (1) shows the Scio-demographic data of studied nurses. It was found that 62% of them were in the age group less than 25 years, and 90% were female. Concerning their educational level, 52% of the nurses held 3 Years Nursing Diploma, 24% of the nurses held Technical Health Institute, 14% a Technical Institute of Nursing and 10% of the nurses held 5 Years Nursing Diploma. Moreover, 58 % nurses had work experience more than 5 years and 42% of them had less than 5 years experience. In relation to their previous training on CPR, the table reveals that, 98 % of them were not receiving any previous CPR training.

Table (1): The Scio-demographic data of studied nurses:

Scio-demographic data	No. (n=50)	%
Age:		
< 25 years	31	62.0
≥ 25 years	19	38.0
Mean ± SD (Range)	24.40 ± 4.19 (20.0 – 40.0)	
Gender:		
Female	45	90.0
Male	5	10.0
Level of education:		
3 Years Nursing Diploma	26	52.0
5 Years Nursing Diploma	5	10.0
Technical Health Institute	12	24.0
Technical Institute of Nursing	7	14.0

Experience:		
< 5 years	21	42.0
≥ 5 years	29	58.0
Mean ± SD (Range)	5.94 ± 4.96 (1.0 – 23.0)	
Training courses:		
Yes	1	2.0
No	49	98.0

Section II: The testing of research hypotheses I
There will be significant difference between posttest knowledge scores to the pretest knowledge scores following implementation of teaching program.

Table (2) Presents that the total score of nurses' knowledge categories before and after teaching program. It was observed that there were statistical significant differences between nurses' knowledge categories indicating good knowledge after teaching program, compared with poor knowledge before teaching program.

Table (2): The Total Score of Nurses' Knowledge categories before and after teaching program

Total Score of Nurses' Knowledge categories	Before (n= 50)		After (n= 50)		P-value
	No.	%	No.	%	
Knowledge about anatomy and physiology of the heart:					0.000*
Poor	42	84.0	8	16.0	
Fair	2	4.0	6	12.0	
Good	6	12.0	36	72.0	
Knowledge about cardiac arrest:					0.000*
Poor	35	70.0	7	14.0	
Fair	8	16.0	10	20.0	
Good	7	14.0	33	66.0	
Knowledge about external defibrillation:					0.000*
Poor	20	40.0	4	8.0	
Fair	19	38.0	8	16.0	
Good	11	22.0	38	76.0	
Total knowledge:					0.000*
Poor	39	78.0	4	8.0	
Fair	8	16.0	12	24.0	
Good	3	6.0	34	68.0	

* Statistical significant difference (P < 0.05) Chi-square test

Section III: The testing of research hypotheses II
There will be significant difference between post test skill scores to the pretest skill scores following implementation of teaching program.

Table (3) Present that the total score of nurses' skills before and after teaching program. It was observed that there were statistical significant differences between nurses' skills indicating good skills after teaching program, compared with poor skills before teaching program

Table (3): The Total Score of Nurses' Skills before and after teaching program

Total Score of Nurses' Skills	Before (n= 50)		After (n= 50)		P-value
	No.	%	No.	%	
Total skills:					0.000*
Poor	49	98.0	7	14.0	
Fair	1	2.0	9	18.0	
Good	0	0.0	34	68.0	

* Statistical significant difference (P < 0.05) Chi-square test

Section IV: The testing of research hypotheses III
A positive relation will exist between knowledge and skills score obtained by critical care nurses receiving teaching program.
Table (4) Presents the correlation between total score of nurses' knowledge with skills before and after teaching program. There was no correlation between total score knowledge and skills of nurses before teaching program. while, a significant positive correlation was found between total score of nurses' knowledge related to skills of CRR and total skills after teaching program (r-value=0.183and 0.783) respectively.

Table (4): The correlation between total score of nurses' knowledge with skills categories before and after teaching program

Total Skills		Total knowledge	
		Before	After
Skills of AED	r-value	0.183	0.783
	P-value	0.204	**0.000***

* Statistical significant difference (P < 0.05)   Pearson test

VII.   Discussion

Early defibrillation is widely accepted to correlate closely with survival and recovery of neurological function after cardiac arrest due to ventricular fibrillation or ventricular tachycardia. Focused training of a nurses to defibrillate on their own initiative may significantly decrease time to first defibrillation in cases of in-hospital cardiac arrest. Such a program may be the best single strategy to improve in-hospital survival.[1]

The current study figured out that, the level of knowledge of the majority of studied nurses generally was poor. This might be related to the fact that majority of them hold nursing diploma and most of books are written in English and their learning in Arabic. The technical nurses in the current study have lack of knowledge due to absence of pre-employment orientation programs, in-service training and courses. Moreover, the nurses in Egypt are not used the independent self-learning. Another cause for lack of knowledge nurses' exhaustion due to increased work load which may hinder their ability to read and update their knowledge.

Regarding the nurses' knowledge scores about defibrillation, the present study documented a significant increase in nurses' knowledge post program implementation. This could be attributed to the fact that this insufficient knowledge regarding External defibrillation AED (uses and precautions). Another cause absence of pre-employment orientation and in-service training programs regarding External defibrillation AED (uses and precautions).These findings were consistent with, *Szarpak L (2013)* [25] who reported that the level of knowledge of the AED among nursing students is insufficient. Also, *Taha A., (2006)* [26] documented that, knowledge of nurses about defibrillator were significantly increased post program implementation. On the contrary, *Hamed S., (2009)* [27] in another study revealed that the majority of nurses had satisfied knowledge about nursing care for external defibrillator.

Regarding AED performance, the findings of the present study supported *hypothesis (II)*, in which significant difference between post test skill scores to the pretest skill scores following implementation of teaching program. **The finding of the present study revealed that the majority of nurses didn't apply steps for operating an AED.** This could be attributing to the fact that this insufficient knowledge may be related to proper steps for operating an AED, absence of pre-employment orientation, and in-service training programs. This result is in agreement with *Thomas M., (2013)* [28] who studied "evaluate the effectiveness of video assisted teaching programme on knowledge and practice regarding cardioversion and defibrillation among staff nurses working in cardiac unit in selected hospitals of Bagalkot" . He reported that there is significant difference between post test and pre test practices scores. And *Gupta V, Dias R., (2014)* [29] reported that there was a significant difference in the means of pre and post test practice scores of defibrillation among staff nurses. In the same line, *Liu J. et al., (2015)* [30] who studied the effectiveness of AED training for nurse students. He reported that the training improves both competence and confidence effectively and AED defibrillation can be performed very well immediately after minimal training

As regarding, the relationship between knowledge and skills. The findings of this study supported the *hypothesis III* which stated that there will be a positive correlation between nurse's knowledge and skills scores. This reflects the importance of integration between theory and practice. In the same line, *Taha A., (2006)*[26] 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.

VIII.   Recommendations:

Based on the finding of the current study, the following recommendations are suggested:

Recommendation regarding administration:

- Hospital wards need to be equipped with better facilities for CPR and with readily accessible and properly maintained defibrillators.

    Recommendations regarding education and training:

- The risk factors, etiology and prevention measures of cardiac arrest should be integrated in schools and the undergraduate nursing courses.
- Integrate the necessary knowledge and skills related to the risk factors, etiology and prevention measures of cardiac arrest in in-service training to help the nurses in recognition of the patient at risk for cardiac arrest.
- Included AED teaching program in the schools and undergraduates' curriculum.
- Pre-employment orientation, in-service education and training programs regarding AED should be for all .

▪ Learning facilities such as update scientific journals and books, posters, and results of researches, in addition to access to the internet should be available to promote self learning regarding AED.

Recommendation regarding nursing practice:

▪ Regular resuscitation training for all nurses.

▪ All nurses should be familiar with most piece of technology and equipment that is stored on the emergency trolley as well as of the function and role of the defibrillator in CPR.

▪ The use of educational resources such as simulator manikins which allows participants to experience an emergent critical situation, take action, and review consequences of choices without jeopardizing patient safety.

Recommendation regarding the research:

▪ Repeat this research on large sample size and in different settings for generalization.

References

[1]. Rohith Rao A.S. (2013) A Study To Assess The Effectiveness Of Structured Teaching Programme On Knowledge Of Defibrillation Among The Staff Nurses In Selected Hospitals At Tumkur. Master degree of medical surgical nursing. Srisddharha College of nursing, Agalakote, Tumkur.

[2]. Lee F. Defibrillation. Singapore Med J. 2011; 52(8): 544-7.

[3]. Rochman M.F (2012) The impact of nurse staffing on in-hospital cardiac arrest patient outcomes. Doctor of Philosophy (Nursing) in The University of Michigan

[4]. American Heart Association. American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care 2005. Circulation supplement 2005;112:IV-1-IV-211

[5]. The World Health Organization. Media centre cardiovascular diseases (2013). Available at: www.who.int/mediacentre/factsheets/fs317/en/

[6]. Taha A, (2012) Impact of Adesigned Teaching Protocol about Advanced Cardiac Life Support (ACLS) On Critical Care Nurse's Knowledge and Practices at Benha University Hospital, Cairo, Egypt. Journal of American Science 2012;8(10)

[7]. Carlbom D, Doll A, Eisenberg M, Emert J, Husain S, Kudenchuk P, Rea T, Sayre M, Sherman L, Stubbs B, (2014) Strategies to Improve Survival from Sudden Cardiac Arrest: An Evidence-Based Analysis. This document, written by faculty of the Resuscitation Academy and staff of King County Emergency Medical Services.

[8]. Taniguchi T, Omi W, Inaba H.(2008) Attitudes toward automated external defibrillator use in Japan. Resuscitation;79(2):288e91.

[9]. Limmer D, Michael F. O'Keefe, Edward T. Dickinson, Harvey D. Grant, Robert H. Murray, J. David Bergeron (2012) Emergency Care, Twelfth Edition 197-280

[10]. Gonce P, Fontaine D. (2013) Critical care nursing-Aholistic Approach. 10ed Wolters Kluwer/Lippinott, willams&wilkins.printed in china. 362-370

[11]. Thygerson A, Thygerson S, Gulli B, Piazza G. (2013) First Aids, CPR, and AED Essentials. Sixth ediation. Jones & Bartlett Learning, LLc, an Ascend learning Company.Printed in United States of America. 35-54.

[12]. Perry A, Potter P, (2010) Clinical Nursing Skills & Techniques. 7th edition, Mosby, Inc., an affiliate of Elsevier Inc.Printed in Canada. 720-40.

[13]. Daniels R, Grendell R, Wilkins F, (2010) Nursing Fundamentals: Caring & Clinical Decision Making. Second edition, Delmar Cengage Learning. Printed in United States of America. 1451-72.

[14]. Jacob A, Rekha R, Tarachand J. (2010) Clinical Nursing Procedures: The Art of Nursing Practice. Second edition. Jaypee Brothers Medical Publishers (P) Ltd.Printed in New Delhi. 387-93.

[15]. Endacott R, Jevon P, Cooper S, (2009) Clinical Nursing Skills: Core and Advanced. Oxford University Press Inc.,Printed in United States of America. 273-82.

[16]. Proehl J (2009) Emergency Nursing Procedures. Fourth edition. Saunders, an imprint of Elsevier Inc., Printed in United States of America.17-22.

[17]. Bergeron J, Baudour C. (2009) First Responder. 8th edition, Pearson Education, Inc., Printed in United States of America. 204-44.

[18]. Barbara Aehlert. (2012) ACLS STUDY GUIDE. 4th edition. Mosby, an imprint of Elsevier Inc. printed in the USA. 9-23, 30-35, 62.

[19]. BLS for health providers course1- and 2- Rescuer Adult BLS with AED Skills Test Sheet. Available at : American Heart Association: http://guidelines.ecc.org/2010-guidelines-for-cpr.html

[20]. CPR Training - ProCPR.org (2010 Latest AHA Guidelines) available at: http://www.ProCPR.org

[21]. Megacode from AHA .available at:www.youtube.com/Megacode from AHA

[22]. Code Blue Simulation. available at: www.youtube.com/Code Blue Simulation

[23]. Ambu CPR Manikins Basic Life Support. available at: www.ambu-cpr-manikins.com/Basic-Life-Support.html

[24]. AED Challenge — Online CPR/AED Training and Practice. available at: www.aedchallenge.com

[25]. Szarpak L, (2013) What nursing students know about resuscitation? A survey study Military Pharmacy and Medicine VI :4 , 27 – 32

[26]. Taha, A. (2006): Emergency nursing care for critically ill patients: Impact of a designed teaching protocol on nurses knowledge and practices at Intensive Care Units (ICUS) of Benha University and Benha Teaching Hospitals, Master thesis, Faculty ofNursing, Benha University.

[27]. Hamed, S. (2009): Nurses performance during cardio-pulmonary resuscitation in Intensive Care Unit and Cardiac Care Unit at benha University hospital,Master thesis, Faculty of Nursing,Benha University.

[28]. THOMAS M. (2013) A study to evaluate the effectiveness of video assisted teaching programme on knowledge and practice regarding cardioversion and defibrillation among staff nurses working in cardiac unit in selected hospitals of Bagalkot. Master thesis. Rajiv Gandhi University of Health Science

[29]. Gupta V, DiasR., (2014)Effectiveness of Simulated Demonstration regarding Defibrillation Technique on Knowledge and Practices among Nurses. International Journal of Science and Research (IJSR). ISSN (Online): 2319-7064. Volume 3 Issue 6.

[30]. Liu J, Gui L, Chen Z, Xu K, Li Y, Zhang J, Zhou L., (2015) Effectiveness of combining manual external defibrillator and automated external defibrillator training for third-year nurse students. international journal o f nursing sciences (2): 105-109