Original Article

Managerial Challenges in Establishing a Structured Cardiopulmonary Resuscitation Program in a Small Health-Care Setup

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Abstract

Introduction: Effective cardiopulmonary resuscitation (CPR) program is required in all health care organizations (HCOs). The focus is primarily on technical aspect of CPR training and managerial challenges encountered in establishment of CPR program are not discussed in detail previously. The aim was to study the managerial challenges in establishing a structured CPR program in a small HCO. A prospective, observational study conducted over a period of 3 months. All staff of the HCO was trained in basic life support. **Materials and Methods:** A CPR committee was constituted which formulated the CPR policy, CPR rapid response teams (CPR RRT), and training protocols and recorded observations during the study period. **Statistical Analysis Used:** Mean, percentage, and gain score were used for statistical analysis. **Results:** The major challenges encountered were unorganized work, lack of resources, old building structure with difficult to access areas, lack of knowledge upgradation, and nonmotivated staff. The clinical staff, involved in regular CPRs, although had basic CPR knowledge, they required continual refresher training. The nonclinical staff showed much larger improvement in scores post training. **Conclusions:** Flexible functional CPR policy with multidisciplinary CPR RRTs, low dose high frequency training, customized crash kits, interdepartmental liasoning, and mock drills were found useful in making "CPR a reflex manoeuvre" and effective implementation of CPR program. Concepts and principles implemented from organizational behavior, leadership, and motivation such as "Herzbergs Motivational hygiene theory" were useful. Continual training of staff is required for consistent delivery of high quality CPR and even nonmedical staff can be trained to provide high quality Basic Life Support (BLS) similar to clinical staff.

Keywords: Basic life support, cardiopulmonary resuscitation, cardiopulmonary resuscitation reflex, managerial challenges, training effectiveness

Introduction

Cardiopulmonary resuscitation (CPR) is a life-saving procedure and one of the few interventions which require an order not to be administered.[1] In-hospital cardiac arrest (IHCA) is largely underreported with variable survival rates. The incidence of IHCA is reported to be around 1–6/1000 admissions.[2-4] Effective and successful resuscitation requires early recognition of arrest, early activation of CPR team, and early CPR and defibrillation followed by early advanced life support. This requires a robust hospital CPR system in place.[1]

In a CPR program, the focus is primarily on the technical aspect of CPR training and skill development. However, effectiveness of a skill like CPR is determined by many other managerial and human factors as well. These factors are not discussed in detail earlier and may lead to a less efficient program. The challenges encountered during establishment of a structured CPR program in a small health-care organization (HCO) are described in this study, along with their solutions. The

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effectiveness of CPR training program was also studied with the help of questionnaire.

Methodology

This study was conducted in a small 30-bedded general HCO in Delhi, with round-the-clock medical, surgical, and inpatient facilities. It was a prospective, observational study conducted over a period of 3 months. A total of 75 staff members underwent basic life support (BLS) training. The aim was to train all staff in BLS. Doctors and intensive care unit (ICU) nurses were also further trained in advanced cardiac life support, which is not a part of this study.

Major areas needing attention were the formulation of a CPR policy, protocols for crash cart maintenance, training, and knowledge upgradation of staff. A CPR committee was formulated. The anesthesia in charge was overall responsible for the CPR program.

Cardiopulmonary resuscitation committee

It constituted:

- Senior physician and head, internal medicine, and ICU–chairman
- Anesthesia in charge–convener
- Nursing superintendent–member
- ICU nurse in charge–member
- Administrative head–member.

Monthly committee meetings were conducted and challenges, solutions, results, and further course of action were discussed.

a. CPR policy
   A written hospital CPR policy was formulated by the CPR committee, which was made available and explained to all departments in the hospital
b. CPR rapid response teams (RRT)
   CPR RRT was designed to provide round-the-clock effective CPR services, even during staff shortage.

Cardiopulmonary resuscitation rapid response teams members and role allotment

- Anesthesiologist/physician – Team leader
- Duty doctor (ward/ICU) – First responder to call CODE BLUE and start CPR
- Staff nurse (floor/ICU) – First responder to call CODE BLUE and start CPR
- Nursing assistant/ICU technician – Bring crash cart and defibrillator
- Housekeeping/ward boy – Arrange for patient shifting
- Security-crowd management and reserving lift for patient/crash cart transport
- Manager on duty/senior nurse (recorder) – fill the coder sheet

  The role of each team member was clearly defined. Each team member was trained in BLS and was able to perform CPR in a crisis situation. Each CPR would be followed by review and feedback within 24 h. All members who participate in the CPR RRT along with recorder and anesthesia in charge would attend the review session.

c. Code blue announcement
   The first responder would call at the reception from where CODE BLUE was announced in the public address (PA) system. A uniform way of announcing code blue was developed. It said"Code Blue, ward number, room number. To be repeated three times."
d. Crash cart maintenance
   Crash carts were maintained in all wards and in critical care areas. Nursing in charge was responsible for maintenance of crash carts. A common drug and equipment inventory was made for all crash carts. The crash carts were locked, with manual breakable locks. Drugs and equipment were checked manually for quantity and expiry date every month and defibrillator was checked daily. The used crash carts were checked, refilled, reorganized, and locked by the floor nurse within 30 min of completion of any CPR.

Training and material

A dedicated room was identified in the hospital for the training sessions. It had enough space and facilities for hands-on training on mannequins and PowerPoint presentations.

The staff had varying degrees of knowledge about CPR and training sessions were tailored according to the need. Regular mock drills and role plays were conducted at various places in the HCO.

Effectiveness of cardiopulmonary resuscitation

Effectiveness of the program was studied by a written questionnaire of 15 questions on BLS [Annexure 1], filled by participants before training (pretest) and after training (posttest). Questionnaire was available in the local language and English. This questionnaire was validated by other doctors working in the field of CPR and was tested initially on 10 participants on a pilot basis in the study. Based on the questionnaire results, improvement in the participants' knowledge of CPR was studied.

Results

Table 1 shows the department-wise number of staff trained in the CPR program. Clinicians, nurses, and technicians were included in clinical staff, others were nonclinical staff. Post training, all staff answered at least 14 of 15 questions correctly.

The overall mean score of staff was 52.44% which improved up to 96.26%, reflecting a relative improvement of 83.71% over the pretest scores. The mean pretest score of clinical staff was 69.90% which reached up to 98.91% post training, showing a relative improvement of 41.5% over pretest scores. The nonclinical staff showed an enormous improvement of 164.5% in their posttest (93.68%) over their pretest scores (35.4%) [Table 2 and Figure 1].

Table 1: Training results

Department	Numbers	Pretest (mean) (mean/15)	Posttest (mean) (mean/15)
Clinicians	9	12 (0.8)	15 (1)
Nurses	22	10 (0.67)	15 (1)
Technicians	6	10 (0.67)	14 (0.93)
Lab services	4	6 (0.4)	14 (0.93)
Security	5	8 (0.53)	14 (0.93)
F and B	5	5 (0.33)	14 (0.93)
Engineering	2	6 (0.4)	15 (1)
Housekeeping	9	4 (0.26)	14 (0.93)
Front desk	4	5 (0.33)	14 (0.93)
Administration	9	5 (0.33)	14 (0.93)
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Clinicians, nurses, and technicians were included in clinical staff, other were nonclinical staff

Table 2: Training effectiveness

	Pretest mean score (n) (n/15×100%)	Posttest mean score (m) (m/15×100%)	Gain score (posttest pretest)	Relative change over pretest score (m−n/n×100)
All candidates	7.866 (52.44)	14.44 (96.26)	43.82	83.71
Clinical staff	10.48 (69.90)	14.83 (98.91)	29.01	41.50
Nonclinical staff	5.31 (35.4)	14.05 (93.68)	58.28	164.5

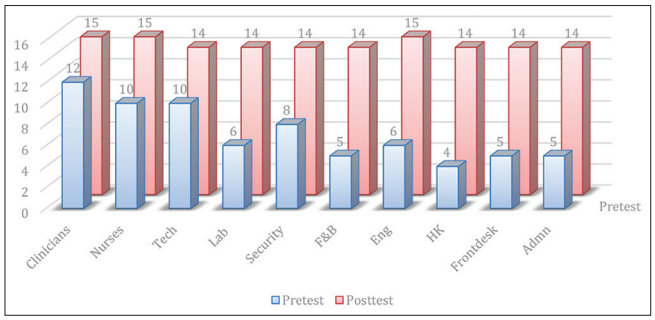

Figure 1: Training results

Discussion

Challenges encountered in the implementation of cardiopulmonary resuscitation policy

The dynamics of a small HCO are different from a large setup, which has ample staff, funds, and access to technology. The major challenges faced in this small HCO in the implementation of CPR program were limited resources, unorganized crash carts, limited and unmotivated staff, and lack of sensitization about the importance of CPR amongst staff. Limitations in hospital structure and difficult to access areas also posed a challenge in timely communication and availability of crash carts at the scene.

Similar challenges were found in a landmark study in Botswana (2013) where challenges encountered during CPR were studied in two referral public hospitals. The major shortcomings found were the absence of CPR policy, limited CPR competency of clinical staff and doctors, need for knowledge up-gradation, unorganized CPR trollies, absence of CPR teams, communication problems while CPR drill, shortage of doctors and nurses, and overpopulated hospital units.[5]

Measures taken to address the challenges in the implementation of CPR policy in our study unit are as follows:

Challenge 1-small health-care organizations with limited staff after routine working hours

Team structure – functional, flexible, multidisciplinary team

The team was constituted to make effective round-the-clock CPR services possible, even with limited staff. Members from nonclinical and administrative departments were also included in the CPR RRT. All the team members were trained to provide BLS and act as team leaders if required. Multidisciplinary trained team provided additional CPR hands in emergency. Staff well versed with the uniform CPR policy and their role in CPR RRT resulted in quick, coordinated action in times of emergency.

Challenge 2-delay in communication by the first responder

Code blue announcements

A dedicated phone line and receiving instrument was installed at the reception for immediate response to the code blue call. Regular check for working PA system and clarity of announcements in all relevant areas was ensured.

Challenge 3-unorganized crash carts

Making crash carts uniform

Uniform labeling and layout of drugs and equipment in all carts reduced the response time. The items were arranged in accordance with priority and fitted to prevent falling of equipment while moving the crash cart quickly.

Separate bags and small boxes were hung on the side of crash carts for keeping used laryngoscope, gloves, sharps, and other waste, which were later sterilized/disposed according to the Biomedical Waste Management protocol. This prevented waste mixing and surface contamination in emergency situations.

Various international organizations have described the use of computerized systems, sealed disposable trays with barcoding, prefilled syringes, and use of prepacked trays to maintain uniformity and enhance drugs and equipment tracking and automated expiry notifications.[6-8]

Implementation of similar advanced computerized systems is under process in the study unit.

Challenge 4-old building structure with difficult to access areas

Customization of crash carts-mobile crash kits

Crash carts could not be maneuvered in difficult to access areas of the hospital like narrow staircases, rooftop, water tanks, and some other peripheral areas. To prevent CPR delay in these areas, mobile crash kits were made containing gloves, adult and pediatric AMBU bag with masks, handheld manual suction device, and gauze pieces.

Mobile crash kits were kept on the ground floor and top floor at designated areas. Nearest "mobile crash kit" and scoop stretcher were used in the event of code blue in these difficult to access areas where crash carts could not be transported easily. The nearest defibrillator would be carried manually by the technician.

Similar customization of crash carts and use of mayo trolleys to maneuver difficult areas have been suggested by other workers also. In a gap analysis of the crash carts at a tertiary care hospital in North India, the authors advocated customization of crash carts, suggested the use of mobile sub trolleys with a fixed master cart to enhance efficiency in bottleneck areas. Standardization of crash carts in terms of labeling and documentation increased efficiency in emergencies. Uniformity and standardization was recommended in customized sub trolleys also.[9]

Challenge 5-difficulty in organizing training sessions with ongoing hospital work due to limited staff availability

With limited staff in each department, the challenge was to continue trainings without disrupting hospital services.

Short duration, frequent training sessions with flexible timings

1. The training sessions were made crisp, timely, and frequent. Each training session lasted for 45 min at the most and included PowerPoint presentation and hands-on training. Each session had maximum10 trainees and two instructors
2. Training sessions were kept at staff change over time and during light working hours
3. Role plays and mock drills were carried out with participation from the staff at all levels
4. "Well-circulated CPR policy," "well-rehearsed mock drills" and "role-plays" ensured prompt and effective CPR response in the hospital.

A similar simplified 45-min CPR training program consisting of instruction and practice in chest compression and AED use with a personal training mannequin for the nonmedical staff was introduced in a university hospital in Japan. They did this because they needed to educate more personnel in a short time. Improvement in both attitude and quality of CPR was observed in this study.[10] Low-dose high-frequency CPR training has been shown to retain skill and reduce hospital cost.[11]

Interdepartmental liasoning

Staff attendance during training sessions required adjustments in all departmental rosters.

Coordination with other departments such as clinical, nursing, housekeeping, security, engineering, and administration was essential for training and smooth functioning of multidisciplinary CPR RRT.

Challenge 6-lack of leadership and communication among doctors and staff

The need for discrete leadership and unambiguous communication is paramount in medicine, especially in high-intensity situations like CPR. During training and mock drills in this study, lack of active leadership and clear communication in the team was clearly observed. Lack of clear announcement of drug administration led to confusion in the CPR, repetition of orders, drug errors, and improper recording. Performance anxiety in staff was noticed in front of senior doctors and peers. Under confidence ("not so sure") about the job also led to ambiguous communication.

As quoted in Mathis Maxim: "There is nothing in a physician's education and training that qualifies him to become a leader."[12]

Training all members to function as team leaders if required, positive feedback and staff motivation (discussed below) improved leadership and communication. Observers with no specific role were discouraged to be present during real CODE BLUEs.

In a study performed in a Canadian teaching hospital on resuscitation, it was found difficult to identify the leader of the resuscitation team. Anesthesiologist was the most identifiable and default team leader. People attending the CPR with no specific role were found to hinder performance. Mock drills, trainings, and debriefing were considered useful by the staff. Clear legible communication and identifiable leadership was considered the key to team functioning.[13] The introduction of situation, background, assessment, and recommendation has shown to improve effective communication and improve outcomes in CPR, emergencies, and ICU.[14]

Challenge 7-lack of employee motivation

The following motivational concepts were applied

a. Control the situation (internality)

b. Make a difference (optimism)
c. Self-satisfaction.

Herzberg's Motivational Hygiene Theory[15] was applied for job content at workplace and motivational dimensions (satisfiers) were used to keep staff motivation high, like

a. Interesting, challenging work
b. Utilization of ones' capabilities
c. Opportunity to do something meaningful
d. Recognition for achievement
e. Sense of importance to organization
f. Involvement in decision-making.

Awareness of the importance of CPR was essential for trainee motivation. It was achieved through

1. Videos demonstrating lifesaving CPR in day-to-day situations. The utility of CPR in personal life was also emphasized. "It can help save lives, not only of patients in hospital but also of family and friends"
2. Real-life stories of CPR survivors from the hospital were shared with the staff, while maintaining patient confidentiality
3. Different team players acting as team leaders on rotation during trainings
4. Feedback, appreciation. Feedback of CPR and mock drill were discussed in CPR review and monthly meetings
5. Repeated emphasis in all training sessions that each individual can make a difference.

Observations from mock drills and role plays

1. Hesitation in initiating chest compressions and waiting for CPR team to arrive.
   It was seen more in junior staff who had not witnessed many real life CPRs.
   Underlying factors were found to be:
   a. Lack of confidence – "Not sure" about their knowledge/technique of CPR
   b. Fear of doing harm to the patient.
   Dwyer has reported similar findings in a study where participants who claimed to be confident in initiating CPR also could not perform adequately in an actual emergency situation.[16]
   To reduce hesitancy in CPR providers, repeated training and confidence building was done, as described below, in the study unit.
2. Making "CPR a reflex manoeuvre"
   Reflex maneuvers like sprinkling water on victims face, lifting victims' legs, and skin pinching to elicit response from the victim were observed in mock drills and real-life CPRs, even in trained first responders. In times of emergency, people are unable to think and they tend to act by reflex. It was then planned to "make CPR also, a reflex manoeuvre."

It was achieved by following means

Frequent CPR training, exposure to real-life situations, and group discussions were planned to reduce hesitation in initiating CPR and in "making CPR a reflex manoeuvre" among the staff.

Following steps were taken

1. Targeted involvement of identified staff in all real-time CPRs and mock drills
2. Frequent quick revisions of CPR algorithms with repeated discussions, interactive quizzes, and role plays
3. Color charts of CPR algorithms and steps with pictorial representation were put in critical areas, and on each floor
4. Video clips of CPR were displayed at the reception and visitors' area.

Pictorial display charts and video clips of CPR also helped in creating awareness among patients, relatives, and visitors and creation of a positive environment.

It was reinforced in all trainings that

"Any CPR is better than NO CPR."

"Do not hesitate to attempt to save a life. Delay can be deadly."

Effect of training

The effect of training was assessed through a written questionnaire to all staff by applying pre- and post-CPR training evaluations. Clinicians, nurses, and technicians were included in clinical staff, who were regularly involved in providing CPR to patients. The clinical staff had knowledge of CPR and needed a refresher training only. The pretest score of clinical staff was 69.90%. Without refresher training, even some clinicians did not achieve 100% in the pretest [Table 1]. This highlights the importance of continual training and refresher courses even in clinical staff. All other (non-clinical) staff had little knowledge of CPR and required full training. The nonclinical staff showed an enormous relative improvement of 164% over their pretest scores. This indicates the minimal knowledge of CPR in the general nonclinical population and the high impact of training in this group [Table 2 and Figure 1]. The nonclinical staff could achieve posttest results similar to clinical staff (93%–100%), reflecting that even nonmedical people/laypersons can be trained to deliver high-quality CPR.

In the study reported from Japan in 2014, postprogram questionnaire survey revealed the proportion of participants who answered "I can check for a response," "I can perform chest compressions," and "I can absolutely or I think I can use an AED" increased versus that before the program (81.8% vs. 19.5%, 77.4% vs. 10.1%, and 84.3% vs. 23.3%, respectively). Significant improvement was seen in chest compression rate and depth and in minimal interruptions.[10] The results of these two studies cannot be directly compared because of different evaluation parameters used.

One limitation of our study is that although satisfactory practical skills of the caregiver were ensured by the trainers, it could not be recorded objectively in the assessment.

Conclusions

Dynamics of a small HCO are different from larger setups which have ample staff and resources. A discrete CPR policy with well-trained and motivated CPR team is the basic requirement of a robust CPR program. The CPR policy and training program needs to be customized for the staff and resource availability. "Mobile crash kits" were found very useful in structural bottlenecks and difficult to access areas of the HCO. "Functional flexibility" in CPR policy within permissible limits, repeated training and feedback, interdepartmental liasoning, staff motivation, training for clear communication, and active leadership are paramount for a robust CPR program. Continual training is required by all staff for consistent delivery of high-quality CPR. Even nonmedical staff can be trained to provide high-quality Basic Life Support (BLS) as clinical staff. The author recommends "Repeated Low Dose High Frequency" training to make "CPR a Reflex Manoeuvre."

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Conflicts of interest

There are no conflicts of interest.

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Annexure 1

Questionnaire

1) The Basic Life Support sequence of steps are:
   a. Airway, Breathing, Check Pulse
   b. Chest compressions, Airway, Breathing
   c. Airway, Breathing, Chest Compressions
   d. Airway, Check Pulse, Breathing.
2) Critical characteristics of high-quality CPR include which of the following?
   a. Starting chest compressions within 10 seconds of recognition of cardiac arrest
   b. Allowing complete chest recoil after each compression
   c. Minimize interruptions of CPR
   d. All of the above.
3) The compression to ventilation ratio for CPR is:
   a. 30:1
   b. 30:2
   c. 15:1
   d. 15:2.
4) Where should you attempt to perform a pulse check in an adult?
   a. Brachial artery
   b. Carotid artery
   c. Popliteal artery
   d. Temporal artery.
5) You are alone and find a potential victim. What is the sequence of BLS
   a. Check for responsiveness
   b. Ensure scene safety
   c. Begin Chest Compressions
   d. Open the airway and give 2 breaths.
6) What is the correct rate of compressions per minute?
   a. 30
   b. 50
   c. 60
   d. 100–120.
7) You are giving compressions on an adult. What is the correct depth for these compressions?
   a. At least 1 inch
   b. At least 2 inches
   c. At least 3 inches
   d. At least 4 inches
8) During CPR on an adult victim, the compression-to-breath ratio is:
   a. Give 2 breaths after every 30 compressions
   b. Give 1 breath after every 5 compressions
   c. Give 3 Breaths after every 15 compressions
   d. Give 2 breaths after every 100 compressions
9) What is the correct hand placement for compressions on an adult?
   a. Use 2 hands on left side of chest
   B. Use one hand on left side of chest
   c. Use 2 hands on center side of chest
   d. Use one hand on center side of chest
10) CPR can be provided by
   a. Doctors and nurses only
   b. Males only
   c. Well built persons only
   d. Any trained person
11) Which airway maneuver is done in cervical spine injury patients
   a. Head tilt
   b. Chin lift

c. Jaw thrust
d. All of the above.

12) AED is used for
a. Giving compressions
b. Giving shock
c. Giving breaths
d. All of the above.

13) How many shocks are given at a time
a. One shock followed by 5 cycles of CPR
b. 3 stacked shocks followed by 5 cycles of CPR
c. One shock followed by pulse check, again shock
d. 3 stacked shocks followed by pulse check, again shock.

14) What is EC maneuver
a. For mask ventilation
b. For chest compressions
c. For AED shock delivery
d. Patient positioning.

15) Which emergency numbers will you call at the time of individual disaster.