

# Effectiveness of CPR training on knowledge among primary healthcare personnel - A pilot study

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## Abstract

**Background:** Cardiopulmonary Resuscitation is the vital part of emergency care. The healthcare facilities and trainings among the primary healthcare sector is always lacking behind in rural India. We conducted a pilot interventional study to see the effectiveness of cardiopulmonary resuscitation training among primary healthcare personnel. **Methods:** an interventional pre-test post-test, questionnaire based study was conducted at a tertiary care hospital among the primary health centre staff attending a training. Analysing their responses, the difference in the mean knowledge score was assessed. **Results:** There were 22 participants, nine medical officers and 11 nurses. Their mean (out of 10) pre-test score was 3.7(±1.80) and post test score was 8.7(±1.26), which was significantly higher (p <0.0001, paired t test). On skill assessment, performance for chest compression was better than the airway and breathing skills. **Conclusion:** The knowledge of primary health care personnel regarding CPR improved after the training.

**Key Word:** BLS (Basic Life Support); CPR (Cardiopulmonary resuscitation); Primary Health Care: Questionnaire; Training

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Received Date: 20/01/2019 Revised Date: 02/03/2019 Accepted Date: 14/03/2019

DOI: <https://doi.org/10.26611/10159311>

## Access this article online

Quick Response Code:



Website:

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Accessed Date:  
14 March 2019

## INTRODUCTION

Approach to cardiac arrest and prompt Cardiopulmonary resuscitation (CPR) is essential at all levels of healthcare starting from multi-speciality hospitals to primary health centres. Early CPR improves survival.<sup>1</sup> Hence knowledge of CPR is important for staff and doctors at all levels of healthcare system. In the Urban areas, tertiary care hospitals have an established protocol-based management for handling emergencies and executing CPR whenever required. Awareness for CPR training has been increasing over the years and most of the hospitals have training

programs in place, which occur at regular intervals.<sup>2</sup> Primary health centres and Community health centres are an extension of the healthcare system in the rural areas. Government of India has taken up the initiative to upgrade the healthcare personnel at PHCs and the sub-centres.<sup>3</sup> Six month CCCH (Certificate course for community health) training is being imparted to the Nursing cadre as well as the doctors with BAMS degree, which includes Emergency management: First aid and CPR, to empower them for handling emergency situations and refer them to higher centres accordingly.<sup>4</sup> Training for First aid and CPR is just one part of the syllabus that is taught to them. It is a vital training as they are the first contact for the rural patients. Such training to the healthcare personnel working at the periphery can be assessed to see the effectiveness of the same. Any such formal assessment of CPR training amongst the PHC and sub-centre healthcare personnel has not yet been studied as per the available Indian literature. So we conducted this study to know the effectiveness of such training on knowledge of CPR among primary healthcare personnel.

**How to site this article:** D B Tanna, N Bose. Effectiveness of CPR training on knowledge among primary healthcare personnel - A pilot study. *MedPulse International Journal of Anesthesiology*. March 2019; 9(3): 208-211. <http://medpulse.in/Anesthesiology/index.php>

## MATERIALS AND METHODS

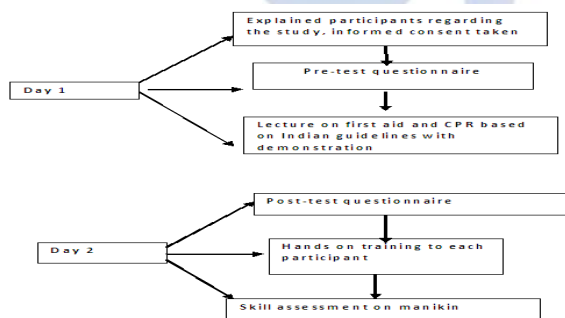
**Ethical consideration:** This study was conducted after institutional Human Ethics Committee approval. Written and informed consent was obtained from all the participants. The data collected was kept confidential.

**Study design and setting:** This pilot interventional study was conducted at a tertiary care 750 bedded hospital and medical college from Gujarat, India.

**Study population:** We included one batch of primary health care centre's nurses and medical officers (MO) coming for their training to our department as a part of Certificate Course of Community Health training. Those who didn't take part in post-test questionnaire, incomplete questionnaire or who couldn't perform skill assessment were excluded from the analysis.

**Study tool:** Questionnaire: It was a structured questionnaire prepared to assess the knowledge of the participants regarding the CPR based on Indian guidelines published in 2017.<sup>5,7</sup> The questionnaire included the demographic information of the participants like age, sex and basic degree and previous CPR training received or not. There were ten knowledge based questions. The questionnaire was pre-validated by two independent field experts. The same questionnaire was used for pre-test as well as the post-test. CPRLillyPro A8A2 manikin It is a manikin specially designed for objective skill assessment of CPR. Skill data is stored in a tablet connected with the manikin from which various parameters for the study were obtained.

### Intervention:



The intervention was for two days, as shown in the above flow chart.

**Day One:** On the first day, after taking consent and explaining about the training, the participants were given a pre-test questionnaire to fill up. They were given a lecture on first aid for around 20 minutes and on Indian guidelines of Cardio-pulmonary resuscitation (CPR) for around 40 minutes. The CPR training lecture included guidelines for medics and paramedics for in-hospital cardiac arrest- Comprehensive Cardiopulmonary Life Support (CCLS), guidelines for medics and paramedics for out of hospital cardiac arrest- Basic Cardiopulmonary

Life Support (BCLS) and guidelines for lay person- Compression Only Life Support (COLS).<sup>5,7</sup> The lecture was taken by the author who is a Trainer for Indian CPR guidelines. It was followed by demonstration of the CPR skills on manikin like chest compression, rate, depth and location of hands etc. It also included airway manoeuvres like head tilt, chin lift and breathing with bag and mask.

**Day Two:** on the second day, the participants were first asked to fill up the post-test questionnaire. After that all the participants were given the hands on training on the manikin for all aspects of CPR including chest compressions, airway manoeuvres and breathing. Each participant was given ten minutes time on manikin and performed skills under the guidance of the trainer. After hands on training of each participant, they were asked to perform 30 chest compressions and two breathings on skill assessment manikin CPRLillyPro A8A2 for their objective assessment one by one. Skill assessment included rate of chest compression per minute, average proportion of adequate depth, average proportion of time for correct hand position while performing chest compression. Airway skills included adequate neck extension and proportion of inspiratory pressure and volume. Their skill data were later analysed to know how effective skills they can perform in practical situation.

### Outcome measures:

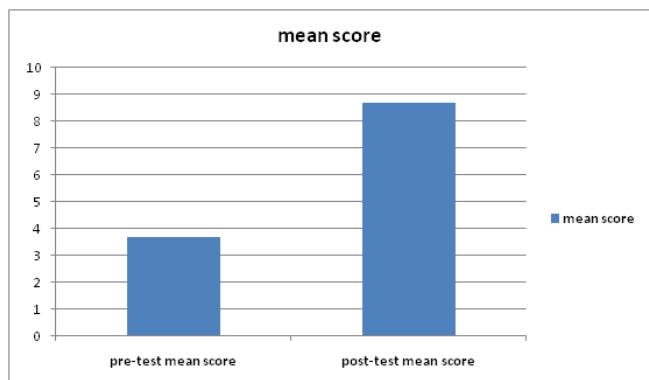
- Difference in the knowledge score (mean score out of ten) between pre-test and post-test after the CPR training.
- Assessment of skills after the hands on training

**Data analysis:** The collected data from the questionnaire were entered in Microsoft office Excel sheet 2007. Statistical analysis was done using GraphPad InStat 3 software. Descriptive analysis was done using mean and percentage. Comparison between pre and post test was done using paired t test.

## RESULTS

This interventional pilot study included total 22 participants, 13 nurses and nine medical officers working at primary health centre. Their demographic data was as follows. Mean age of the participants was 32.9 years; there were 11 males and 11 females. Among the 13 nurses, all had their basic qualification as GNM (General Nursing Midwife). All the medical officers were BAMS (Bachelor of Ayurvedic Medicine and Surgery). Two of the medical officers had received AHA (American Heart Association) Basic Life Support training. Two participants did not attend the second day training, so they were excluded from the analysis. Total participants available for pre-post test comparison were 20. Mean pre-test score ( $\pm$ SD) and post-test score (out of 10) was 3.7 ( $\pm$ 1.80) and 8.7 ( $\pm$ 1.26) respectively, with an average

improvement of 5.0. It was statistically significant,  $P < 0.0001$ , as shown in figure 1.



**Figure 1:** comparison of mean pre-test and post-test score  
P value  $< 0.0001$ , paired t test

**Post-training skill assessment:** Out of 20, 19 participants underwent skill assessment, because one participant couldn't undergo skill assessment due to illness. Average rate of chest compression was 118.84/minute. Nine participant's rate of chest compression was between 110-130, six had between 130-150 and four participants' compression rate was below 100 per minute. Average hand position of the participants was correct 79.63% of time. Nine participants out of 19 had correct position 100% of time of their chest compressions and three had correct hand position 90-99% of time. Eight participants had given chest compression with correct depth during 80-100% of their chest compression cycle. Rest of the participants couldn't achieve proper depth in most of their compressions. Maximum participants couldn't achieve adequate tidal ventilation while giving bag and mask breathing, only three participants could ventilate with more than 75% of the required volume. Only six participants could perform proper head tilt.

## DISCUSSION

The facilities and manpower available in tertiary care and multi-speciality hospitals is a rare finding in primary health centres and sub centres. The government of India is running various programs under National Rural Health Mission to improve the quality of care at the rural areas. The PHC healthcare personnel attended a Certificate Course in Community medicine, as a part of which they were given CPR training in our department. This was a pilot interventional study conducted among the PHC healthcare personnel attending the first aid and CPR training. The participants showed low pre-test score and improvement in post-test score after approximately four hours of training program for first aid and CPR. Nurses

had GNM as their basic degree, which is a three and a half year course. It doesn't include CPR in curriculum, so majority had no prior experience or had encountered a few times in their clinical practice. The BAMS doctors also had minimal exposure of such clinical emergency. This may be the reason of their low pre-test score. Some of the researches had shown similar poor knowledge of CPR among the nurses. An observational study conducted in south India in 2016 showed poor result among healthcare professionals as well as nursing staff<sup>8</sup>. Other studies conducted on nurses also suggested poor knowledge among the participants regarding CPR<sup>9,10</sup>. Our short training program was like a sensitization to the healthcare personnel working in rural area towards the importance of emergency health care. The training significantly improved the knowledge of the healthcare personnel. There are various studies supporting CPR trainings to be effective in improving knowledge. Cooper S et al. conducted a quasi-experimental study in primary care setting. They suggested immediate improvement in the knowledge and skills regarding CPR, with both the observations statistically significant,  $p < 0.001$ . They observed decline in the skills after six months of training, stressing upon regular refresher trainings.<sup>11</sup> Some other studies had similar findings as improvement of knowledge after CPR training among health personnel.<sup>12</sup> In this study, we have assessed skills only after training, so there was no comparator group to assess improvement. The reason behind this is that majority of the participants (except two who were trained) had never received any CPR training, so it was practically not possible to ask them to perform skills on our skill manikin. We observed satisfactory skill development with regard to chest compression. Almost all had acquired proper location and rate of the compression. Though the proper depth of the compression could not be achieved by many participants, only eight of them could achieve that. Partiprajak et al. had used Resusci® Anne manikin with Laerdal skillmeter for objective assessment of chest compression skills, found improvement in skills after training.<sup>13</sup> As per our study, participants' performance for airway and breathing skill was poor after the training, which suggests more hands on practice is required for airway and breathing skills. However, participants could perform chest compression effectively after the training. This supports the emphasis on chest compressions only by majority of resuscitation guidelines like AHA and Indian guidelines.<sup>7-14</sup> This recommendation is to minimise the interruption in chest compressions, which are most important during resuscitation. The Indian resuscitation council has come up with COLS (Compression Only Life Support) guidelines for lay person, who are not expected to do any

of the airway manoeuvres as they are difficult to learn and implement.

## CONCLUSION

It can be concluded from our study that the knowledge regarding CPR is improved after training among Primary Health Centre healthcare personnel.

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Source of Support: None Declared  
Conflict of Interest: None Declared