**Original Article**

# Study of the impact of training of registered nurses in cardiopulmonary resuscitation in a tertiary care centre on patient mortality

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## ABSTRACT

**Background and Aims:** Nurses should have cardiopulmonary resuscitation (CPR) knowledge and skills to be able to implement effective interventions during in-hospital cardiac arrest. The aim of this descriptive study was to assess mortality impact after nurses' CPR training with pre-CPR training data at our institute. **Methods:** Training regarding CPR was given to nurses, and CPR mortality 1-year before basic life support (BLS) and advanced cardiac life support (ACLS) training were collected and compared with post-training 1-year CPR mortality. **Results:** A total of 632 adult patients suffering in-hospital cardiac arrest over the study period. CPR was attempted in 294 patients during the pre-BLS/ACLS training period and in 338 patients in the post-BLS/ACLS training period. In the pre-BLS/ACLS training period, 58 patients (19.7%) had return of spontaneous circulation (ROSC), while during the post-BLS/ACLS training period, 102 patients (30.1%) had ROSC ($P$ = 0.003). Sixteen of the 58 patients (27.5%) who achieved ROSC during the pre-BLS/ACLS training period survived to hospital discharge, compared 54 out of 102 patients (52.9%) in the post-BLS/ACLS training period ($P$ < 0.0001). There was no significant association between either the age or sex with the outcomes in the study. **Conclusion:** Training nurses in cardiopulmonary resuscitation resulted in a significant improvement in survival to hospital discharge after in-hospital cardiac arrest.

**Key words:** Advanced cardiac life support, basic life support, cardiopulmonary resuscitation, nurses

## INTRODUCTION

Over the past few years, cardiopulmonary resuscitation (CPR) has received much importance. Various internationally and nationally accepted guidelines for CPR have been published, and formal training programmes based on these guidelines are being conducted by certified training centres worldwide.[1] The aim of these training courses is to impart both knowledge and understanding of CPR and to provide a standardised quality care to cardiac arrest victims in accordance with the specific guidelines.[2,3] A lot of data are available on survival after CPR in different clinical scenarios, but very few studies have been conducted to assess the effectiveness of formal resuscitation training programmes on the outcome of CPR.[4,5] We designed a retrospective study to evaluate the impact of training nurses in the American Heart Association (AHA)-certified basic life support (BLS) and advanced cardiac life support (ACLS) training course on the outcome of CPR in our hospital.[6-8]

## METHODS

Our hospital is a 750-bedded tertiary care hospital in India. All healthcare professionals are provided

in-hospital BLS training. They initiate CPR whenever there is a cardiac arrest in the hospital and continue till the arrival of the code blue team. The hospital has a designated code blue team that responds to all in-hospital cardiac arrests. The code blue team consists of an anaesthesiology registrar, a medicine registrar, on-duty resident medical officer, attending staff nurse and nursing supervisor of the shift. The hospital policy is to always initiate CPR in a cardiac arrest victim. A code blue running sheet is filled by a record keeper during the course of CPR.

Before the intervention, the nurses and code blue team followed the AHA 2015 guidelines for CPR, but no formal training had been conducted. With the aim of improving CPR skills, an AHA-certified 3-day BLS and ACLS provider course was conducted in our hospital in the 1$^{st}$ week of December 2016. The course included lectures and hands-on training of peri-arrest case scenarios, which were followed by a written test and skill assessments. All the nurses in the emergency and Intensive Care Units participated in the course and were certified.

After getting approval from the hospital Ethics Committee, we designed a retrospective study to evaluate the effectiveness of the above intervention on the outcome of CPR in in-hospital cardiac arrest victims. Cardiac arrest was defined by the absence of a detectable pulse or ventricular fibrillation, asystole, pulse less electrical activity or pulseless ventricular tachycardia.

We identified all cases of in-hospital cardiac arrest in adults (>14 years of age) that occurred over a 12-month period between January 2017 and December 2017. Data regarding each cardiac arrest were collected from the code blue running sheets. We compared the code blue data from January 2016 to December 2016 i.e., pre-ACLS training period, with post-ACLS training period from January 2017 to December 2017.

The patients on whom CPR was started outside the hospital or on arrival in the emergency ward were not included in the study. When a patient suffered several cardiac arrests in the hospital, only the first episode was included in the analysis.

Data entry consisted of patient demographic data and the outcomes of CPR. CPR in our study was given to cardiac arrest patients for up to 40 min. The outcomes of interest were immediate survival after CPR and survival to hospital discharge. Immediate survival was defined as the return of spontaneous circulation (ROSC).

The relevant data were entered in the excel sheet and were analysed using Chi-square test to compare the immediate survival rates (ROSCs) and survival to hospital discharge rates in the pre-BLS/ACLS training period and post-BLS/ACLS training period. For all statistical analyses, $P < 0.05$ was considered to be statistically significant.

## RESULTS

During the pre-BLS/ACLS training period of the 294 cardiac arrest patients, 58 patients (19.7%) had ROSC, while during the post-BLS/ACLS training period, 102 patients (30.1%) of 338 patients who had cardiac arrest had ROSC ($P = 0.003$).

In our study, there was markedly improved survival to hospital discharge rates (27.5% vs. 52.9%) after formal BLS/ACLS training ($P < 0.0001$). Of the 58 patients who survived during the pre-BLS/ACLS training period, only 16 patients (27.5%) were discharged from the hospital. During the post-BLS/ACLS training period, 54 patients (52.9%) were discharged of the 102 cardiac arrest victims who had ROSC. The survival to hospital discharge rate in the post-BLS/ACLS training period was statistically significant ($P < 0.0001$) when compared with the pre-BLS/ACLS training period.

## DISCUSSION

The present study shows that the rate of ROSC was 19.7% during the pre-BLS/ACLS period, which increased to 30.1% during the post-BLS/ACLS period. The rates of ROSC during both the study periods were not much different from those of previous studies of in-hospital cardiac arrests.[9] However, our study clearly shows an improved rate of immediate survival after the formal BLS/ACLS training ($P < 0.003$).

Our study also reports markedly improved survival to hospital discharge rates (27.5% vs. 52.9%) after formal BLS/ACLS training ($P < 0.0001$). The survival to discharge rates during the pre-BLS/ACLS period of our study are almost comparable to that reported in the literature (11.7%–32.2%), but[10] the significant increase in survival to discharge rates after the BLS/ACLS training to 52% highlights that formal training of code blue team members improved the skills of CPR and their level of competence in

resuscitation. This also shows that the quality of CPR performed might be better after BLS/ACLS training. This highlights the importance of certified hands-on training programme on the outcome of resuscitation. In our study, we found that paramedical staffs were lacking in proper knowledge about CPR and such training greatly enhances their efficiency.

In-hospital cardiac arrest is an emergency situation that requires teamwork and the appropriate sequential actions to rescue the patients. The success of ROSC after cardiac arrest with CPR is dependent on timely interventions, particularly early defibrillation, effective chest compressions and assisted ventilation. Over the past 50 years, after the introduction of modern CPR, there have been major developments and changes in the performance of resuscitation.[11] However, despite considerable efforts to improve the treatment of cardiac arrest, most reported survival outcome figures are poor. Even in the hospitalised patients, the rate of successful CPR has been reported by some studies to be as low as 2%–6%, although most studies report successful CPR outcome in the range of 13%–59%.[12]

The improper training and lack of proper knowledge of nurses and doctors in basic and advanced life support have been identified as a contributing factor to poor outcome in cardiac arrest victims.[13] In an effort to improve cardiac arrest outcomes, recent investigations have focused on the timing and quality of CPR.[14] Several guidelines on performing CPR have been published,[15] and certified training courses based on these guidelines have become a standard in medical professionals' training in many parts of the world. The aim of these courses is to provide information and hands-on practice in the management of peri-arrest situations in accordance with the latest guidelines.

Although life support courses are widely advocated, their effectiveness has been little studied. Very few studies are available in the literature on comparative CPR outcomes after formal resuscitation training. An in-hospital investigation demonstrated that cardiac arrest detected by an ACLS-trained nurse was strongly associated with a four-fold increase in survival to discharge (38% vs. 10%) than those detected by a nurse without ACLS training.[13] This indicates that ACLS-trained nurses provided an independent contribution to increased survival rate.

A few limitations of our study should be acknowledged. First, because this study was conducted at a single institution, external validity is relative and uncertain. There was also the absence of formal sample size calculation. It was a time frame study; no pre-determined sample size was taken. Thus, other multicentre studies with larger sample size are required to ascertain the validity. Second, our results might be biased because of increased attention on resuscitation during the post-training period. This study was planned before the release of Indian CPR guidelines;[1,16] hence, we have chosen the international structured training programme. Similar study is required for the impact of Indian guidelines as well. Finally, our study does not indicate how frequently such training courses should be conducted to facilitate retention of knowledge and skills.[11]

## CONCLUSION

We conclude that formal certified BLS and ACLS training courses for nurses are crucial in improving the outcomes of CPR.

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### Conflicts of interest
There are no conflicts of interest.

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