Original Article

Does community emergency care initiative improve the knowledge and skill of healthcare workers and laypersons in basic emergency care in India?

Sanjeev Bhoi, Nirmal Thakur[1], Pankaj Verma, Chhavi Sawhney[2], Sameer Vankar, Deepak Agrawal[3], Tejprakash Sinha

Departments of Emergency Medicine, [2]Anaesthesia and [3]Neurosurgery, JPN Apex Trauma Centre, All India Institute of Medical Sciences, [1]JPN Apex Trauma Centre, All India Institute of Medical Sciences, Community Emergency Care Initiative, All India Institute of Medical Sciences, New Delhi, India

ABSTRACT

Background: Due to lack of training in emergency care, basic emergency care in India is still in its infancy. We designed All India Institute of Medical Sciences basic emergency care course (AIIMS BECC) to address the issue. **Aim:** To improve the knowledge and skill of healthcare workers and laypersons in basic emergency care and to identify impact of the course. **Materials and Methods:** Prospective study conducted over a period of 4 years. The target groups were medical and nonmedical personnel. Provider AIIMS BECC is of 1 day duration including lectures on cardio-pulmonary resuscitation, choking, and special scenarios. Course was disseminated via lectures, audio-visual aids, and mannequin training. For analysis, the participants were categorized on the basis of their education and profession. A pre- and a post-course evaluation were done and individual scores were given out of 20 and compared among all the groups and *P* value was calculated. **Results:** A total of 1283 subjects were trained. 99.81% became providers and 2.0% were trained as instructors. There was a significant improvement in knowledge among all the participants irrespective of their education level including medicos/nonmedicos. However, participants who had higher education (graduates and postgraduates) and/or belonged to medical field had better knowledge gain as compared to those who had low level of education ($\leq 12^{th}$ standard) and were nonmedicos. **Conclusion:** BECC is an excellent community initiative to improve knowledge and skill of healthcare and laypersons in providing basic emergency care.

Key Words: Basic emergency care course, cardio-pulmonary resuscitation, knowledge and skill

Address for correspondence:
Dr. Sanjeev Bhoi, E-mail: sanjeevbhoi@gmail.com

Access this article online

Quick Response Code:

Website: www.onlinejets.org

DOI: 10.4103/0974-2700.173870

How to cite this article: Bhoi S, Thakur N, Verma P, Sawhney C, Vankar S, Agrawal D, *et al*. Does community emergency care initiative improve the knowledge and skill of healthcare workers and laypersons in basic emergency care in India?. J Emerg Trauma Shock 2016;9:10-6.

Received: 10.07.15. **Accepted:** 19.08.15

INTRODUCTION

The Republic of India is the seventh largest country in the world and is home to nearly 1.2 billion people. With 28 states and 7 union territories spread over a vast geographic area with varying economic resources and infrastructure, India is among world's most populous democracy. Trauma, natural, as well as man-made disasters are common causes of fatalities. Twenty percent of emergencies are trauma-related in prehospital setting adding up to existing burden of other emergencies. The WHO has estimated road crashes, cardiac, as well as stroke as major causes of death by 2020.[1] Thirty percent of acutely ill patients die before reaching the hospital in India and more than 80% of injured patients do not reach the hospital within golden hour. Fear of injuring the victim, fear of poor performance and liability, reluctance to perform mouth to mouth cardio-pulmonary resuscitation (CPR) for out of hospital cardiac arrest, early evacuation of a trauma victim, and stoppage of bleeding are the keys to good outcome. Current status of emergency care is lot to be desired at all tier of heath care system. There is a need for specialty of emergency medicine and emergency nursing, which is still in its infancy in India.[2] Prehospital care is not up to the mark, as it acts only as a transport vehicle. In the absence of training standards, the unskilled persons attempt life-saving tasks.[3]

No basic emergency care training protocols and poor prehospital care leads to adverse outcomes. Considering the deficiencies and affordability in resource-constraint setting, the authors created a program named All India Institute of Medical Sciences (AIIMS) basic emergency care course (BECC) which addresses the issue of basic emergency care skills for healthcare and nonhealthcare personals. Authors studied whether this initiative improves the knowledge and skill of healthcare workers and laypersons in basic emergency care in India.

MATERIALS AND METHODS

It was a prospective study over a period of 3½ years (13-12-2009-24-05-2013) conducted all over the country. Community emergency care initiative program was disseminated by creating AIIMS BECC. This structured course was created considering the important causes of deaths in India as per national crime report bureau. The contents of the course were CPR, choking, and special scenarios such as trauma, electrocution, drowning, hypothermia, and pregnancy [Appendix 1]. To assess the validity, we did a pilot study on police personal and found a good improvement in the knowledge about basic emergency care and CPR.[4]

It has two tier, provider course of 1 day duration and instructor course. The target groups were doctors, nurses, and lay persons (Police constables, Central Reserved Police Force, Border Security Force, National Cadet Crop cadets, and school children) of India. Participants had different education level ranging from primary education to postgraduate level. The course material was sent to the participants 15 days prior to the course. We designed an 8 h course with about 4 h available for mannequin practice. The course components included lectures, mannequin practice, audio-visual, and scenario-based training along with performance testing on one-person and two-person CPR as well as infant CPR. All presentations were delivered using power point projections. Lectures were delivered by trained instructors of BECC. Each batch had 16-24 participants with an instructor to student ratio of 1: 4-1:6. Theoretical knowledge was evaluated by 20 pre- and post-test questions [Appendix 2]. The mannequin used was "Little Anne" (Laerdal Medical Corporation, NY, USA). The automated external defibrillator (AED) used was the LIFEPAK® 500T AED training system (Medtronic Physio-control, USA) with defibrillation pads. Subjects had to score ≥80% to be successful. Remedial was done for those who could not pass the test as well as the skills. Those who scored more than 90% and had good communication skills were eligible for instructor course and termed as instructor potential (IP). These IPs underwent instructor course of 1 day. Successful candidates were termed as instructor candidate (IC). IC has to teach under supervision of a faculty in English and local dialect to become a certified instructor. The subjects evaluated the quality of course on parameters of content, presentation, and usefulness on a Likert scale [Appendix Table 1]. After the end of the course, the participants were certified with AIIMS BECC provider status card with a registration number having a validity of 2 years from the date of issue. The instructors were certified with full instructor status.

Appendix 1: All India Institute of Medical Sciences basic emergency care course Provider course schedule

Time	Course Schedule
09:30-10:00 AM	Registration and baseline assessment
10:00-10:15 AM	Pretest
10:15-10:30 AM	Introduction to course
10:30-11:00AM	Adult CPR C-A-B: Circulation-airway-breathing
11:00-11:10AM	AED
11:10-11:20AM	Audio visual
11:20-11:40AM	Child and infant CPR
11:40-11:50 AM	Tea break and move to skill stations
11:50-01:30 PM	Hands on: CPR
1:30-2:15	Lunch
2:15-02:30 PM	Special scenarios Choking Adult choking Infant and child choking
02:30-02:45 PM	Drowning, electrocution, chest pain, stroke
2:45-2:55 PM	Snake and animal bites
2:55-3:30 PM	Trauma management: Concept of ABCDE A - Jaw thrust, suction; B - Tension pneumothorax, open chest wound; C - Bleeding control; D - AVPU scoring and triage
3:30-3:40 PM	Tea break
3:30-5:00 PM	Hands on: Cervical collar application, helmet removal, fracture splinting etc.
5:00-5:30 PM	Posttest and feedback

CPR: Cardiopulmonary resuscitation; AED: Automated external defibrillator

Appendix 2: Basic emergency care course questionnaire

1. To asses circulation, palpate carotid pulse for not more than
   A. 30 s
   B. 60 s
   C. 10 s
   D. 20 s
2. While performing chest compression in adult cardio-pulmonary resuscitation; compression rate should be at least
   A. 50/min
   B. 70/min
   C. 90/min
   D. 100/min
3. The ratio of compression-ventilation ratio in adult cardio-pulmonary resuscitation should be
   A. 15:1
   B. 30:2
   C. 15:2
   D. 30:1
4. While performing cardio-pulmonary resuscitation in 5 year old child, you use?
   A. Use your fist
   B. Heel of one hand
   C. Both hands
   D. Your middle and index fingers
5. Which pulse is felt in infants during cardio-pulmonary resuscitation?
   A. Carotid
   B. Radial
   C. Brachial
   D. Popliteal
6. Best way to assess responsiveness in trauma patient is
   A. Shake and shout
   B. Touch and talk
   C. Pressure pain and
   D. Order and observe
7. Sequence of Cá AáB is followed in resuscitation because
   A. It is easy to remember and follow
   B. It denotes the basic physiological relationship between various parameters
   C. It is based on the frequency of complication seen in trauma victims
   D. It is based on the ease with which maneuvers are performed
8. Which maneuver is used for opening airway in a trauma victim?
   A. Heimlich's maneuver
   B. Head tilt maneuver
   C. Jaw thrust maneuver
   D. Sellick's maneuver
9. The preferred posture of cardio-pulmonary resuscitation in pregnant lady is
   A. Right lateral position
   B. Left lateral position
   C. Supine position
   D. Prone position
10. If you witness a person collapsing before you, what will you do first?
    A. Call the ambulance and then start cardio-pulmonary resuscitation
    B. Start cardio-pulmonary resuscitation and then call ambulance
    C. Do not attempt any cardio-pulmonary resuscitation
    D. None of the above
11. Heimlich maneuver is done in
    A. Airway obstruction due to foreign body
    B. Resuscitation of drowning victim
    C. Resuscitation of pregnant women
    D. Resuscitation in hypothermia
12. Most common cause of airway obstruction in an unresponsive patient:
    A. Jaw fall
    B. Head fall
    C. Tongue fall
    D. Teeth fall
13. Most important aspect of transporting a patient of multiple trauma with head injury due to road traffic accident is
    A. Calling doctor at the site very urgently
    B. splinting of injured limb
    C. Transportation by maximum number of person to avoid injury
    D. Spine stabilization

14. The most effective treatment for ventricular fibrillation in out of hospital setting is:
    A. Drugs
    B. Cardio-pulmonary resuscitation
    C. Monophasic Defibrillator
    D. Automated external defibrillator
15. Triage means:
    A. Sorting of patients in the field and the decision regarding to which medical facility they should be transported
    B. The sorting of patients based on their need for treatment and the resources available
    C. Treatment rendered is based on the ABC priorities
    D. All of the above
16. Red color in triage category of trauma victims stands for
    A. Life-threatening injury that requires immediate intervention
    B. Injuries which may be life or limb threatening if care is delayed beyond several hours
    C. Walking wounded patients
    D. Dead patients
17. A 24-year-old boy in your neighborhood had sustained snake bite while playing what you shall not do
    A. Reassurance
    B. Make him run as fast as he could to the nearby doctor
    C. Immobilization
    D. Remove any tight clothing from the bitten limb
18. "R.I.G.H.T" protocol used for management of snake bite includes all except
    A. Reassurance
    B. Ice application
    C. Get to the Hospital Immediately
    D. Tell the doctor
19. In assessing the circulation of patient in hypothermia carotid artery is palpated for how many seconds
    A. 10
    B. 20
    C. 30
    D. 40
20. All are the contraindication to start cardio-pulmonary resuscitation except
    A. Pulseless, no spontaneous breathing
    B. Decapitation
    C. Alert, with palpable, pulse
    D. Rigor mortis

Table 1: Precourse and postcourse score (mean SD) and *P* value

Level of education	Mean ± SD		*P*
	Prescore	Postscore	
Overall (*n*=1283)	12.7±3.8	17.9± 2.1	<0.001
12th pass (*n*=352)	13.1±3.5	17.7±2.4	<0.001
Graduate (*n*=804)	12.6±3.8	18.1±1.9	<0.001
Postgraduate (n=127)	12.5±4.7	18.0±2.1	<0.001
Medico (*n*=695)	12.6±3.9	18.0±2.0	<0.001
Nonmedico (*n*=588)	12.8±3.6	17.9±2.1	<0.001

SD: Standard deviation

Table 2: Difference in knowledge gain among various groups and their *P* value

Level of education	Knowledge gain (mean±SD)	*P*	*P*		
			1 versus 2	1 versus 3	2 versus 3
Education					
12th pass (*n*=352)	4.7±3.7	0.004	0.000	0.043	1.000
Graduate (*n*=804)	5.4±3.5				
Postgraduate (*n*=127)	5.6±3.8				
Field					
Nonmedico (*n*=588)	5.1±3.5	0.014			
Medico (*n*=695)	5.5±3.6				

SD: Standard deviation

Statistical analysis

A total of 1400 participants have done BECC course. Out of them, 1283 participants were included in final analysis due to missing data of some participants. Initially, a code was given to the participants on the basis of their education level and profession [Appendix Table 2]. However, for analysis, the participants were assigned three codes depending upon their education level. Those who had studied up to 12th class (low education), graduates, and postgraduates (higher education) were given the code 1, 2, and 3, respectively [Appendix Table 3]. Participants were also divided into two groups: Medico and nonmedico group, depending on whether they belong to medical field or not. All paramedics, nurses, and doctors irrespective of education level were clubbed together and labeled as medicos and given code B. All the remaining participants were labeled as nonmedicos and given code A [Appendix Table 4]. All the participants were given pre- and post-course questionnaire containing 20 questions. Final score were calculated out of 20 points. All the values were given as mean ± standard deviation. Pre- and post-course scores were compared and *P* value was calculated in all participants and intra- and inter-group comparisons were made.

Appendix Table 1: Likert scale

Variable	Code
Excellent	1
Good	2
Satisfactory	3
Unsatisfactory	4
Not filled	9

Appendix Table 2: Initial codes of participants of BECC

Initial codes	Level of education
1	Illiterate
2	8th pass
3	12th pass
4	Graduate doctors
5	Postgraduate doctors
6	Graduate nurses
7	Postgraduate nurses
8	Graduate nonmedico
9	Postgraduate nonmedico
10	Paramedics
11	5th pass

BECC: Basic emergency care course

Appendix Table 3: Final code after merging of various categories of education

Code 1 (up to 12th) (*n*=352)	Code 2 (graduate) (*n*=804)	Code 3 (postgraduate) (*n*=127)
2	4	5
3	6	7
11	8	9
	10	

Appendix Table 4: Final coding after merging various categories as nonmedico (code A) and medico (code B)

Nonmedico Code A (*n*=588)	Medico Code B (*n*=695)
2	4
3	5
8	6
9	7
11	10

RESULTS

The overall precourse score of participants on knowledge about CPR and acute emergency care was 12.7 ± 3.8. Post-BECC course, there was significant improvement in the score (17.9 ± 2.1) as depicted in Table 1. There was significant increase in score after undertaking BECC in all the groups irrespective of their education level and profession.

Intergroup comparison revealed that participants who are graduates and postgraduates had more significant gain in knowledge as compared to participants who are less educated, i.e., till class XII. The difference in knowledge gain between graduates and postgraduates participants was not significant [Table 2].

On comparing medico and nonmedico groups, it was found that medicos had better knowledge gain than the nonmedico ($P < 0.05$).

Out of 1283 participants, 1263 participants gave valid feedback and evaluated the quality of course on the basis of content, presentation, and usefulness. Final code lies in between excellent and good on all the three scales of quality determination on a Likert scale (content 1.11 ± 0.35, presentation 1.18 ± 0.39, and usefulness 1.16 ± 0.46).

Thirty-seven participants scored >90% and identified as IP. They underwent 1 day instructor course, out of them, 25 participants became certified instructors.

DISCUSSION

It is evident from the results that knowledge and skill of participants improved by our BECC. There was significant knowledge gain at all education level including medicos and nonmedicos. By creating this program, we addressed the need of basic emergency care skills for healthcare and nonhealthcare personnel. There was a significant impact of the course as the variability in education, understanding, profession, and loco-regional factors were taken care of. It is being taught in local dialect such as Hindi, Marathi, and other local languages. The faculty was trained with micro-teaching skills in dialectics as well as taking skill stations. In a study by Meaney *et al.*, the authors compared novel techniques such as increased student: Teacher ratio and feedback mannequins with traditional American Heart Association basic life support (BLS) course. They found that cost-effective training strategies and devices are not inferior to the traditional techniques. They concluded that such courses should be developed in resource-limited settings to train the healthcare professionals.[5]

Life supporting first aid was a term coined by Safar and Bircher for few simple measures which are crucial to make a difference for a patient's immediate survival while waiting for the help.[6] The American College of Emergency Physicians strongly encourages CPR training for the lay public. In recent years, various initiatives to optimize prehospital care have been developed such as organization of mass CPR training events, CPR training of family members of patients suffering from heart disease, mass education, television campaigns, and training of high school students.[7,8] However, in a country such as India, affordability, language problem, and a demand far exceeding availability are the major issues.

In a study by Gombeski *et al.*, they compared two training courses, one was 8 h long with three sessions and the other was 4 h long, single session, and they found that knowledge and performance

scores were significantly higher for trainees from the long course. They further concluded that the length of the training program should be determined on the basis of the community's needs and resources.[9] In India, emergency medical service (EMS) is in its infancy, a longer training course, which gives trainees a greater opportunity to expertise and retaining the skill is more appropriate. Authors have trained doctors, nurses, and lay persons across India, and also recommend a longer (at least 8 h) training module with more hands on practice in view of poor availability of EMS access in our country.

In a meta-analysis by Husain and Eisenberg, the authors concluded that providing the police officers with basic CPR skills and training in the use of AED can increase survival rates for out-of-the hospital cardiac arrests (major link of "early defibrillation" in the "chain of survival").[10] In a study by Papalexopoulou *et al.*, the authors concluded that education level affects positively and age has an adverse effect on both acquisition and retention of CPR/AED skills. They recommended that the resuscitation courses might be designed according to the candidate's literacy level. However, this may cause discrimination between the participants.[11] Our course content was simple, easy to understand, and the basic minimum required for saving a life was taught. In our study we also found that the education level and profession too had an influence on knowledge gain with better gain in participant with higher education and medical personnel.

In India, prehospital emergency care is not included in the medical curriculum, so most doctors have little knowledge of difficulties associated with the prehospital management of cardiac arrest victims. Allison *et al.* developed an undergraduate prehospital trauma course and 205 medical students in the 4th year of medical school participated in the course. The feedback from the students and doctors completing the course was positive and they all felt better equipped to deal with the emergency situations.[12] The authors also recommend the inclusion of chapter on basic prehospital emergency care for school children as well as training program for medical curriculum.

Our course mainly stresses on improving the knowledge and skill whereas the respondent's intention to perform CPR on a real victim is predicted by his attitude. In a study by Nielsen *et al.*, they compared the effect of local television broadcast with BLS and AED courses on the attitude of people toward different aspects of resuscitation. They concluded that a targeted media campaign and widespread education can significantly increase the willingness to use an AED and the confidence in providing chest compressions and mouth-to-mouth ventilation rather than a targeted campaign.[13] We also feel that attitude can be changed with the support of media and mass education program along with frequent exposure and CPR training courses such as BECC.

Deterioration in the skill is a major problem, unless refresher training is provided. The CPR guidelines recommend that the refresher training should be done within 12-24 months. In a study by Papalexopoulou *et al.*, the authors re-evaluated the participants 1, 3, and 6 months after initial training. They found that practical performance during the CPR/AED scenario was worse in the 1st month of re-evaluation, but due to repetition of the algorithm, there was an improvement in the performance in subsequent re-evaluations. Regarding written evaluation, the mean scores improved over time. Hence, they suggested that 6 months would be the ideal time for re-evaluation. In another study by Nishiyama *et al.*, the authors compared the CPR quality at 6 months and 1 year after the initial training.[14] The CPR quality at 1 year was better as compared to 6 months, so they suggested that the 6 months evaluation can serve as refreshing training to improve and maintain CPR skills.

Limitations

One of the major drawbacks of our study is the absence of refresher courses. The authors feel that every training course should be followed by a refresher course after 6 months.

CONCLUSION

BECC has been an effective community emergency care initiative in improving the knowledge and skill of healthcare workers and laypersons in basic emergency care in India. Our vision is to expand the pool of BECC certified instructors across the country, so that they can disseminate the knowledge of prehospital care to each and every person across India leading to improvement in the outcome.

Acknowledgment

We would like to acknowledge AIIMS, New Delhi, for providing logistic support and also our course faculties Dr. Amit Gupta, Dr. Kapil Dev Soni, Dr. Naveen Yadav, Dr. Farooq Kamran, Dr. Vijay Sharma, Dr. Shilpa Sharma, Dr. Ashish Bindra, Dr. Sanjeev Lalwani, and Dr. R.K. Ramchandani.

Financial support and sponsorship

All India Institute of Medical Sciences, New Delhi, disseminated the course with the logistic and financial support of National Rural Health Mission and State Government Across India.

Conflicts of interest

There are no conflicts of interest

REFERENCES

1. National Crime Report Bureau. "Crime in India" 2012, Statistics. Retrieved from the National Crime Report Bureau; June 04, 2013. Available from: http://www.ncrb.nic.in/CD-CII2012/Statistics2012.pdf. [Last accessed on 2014 Jul 27].
2. Das AK, Gupta SB, Joshi SR, Aggarwal P, Murmu LR, Bhoi S, *et al.* White paper on academic emergency medicine in India: INDO-US Joint Working Group (JWG). J Assoc Physicians India 2008;56:789-98.
3. Aggarwal P, Galwankar S, Kalra OP, Bhalla A, Bhoi S, Sundarakumar S. The 2014 Academic College of Emergency Experts in India's Education Development Committee (EDC) white paper on establishing an academic department of emergency medicine in India - Guidelines for Staffing, Infrastructure, Resources, Curriculum and Training. J Emerg Trauma Shock 2014;7:196-208.

4. Bhoi S, Thakur N, Chauhan S, Kumar R, Aggarwal D, Gulati V, *et al.* Does community emergency care initiative improves the knowledge, skill and attitude of healthcare workers and laypersons in basic emergency care in India? Prehosp Disaster Med 2011;26 Suppl 1:S7-8.
5. Meaney PA, Sutton RM, Tsima B, Steenhoff AP, Shilkofski N, Boulet JR, *et al.* Training hospital providers in basic CPR skills in Botswana: Acquisition, retention and impact of novel training techniques. Resuscitation 2012;83:1484-90.
6. Safar P, Bircher NG. Cardiopulmonary Cerebral Resuscitation. An Introduction to Resuscitation Medicine. Guidelines by the World Federation of Societies of Anaesthesiologists (WFSA). Stavanger: Laerdal; 1968. London: Saunders; 2nd ed., 1982; 3rd ed., 1988.
7. Fong YT, Anantharaman V, Lim SH, Leong KF, Pokkan G. Mass cardiopulmonary resuscitation 99 — survey results of a multi-organisational effort in public education in cardiopulmonary resuscitation. Resuscitation 2001;49:201-5.
8. Chu KH, May CR, Clark MJ, Breeze KM. CPR training in households of patients with chest pain. Resuscitation 2003;57:257-68.
9. Gombeski WR Jr., Effron DM, Ramirez AG, Moore TJ. Impact on retention: Comparison of two CPR training programs. Am J Public Health 1982;72:849-52.
10. Husain S, Eisenberg M. Police AED programs: A systematic review and meta-analysis. Resuscitation 2013;84:1184-91.
11. Papalexopoulou K, Chalkias A, Dontas I, Pliatsika P, Giannakakos C, Papapanagiotou P, *et al.* Education and age affect skill acquisition and retention in lay rescuers after a European resuscitation council CPR/AED course. Heart Lung 2014;43:66-71.
12. Allison KP, Kilner T, Porter KM, Thurgood A. Pre-hospital care — The evolution of a course for undergraduates. Resuscitation 2002;52:187-91.
13. Nielsen AM, Isbye DL, Lippert FK, Rasmussen LS. Can mass education and a television campaign change the attitudes towards cardiopulmonary resuscitation in a rural community? Scand J Trauma Resusc Emerg Med 2013;21:39.
14. Nishiyama C, Iwami T, Kitamura T, Ando M, Sakamoto T, Marukawa S, *et al.* Long-term retention of cardiopulmonary resuscitation skills after shortened chest compression-only training and conventional training: A randomized controlled trial. Acad Emerg Med 2014;21: 47-54.