Original Research Article

Advanced Cardiovascular Life Support Performance: Study on the Effectiveness of Training among Nurses in a Tertiary Care Hospital, Karachi

ABSTRACT

Nurses are the integral part of health care delivery system and play a vital role in critical areas. Nurses are required to respond quickly and effectively in the situation of cardiac arrest and the success of cardiopulmonary resuscitation depends upon their competence. Nurses' knowledge, preparedness and skills in regard to cardiopulmonary resuscitation have to be at advanced level. Hence, this study was conducted to determine the effectiveness of advanced cardiovascular life support training among nurses at a tertiary care hospital, Karachi, Pakistan.

Study Design: Quasi-experimental (pre and post) study was employed.

Place and Duration of Study: Study was accomplished at Dr. Ruth K.M Pfau Civil Hospital, Karachi for the period of ten months from December 2018 to September 2019.

Methodology: Sample size was calculated through PASS version 11.0 with proportion formula, calculated sample size was 180 nurses. Nurses' responses regarding advanced cardiovascular life support were assessed by validated and structured questionnaire. The collected data was analyzed by using SPSS version 21. The mean score of pre-test and post-test of advanced

cardiovascular life support training were computed by using paired t-test. p-value ≤0.05 were considered as level of significance.

Results: The pre mean of advanced cardiac life support score was 19.28±5.29. While, after training mean score of advanced cardiac life support score was 22.38±4.0. It is also statistically significant (p<0.001).

Conclusion: Successful resuscitation in patients with cardiac emergencies necessitates early credit of condition, prompt activation of responders, timely and effective basic life support and timed defibrillation when needed. Formal basic life support and advanced cardiovascular life support trainings are essential for nurses to enhance their skills that lead to improve victim survival after cardiopulmonary resuscitation.

Keywords: Advanced Cardiovascular Life Support, Nurses, Tertiary Care Hospital

1. INTRODUCTION

In the recent times, the importance of cardiopulmonary resuscitation (CPR) is emphasized both nationally and internationally. Guidelines are being published and training programs are being conducted by various healthcare institutions. Advanced cardiovascular life support (ACLS) is one of the life saving techniques, the focus of ACLS is to educate and certify healthcare professionals such as doctors, nurses, and paramedical staff with the cardiopulmonary resuscitation techniques. [1, 2]. Basic life support (BLS) and ACLS are used for early detection of sudden cardiac arrest (SCA), myocardial infarction, foreign body, airway obstruction, respiratory failure and other life threatening cardiovascular conditions [3]. It is important that registered nurses and healthcare professionals should know the latest protocol and guidelines of BLS & ACLS skills to save valuable lives and improve the quality of health [4].

Cardiac arrest is a condition in which the heart myocardium is unable to supply sufficient blood to the vital organs such as brain, kidneys and heart itself. ACLS technique is used to reduce the mortality in therapeutic emergency. The chances of survival will increase if timely CPR is performed as per ACLS protocols [5]. The success of return of spontaneous circulation after cardiac arrest with CPR relies on prompt interventions, particularly early defibrillation, effective chest compressions and assisted ventilation. Since the introduction of CPR over 50 years ago, many changes and developments have occurred in performing CPR procedure [6]. Despite all efforts to continuously improve cardiac treatment most of the studies have reported very poor CPR success rate. Even in hospital setting, the rate of CPR success is reported between 13 to 56% which is an alarming situation [5].

Improper training and lack of appropriate knowledge regarding CPR among doctors and nurses has been identified as the reason of such poor outcome in cardiac arrest patients. Recent research has made the timing and quality of CPR so that the cardiac arrest outcome can be improved. Substantial literature is available on the survival after CPR but very few studies have reported the effectiveness of formal resuscitation training program among healthcare professionals [7]. Thus, this study was conducted to determine the effectiveness of ACLS training among nurses at a tertiary care hospital, Karachi, Pakistan.

2. MATERIALS AND METHODS

Pre and post-test quasi-experimental study was conducted at Dr. Ruth K.M Pfau Civil Hospital, Karachi, Pakistan among both gender nurses who haven't attended BLS or ACLS training in last two years. Moreover, nurses who were on managerial posts, student nurses were also excluded from the study. The study was carried out from December 2018 to September 2019 over a period of ten months. Non-probability convenience sampling method was used to induct the participants in the study. Sample size was calculated through PASS version 11.0 with proportional formula. By taken 86% [1] proper guidance regarding BLS and 95% confidence level and 5% margin of error and 80% power of the test. Calculated sample size was 180 nurses. Validated and open access data collection tool was utilized for data collection. In addition, permission was also granted from original author. The 35 item questionnaire was used to assess the nurses' knowledge about BLS & ACLS. Questionnaire was split into two sections. The initial part consisted of eight questions inquiring about the demographics. The second section is further divided into two parts consisting of 35 MCQ questions about the techniques ACLS. The participants have to choose correct answer out of the four given options. For each correct response, the participants awarded score of one while for incorrect and no response a score of

zero was awarded. Score of less than 30% was considered as very poor, 31%-45% poor, 46%-55% average, 56%-65% good, 66%-75% very good and more than 75% was considered as excellent.

Two days training including lectures, videos, demonstrations and hands-on-practice were used in training as per American Heart Association (AHA) standard was conducted at Professional Development Center (PDC) department of Dow University of Health Sciences (DUHS), Karachi. Training was conducted by under the supervision of expert panel. The effectiveness of ACLS training was assessed by the same questionnaire and hands-on-practice too. Training session for 180 participants continued for 20 weeks (March–July) and followed by effectiveness of training after 6 weeks.

2.1 Statistical Analysis

The data was analyzed by SPSS version 21. Descriptive statistics was performed for all score variables and presented as mean and standard deviation for pre and post-test. Categorical variables were presented as frequency and percentage. Paired t-test was used to compare pre and post-test means score. P-value ≤ 0.05 were considered significant.

3. RESULTS

Table 1. showed the demographic data of study participants, majority 122 (67.8%) of them were age groups 25-30 years, 37 (20.6%) of 30-35 years, 12 (6.7%) of 35-40 years and 9 (5.0%) of 40-45 years. Almost half 98 (54.4%) participants were female while 82 (45.6%) were male. Among participants, 112 (62.2%) were single, 56 (31.1%) were married. Among enrolled participants, 167 (92.8%) were staff nurses whereas 13 (7.2%) were head nurses. Regarding qualification, 140 (77.8%) were Diploma in Nursing, 38 (21.1%) were BSN and 2 (1.1%) were MSN. With respect of experience, nearly half 99 (55%) had 1-3 years of experience, 55 (30.6%) had 4-6years experience and 26 (14.4%) had experience of 7 and more than it.

Table 1. Socio Demographic Characteristics of Study Participants

Characteristics	n	%
Age (years)		
25-30	122	67.8
30-35	37	20.6
35-40	12	6.7
41 & above	9	5.0
Gender		
Male	82	45.6
Female	98	54.4
Marital Status		
Single	112	62.2
Married	56	31.1
Widow	12	6.7
Designation		
Staff Nurse	167	92.8
Head Nurse	13	7.2
Qualification		
Diploma in Nursing	140	77.8
BSN	38	21.1
MSN	2	1.1
Shift duty		
Morning	89	49.4
Evening	45	25.0
Night	12	6.7
Rotator	34	18.9
Job Nature		
Regular	114	63.3
Contract	66	36.7
Experience		
1-3 years	99	55.0
4-6 years	55	30.6
7 and above years	26	14.4

Figure 1. revealed the pre-training knowledge of ACLS among nurses, 12.8%, 40.6%, 13.3% of the participants had average, good, very good knowledge of ACLS respectively. However, more than one fourth (27.8%) respondents had poor knowledge of ACLS.

Figure 1. Revealed the pre-training knowledge of ACLS among nurses

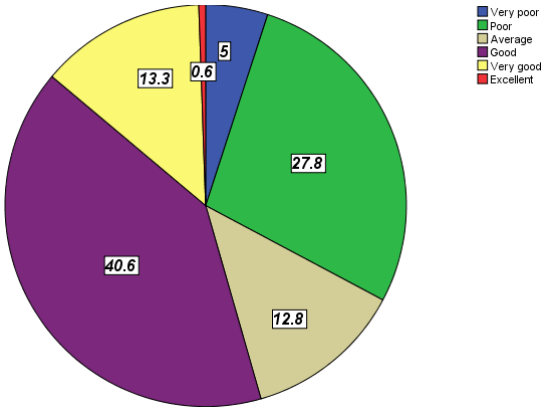


Figure 2. highlighted the knowledge score of ACLS (post-training) among nurses. Only 11.7% of the participants had poor knowledge and rest of the participants had average to excellent knowledge of ACLS.

Figure 2. Knowledge Score Difference of ACLS (Post-Training)

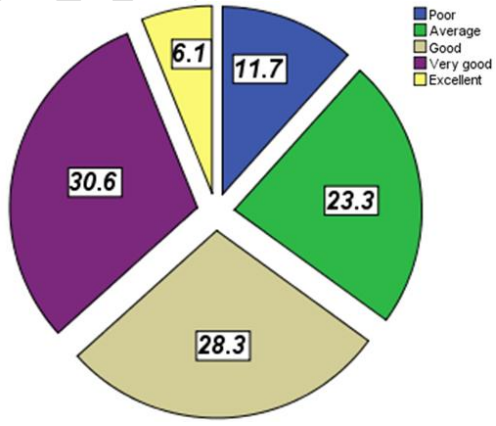


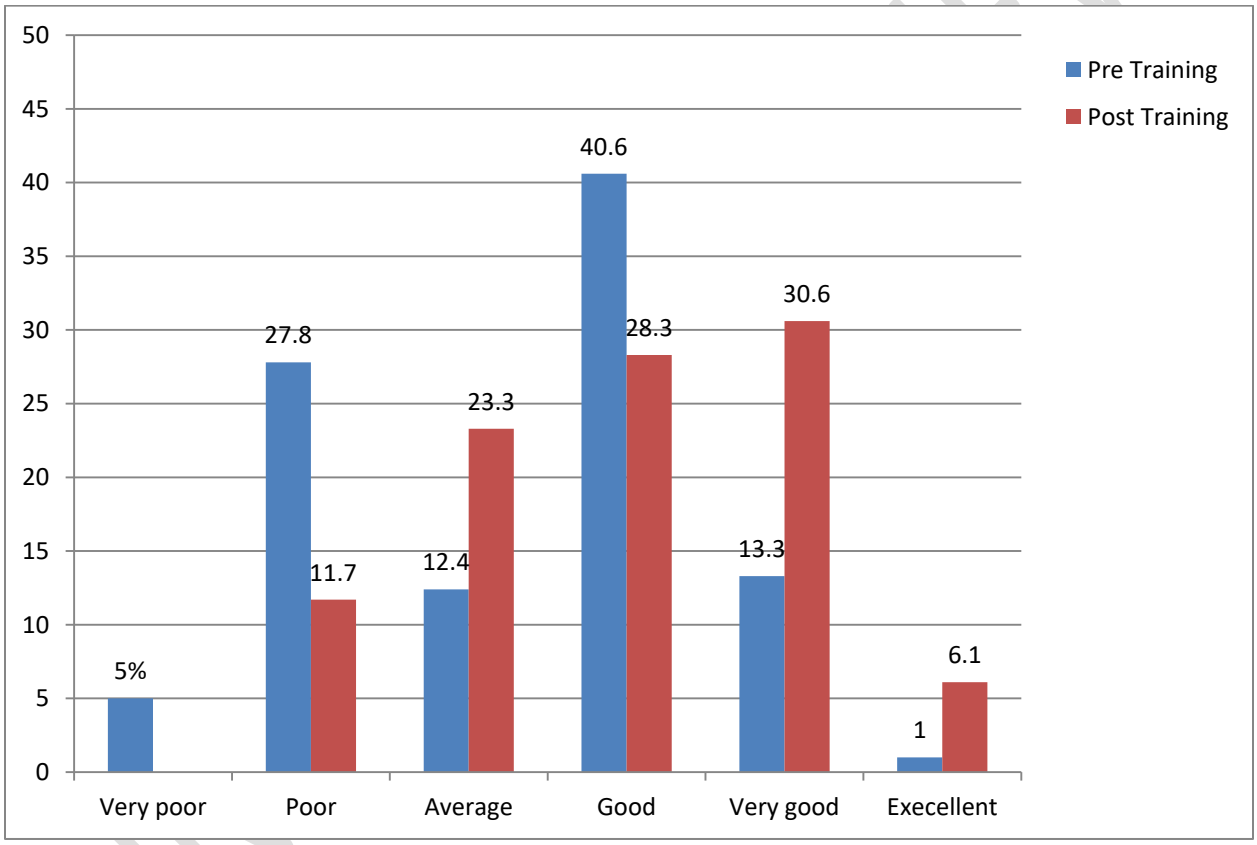
Table 2. pre and post-test mean knowledge score difference of ACLS support disclosed the pre and post-test mean knowledge effectiveness score difference of cardiac life support. The pre mean ACLS score was 19.28±5.29. On the other hand, after training post mean score of ACLS was 22.38±4.0 which is also statistically significant ($p<0.001$).

Table 2. Pre and Post-test Mean Knowledge Score Difference of ACLS Support

Knowledge	**Mean**	**SD**	**t-test**	**P-value**
Pre test	19.2889	5.29940	-6.975	<0.001
Post test	22.3833	4.00178		

Figure 3. exhibited the knowledge difference of ACLS (pre and post training). In pre-training session, 32.8% of the study participants had poor and very poor knowledge, 12.4% and 40.6% average and good knowledge of ACLS. On the contrary, after training 23.3%, 28.3% and 30.6% of study participants had average, good and very good knowledge of ACLS. Only 11.7% had poor knowledge of ACLS.

Figure 3. Knowledge difference of ACLS (pre and post training)



4. DISCUSSION

BLS and ACLS are equally essential to tackle the cardiac related emergencies like sudden cardiac arrest (SCA), myocardial infarction, foreign body, airway obstruction and other life threatening cardiovascular conditions [8]. It is important that registered nurses and other healthcare professionals should know modern protocol and guidelines based on BLS & ACLS skills to save the valuable lives and improve the quality of health.

Research study had demonstrated poor retention of knowledge and skills following CPR training for nursing staff and medical staff [9]. The provision of knowledge and skills of CPR technique are an essential component of basic nursing education program. There is common evidence that Cardiopulmonary Resuscitation knowledge and skills are poorly recalled by nurses [10]. Since quick, efficient and integrated actions are needed to resuscitate victim in case of critical cardiac arrest thus attainment and retention of updated CRP or ACLS skills and knowledge and practical are vital for nurse and other health professionals [11].

Educational sessions are the approach for dealing with both the actual and perceived complexities of CPR. Furthermore, various international organizations on resuscitation have emphasized the importance of regular training programs on primary resuscitation and emergency management and thus improving survival for cardiac arrest [12, 13].

Smith et al [14] in a study observed the abilities to retain BLS & ACLS skills among registered nurses in tertiary care hospital in Texas. Findings of present study were similar to prior studies and revealed short retention period of skills after training course of ACLS. Initial skills performance of the ACLS group had 76.5% failure rate. Then rapid decline of ACLS skills was

observed with just 37% pass rate after 3 months of training and further decline to a 14% pass rate at 12 months evaluation.

In this study, knowledge and skills about CPR were assessed through enrolled participants and also the effectiveness of ACLS training sessions on understanding and performance of life saving techniques. Present study was conducted at Dr. Ruth .K. M. Pfau Civil Hospital Karachi and registered nurses were included in study. It was observed that statistically significant difference was there in participants' pre and post-test mean knowledge score regarding CPR techniques with p-value <0.001.

In a study conducted by M Nambiaret al [6], in hospital of North Kerala, India found that initial assessment knowledge level regarding ACLS was low with a mean score of 44.5%. Results showed that nurses who had attended ACLS training previously had significantly higher means score (10.2±3.4) as compared to untrained (8.2±3.6, p-value = 0.001). In that study, ACLS training programs were seen to only marginally enhance the mean scores of assessment test by 8.1%. Likewise, in this study the mean knowledge score before training session was 19.2±5.2 while in assessment after 6 weeks of training mean knowledge score was 22.3±4.0 with p-value <0.001. Analogous results were observed by A Shahrakivahed et al. [15] In a study conducted in Zabol University of Medical Sciences in Iran where the mean of scores of knowledge tests were 21 before training, 41 after training and 45 three months after training and with paired t-test showed statistically significant difference (P=0.001) between the scores the three tests. Similarly, in another study by Lima et al [16] noted, prior to BLS/ACLS training program the level of knowledge and practical skill was low. Study results also showed that knowledge of BLS and ACLS among nurses to be inversely proportional to the time elapsed since the completion of their undergraduate or technical course. The most shortcomings were correlated to the primary

approach of the airway, care during post-resuscitation period and the external cardiac massage technique. Regarding the scores achieved by the professionals in response to the questions of the test prior to training, a common average of 4.1 points was obtained. While in post-training evaluation, a common average of 7.3 points was attained. The overall average after the course was 7.26. In this study, assessment prior to the training showed the lack of knowledge among participants regarding initial approach to patients in need of medical assistance, correct location and number and depth of compression, exact ventilation compression ratio, shock-able rhythms and dose of adrenaline.

A cross section study [17] conducted at teaching hospital in Baghdad revealed that nurses' understanding regarding cardiac arrest and procedure of cardiopulmonary resuscitation was poor established on statistical mean of score 1.5. The study results indicated that there was considerable association between the overall nurses' knowledge regarding CPR and their academic qualification. Also results showed no relationship between the nurses' understanding towards cardiopulmonary resuscitation procedure and their duration of work experience, area of duty, recognized training, and performing CPR on patient. In a study conducted in a hospital in Western Uganda [18] also showed similar results where the average score for knowledge prior to training sessions was 53.8 and in post training test 82.5 and for skills the score was 46 pre-training test and 81.5 post training test. There was a statistically significant ($p<0.001$) enhancement in the knowledge about CPR and ($p = 0.02$) for improvement in CPR skills. The percentage step up in participants' knowledge ranged from 16.8% to137.2% with a mean of 59.9% while the step up in skills ranged from 19.18% to 2115.6% with a mean of 159.8%.

In a study by L Rajewaran [19] conducted in three different hospitals of Botswana, it was observed that in majority of nurses working in intensive care units did not have sufficient

knowledge about BLS and CPR. In the pre-instruction knowledge test average score was (48%) and that improved by 26.4%in immediate post-instruction test compared with the pre-test.

EGebremedhn [3] in their study found that general attitude and practical or skills level of health science graduates and interns regarding CPR were insufficient. The general mean attitude and skills scores were 7.5 (SD=1.67) & 2.6 (SD=1.97) respectively. The mean attitude score of nurses was 1.15 (SD=1.67) while mean skills scores of nurses 2.34 (SD=1.95)

In another study Pareeketal [20] studied the impact of training among nurses as per AHA, BLS & ACLS training courses on the victim outcome after CPR. In that study they observed that the paramedical staff was lacking proper understanding of CPR and the training program effectively improved their performance. The study evidently showed that rate of immediate endurance was improved after the formal BLS/ ACLS training ($p<0.003$). The noticeably improved survival to hospital discharge rate (27.5% VS 52.9%) was observed after recognized BLS/ ACLS training ($p <0.0001$)

In study Sodhietal [21] reported the impact of ACLS training program over CPR outcome. It was observed that out of 284 patients admitted in hospital in the pre-BLS/ACLS training period, return of spontaneous circulation was seen in 52 patients (18.3%), while in the post training period 97 patients (28.3%) of 343 patients had return of spontaneous circulation ($P<0.005$). Survival to hospital discharge was also considerably higher in the post-BLS/ACLS training period (67 patients, 69.1%) than in the pre-BLS/ACLS training period (12 patients, 23.1%) ($P<0.001$)

5. CONCLUSION

It is concluded that successful resuscitation in patients with cardiac emergencies, timely effective BLS/ACLS and timed defibrillation when needed. Formal BLS and ACLS training are essential for nurses to enhance their skills that lead to improve victim survival after CPR. Along with survival to hospital discharge rating be improved.

CONSENT

As per international standard and hospital protocol, written informed consent has been taken from entire participants for voluntary participation.

ETHICAL APPROVAL

Ethical approval was taken from Institutional Review Board (IBR) of DUHS and permission of data collection was also granted from Medical Superintendent of Dr. Ruth K.M Pfau Civil Hospital, Karachi, Pakistan.

REFERENCES

1. Ralapanawa DMPUK, Jayawickreme KP, Ekanayake EMM, Kumarasiri PVR. A study on the knowledge and attitudes on advanced life support among medical students and medical officers in a tertiary care hospital in Sri Lanka. BMC research notes. 2016;9(1):462.

2. Vausedvan B, Lucas A, BhaskarA, Areekal B. Assessment of level of knowledge of basic life support algorithm among medical and nursing students in a tertiary care teaching hospital. International Journal of Community Medicine and Public Health. 2016;3(12):3520-5.

3. Gebremedhn EG, Gebregergs GB, Anderson BB, Nagaratnam V. Attitude and skill levels of graduate health professionals in performing cardiopulmonary resuscitation. Advances in Medical Education and Practice. 2017;(8):43.

4. Kshirsagar A, Biradar S, Nagur B, Reddy M, Savsaviya J, Panicker S. Knowledge of Basic Life Support among the Nursing Staff and Students of KIMSDU. V 15 No 1(2016).

5. Yunus M, Mishra A, Karim HM, Raphael V, Ahmed G, Myrthong CE. Knowledge, attitude and practice of basic life support among junior doctors and students in a tertiary care medical institute. International Journal of Research in Medical Sciences. 2017;3(12):3644-50.

6. Nambiar M, Nedungalaparambil NM, Aslesh OP. Is current training in basic and advanced cardiac life support (BLS & ACLS) effective? A study of BLS & ACLS knowledge amongst healthcare professionals of North-Kerala. World Journal of Emergency Medicine. 2016;7(4):263.

7. Allen JA, Currey J, Considine J. Annual resuscitation competency assessments: a review of the evidence. Australian Critical Care. 2013;26(1):12-7.

8. Vaillancourt C, Stiell IG. Cardiac arrest care and emergency medical services in Canada. The Canadian journal of cardiology. 2004 Sep;20(11):1081-90.

9. Misko L, Molle E. Beyond the classroom: Teaching staff to manage cardiac arrest situations. Journal for Nurses in Professional Development. 2003 Nov 1;19(6):292-6.

10. Soar J, Monsieurs KG, Ballance JH, BarelliA, Biarent D, Greif R, Handley AJ, Lockey AS, Richmond S, Ringsted C, Wyllie JP. European resuscitation council guidelines for resuscitation 2010 section 9. Principles of education in resuscitation. 2010 Oct 1;81(10):1434-44.

11. Chamberlain DA, Hazinski MF. Education in resuscitation.Resuscitation. 2003 Oct 1;59(1):11-43.

12. Hemming TR, Hudson MF, Durham C, Richuso K. Effective resuscitation by nurses: perceived barriers and needs. Journal for Nurses in Professional Development. 2003 Sep 1;19(5):254-9.

13. Smith S, Hatchett R. Perceived competence in cardiopulmonary resuscitation, knowledge and skills, amongst 50 qualified nurses. Intensive and critical care nursing. 1992 Jun 1;8(2):76-81.

14. Smith KK, Gilcreast D, Pierce K. Evaluation of staff's retention of ACLS and BLS skills. Resuscitation. 2008 Jul 1;78(1):59-65.

15. Shahrakivahed A, Masinaienezhad N, Shahdadi H, Arbabisarjou A, Asadibidmeshki E, Heydari M. The effect of CPR workshop on the nurses' level of knowledge and skill. International Archives of Medicine. 2015 Aug 15;8.

16. Lima SG, Macedo LA, Vidal MD, Sá MP. Permanent Education in BLS and ACLS: impact on the knowledge of nursing professionals. ArquivosBrasileiros de Cardiologia. 2009 Dec;93(6):630-6.

17. Al-Ani BA, Al MA. Assessment of Nurses' Knowledge towards Cardiopulmonary Resuscitation at Al-Najaf City's Teaching Hospital. kufa Journal for Nursing sciences. 2014;4(1):208-17.

18. Munezero JB, Atuhaire C, Groves S, Cumber SN. Assessment of nurses knowledge and skills following cardiopulmonary resuscitation training at Mbarara Regional Referral Hospital, Uganda. The Pan African medical journal. 2018;30.

19. Rajeswaran L, Cox M, Moeng S, Tsima BM. Assessment of nurses' cardiopulmonary resuscitation knowledge and skills within three district hospitals in Botswana. African journal of primary health care & family medicine. 2018;10(1):1-6.

20. Pareek M, Parmar V, Badheka J, Lodh N. Study of the impact of training of registered nurses in cardiopulmonary resuscitation in a tertiary care centre on patient mortality. Indian journal of anaesthesia. 2018 May;62(5):381.

21. Sodhi K, Singla MK, Shrivastava A. Impact of advanced cardiac life support training program on the outcome of cardiopulmonary resuscitation in a tertiary care hospital. Indian journal of critical care medicine: peer-reviewed, official publication of Indian Society of Critical Care Medicine. 2011 Oct;15(4):209.