

Compression-only life support (COLS) for cardiopulmonary resuscitation by layperson outside the hospital

Address for correspondence:

Dr. Rakesh Garg,
Room No 139,
1st Floor, Department of
Onco-Anaesthesiology
and Palliative Medicine,
Dr. BRAIRCH, All India
Institute of Medical
Sciences, Ansari Nagar,
New Delhi - 110 029, India.
E-mail: drrgarg@hotmail.com

**Syed Moied Ahmed, Rakesh Garg¹, Jigeeshu Vasishtha Divatia²,
SSC Chakra Rao³, Bibhuti Bhusan Mishra⁴, M Venkatagiri Kalandoor⁵,
Mukul Chandra Kapoor⁶, Baljit Singh⁷**

Department of Anaesthesiology and Critical Care, J N Medical College, Aligarh Muslim University, Aligarh, Uttar Pradesh, ¹Department of Onco-Anaesthesiology and Palliative Medicine, Dr. BRAIRCH, All India Institute of Medical Sciences, ²Department of Anaesthesiology and Intensive Care, GB Pant Institute of Post-Graduate Medical Education and Research, ³Department of Anesthesia, Max Smart Super Specialty Hospital, New Delhi, ⁴Department of Anaesthesia, Critical Care and Pain Tata Memorial Hospital, Homi Bhabha National Institute, Mumbai, Maharashtra, ⁵Department of Anaesthesiology, Care Emergency Hospital, Kakinada, Andhra Pradesh, ⁶Trustee Indian College of Anaesthesiologists, Eastern Region II Head Quarters, NTPC Ltd, Bhubaneswar, Odisha, ⁷Department of Anaesthesiology, Government General Hospital, Kasaragod, Kerala, India

ABSTRACT

The cardiopulmonary resuscitation (CPR) guidelines of compression-only life support (COLS) for management of the victim with cardiopulmonary arrest in adults provide a stepwise algorithmic approach for optimal outcome of the victim outside the hospital by untrained laypersons. These guidelines have been developed to recommend practical, uniform and acceptable resuscitation algorithms across India. As resuscitation data of the Indian population are inadequate, these guidelines have been based on international literature. The guidelines have been recommended after discussion among Indian experts and the recommendations modified to ensure its practical applicability across the country. The COLS emphasises on early recognition of cardiac arrest and activation, early chest compression and early transfer to medical facility. The guidelines emphasise avoidance of any interruption of chest compression, and thus relies primarily on chest compression-only CPR by laypersons.

Key words: Bystander cardiopulmonary resuscitation, chest compression-only, compression alone, hands-only, layperson cardiopulmonary resuscitation

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DISCLAIMER

Consensus opinion of experts is used wherein robust Indian data are not available. The authors would like to emphasize that these guidelines do not represent the minimum standard of practice nor they are substitution for good judgement.

PREAMBLE

Cardiopulmonary resuscitation (CPR) involves development of skills which are relevant to the practice of all medical specialities, particularly anaesthesiology, critical care, emergency medicine and surgery. Inappropriate and delayed resuscitation may result in adverse outcomes. The mortality in sudden

cardiac arrest in India is approximately 4280/100,000 in contrast to 60–151/100,000 inhabitants in the United States.^[1] It also accounts for more than 60% of all cardiac deaths.^[2,3] Seventy per cent of out-of-hospital cardiac arrests occur at home and 90% of people who suffer out-of-hospital cardiac arrest die. Every minute's delay in resuscitation of the cardiac arrest victim reduces

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the chance of survival by 7%–10%.^[1] Unfortunately, immediate help is received by only about 46% of people experiencing out-of-hospital cardiac arrest.^[1] However, if CPR is performed immediately by someone nearby, the chance of survival of victims can double or triple.^[1]

Major obstacles to successful CPR facility development in India include a large population, 70% of which resides in the rural areas, high rate of illiteracy and poorly developed emergency medical services/ambulance services. Hence, CPR, as recommended in the American Heart Association (AHA) guidelines, is not accessible due to scarce availability of ambulance services with trained personnel and automated external defibrillators. In addition, due to cultural beliefs, majority of people are hesitant to perform mouth-to-mouth resuscitation. The skill is difficult to acquire and its inappropriate use may result in more harm.

Considering these limitations and recent developments, this practice guideline of CPR has been developed by the Resuscitation Council, formed by the Indian Society of Anaesthesiologists (ISA) for resuscitating cardiac arrest victims outside the hospital by layperson – the compression-only life support (COLS). The aim of the COLS guideline is to provide a stepwise approach in accordance with core links for an optimal outcome. The document is not intended to be the long-term strategy for CPR recommendations in India but an interim practise measure, considering the country's diversity. Compression-only CPR is as effective as conventional CPR for cardiac arrest at home, at work or in public. Three large, randomised controlled trials have shown that compression-only CPR is just as effective as traditional CPR performed by laypersons.^[4-6] Compression-only CPR should be made more public and encouraged, as it can save many lives once the public at large gets involved.^[7]

The ISA has, in addition, issued guidelines for management of cardiac arrest patients both outside and inside the hospital by trained personnel – the basic cardiopulmonary life support and the comprehensive cardiopulmonary life support, respectively. The ISA has also recommended generation of a national database of resuscitation after cardiac arrest to facilitate updating of these guidelines in future.

METHODS

A meeting of representatives of all societies and associations of India, with stakes in resuscitation,

was held which decided that Consensus Indian Resuscitation Guidelines be framed. The academic committee of ISA formed the Resuscitation Council consisting of five CPR experts, who had experience in conducting, teaching and training of CPRs, for formulating the ISA guidelines for CPR. These experts were well versed with practising, teaching and training of various international CPR guidelines. Keeping the economic, geographic, diversity and cultural limitations of India in mind, the Resuscitation Council framed three guidelines based on the experience of the rescuer, place of resuscitation and availability of facilities.

Search strategy

A list of resuscitation-related search terms were identified. A literature search for studies published in English between June 2005 and June 2017 using PubMed, Embase, Medline, Ovid, Google Scholar databases and other search engines using the keywords including chest compression-only, compression alone, hands-only, bystander CPR and cardiopulmonary arrest outside the hospital. Additional articles were retrieved by cross-referencing and manual search of manuscripts. The main focus was on randomized clinical trials, but observational cohort studies and case reports/series were also identified. A total of 1433 abstracts were reviewed for relevance and this was narrowed down to 22 articles. In addition, CPR guidelines of various societies were reviewed. Articles specifically related to the individual guideline were circulated to the experts. Each article was reviewed by at least two members of the Resuscitation Council.

The working group had multiple meetings in person and e-meetings/telephonic conferences. Based on all these inputs, a draft guideline including an algorithm and core links for CPR was made. The draft guideline was initially presented to the academic committee of the ISA, where representatives of other academic societies were also invited. The inputs from the different societies were discussed in detail and incorporated. The draft guideline was presented twice to experts and the inputs received incorporated in the revised draft. Thereafter, a trial workshop was conducted which was attended by anaesthesiologists and invited experts. The verbal and written feedback was sought from the participants after the workshop. A questionnaire based on the key elements of each algorithm addressing certain areas where evidence was lacking was circulated during the workshop and inputs taken. Where evidence was lacking, recommendations were made by consensus following

extensive discussion among the group members and considering the results of the questionnaire.

ADULT COMPRESSION-ONLY LIFE SUPPORT (COLS)

Core links in adult Compression-Only Life Support (COLS)

Sequential conducts of targeted core steps are essential for optimal outcome. We recommend three core links for resuscitation in adult by layperson [Figure 1]:

- Early recognition and activation
- Early chest compression
- Early transfer.

Once the rescuer recognises an unresponsive victim, he/she should call for either an ambulance or any other layperson so that the victim can be transferred for advanced medical management at the earliest. Thereafter, the rescuer should initiate chest compressions.

Steps for Adult Compression-Only Life Support (COLS)

The adult COLS is a simple, easy to remember and perform cardiac resuscitation by a minimally trained person, unable or unwilling to perform rescue breaths [Figure 2]. It is the preferred algorithmic approach by a layperson who witnesses a victim collapsing or comes across a victim who has collapsed. It can even be performed by family members who witness collapse of their near and dear ones. The method can be easily taught and training can also be imparted telephonically. Optimal outcomes with COLS can be ensured by early recognition of victim with cardiac arrest, activation of ambulance services, early application of effective chest compression and finally early transfer of the victim to the nearest hospital. COLS has a series of predefined steps which need to be followed sequentially. Although the COLS algorithm is defined as a sequential series, when more than one trained rescuer is available, the steps may be done simultaneously. The main activity of this algorithm is effective chest compression which should be performed continuously till help arrives. The division of work needs to be done in a way that the victim receives optimal care at the earliest while all steps are being followed. The steps of COLS are described in the following sections.

Safe place for resuscitation

The safety of the rescuer is paramount. In panic situations, mishaps can happen leading to injury to

rescuer, if the place is not safe for management of victim with cardiac arrest. It is essential that the rescuer looks around the site for any type of imminent danger. If it is safe, then rescuer should proceed to further steps of COLS. In case any imminent danger is perceived (such as risk of accident, fire, electrocution, drowning and riots), then the rescuer should activate the concerned authority or seek help from the available people to shift the victim to a safe place. The help of police personnel, fire brigade or lifeguard (for victim in water bodies) needs to be taken in unsafe sites by calling them and providing them all the information of the site. The resuscitation should be initiated, as soon as feasible, while this activity of information is being undertaken.

Victim's response check

Once the victim has been shifted to a safe place, the victim's response should be checked for further actions. The rescuer should come from front, facing the victim face, tap on the shoulder, speak loudly (e.g., HELLO-Are you alright?) in a language the victim could understand, to elicit the response from the victim. The victim should not be shaken nor neck movements done (like tapping on face) as it could cause further harm, in case cervical spine injury is also present. If the patient responds either by verbal response or by purposeful movement, or is breathing normally, then cardiopulmonary arrest is unlikely. Such victim needs to be monitored constantly and shifted to nearby medical facility at the earliest for further evaluation and management. If no response is elicited, the victim may be having cardiopulmonary arrest and would require further help. The emergency medical system must be activated for early transfer of the victim to nearby hospital.

Call for help, inform emergency medical system or ambulance service

If the rescuer is alone, then he should activate the emergency medical system or ambulance services himself for early transfer of the victim for definitive treatment. Since availability of mobile phone is common, it is suggested that the rescuer should call from his mobile, with speakerphone on, and continue following the steps of COLS.^[8] The rescuer should be aware of local emergency contact details. In India, till the acceptance of a uniform number for pan-India, local emergency number should be called by the rescuer. The number 108 has been proposed as the pan-India emergency contact number, and it has been accepted by many states of India.

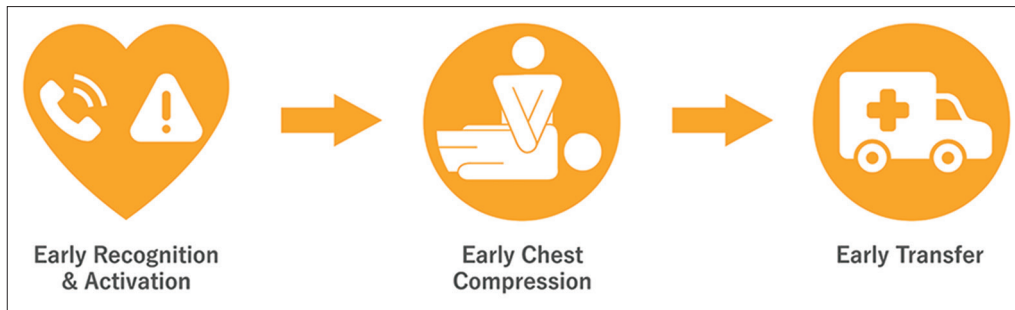


Figure 1: Core links in adult compression-only life support (COLS)

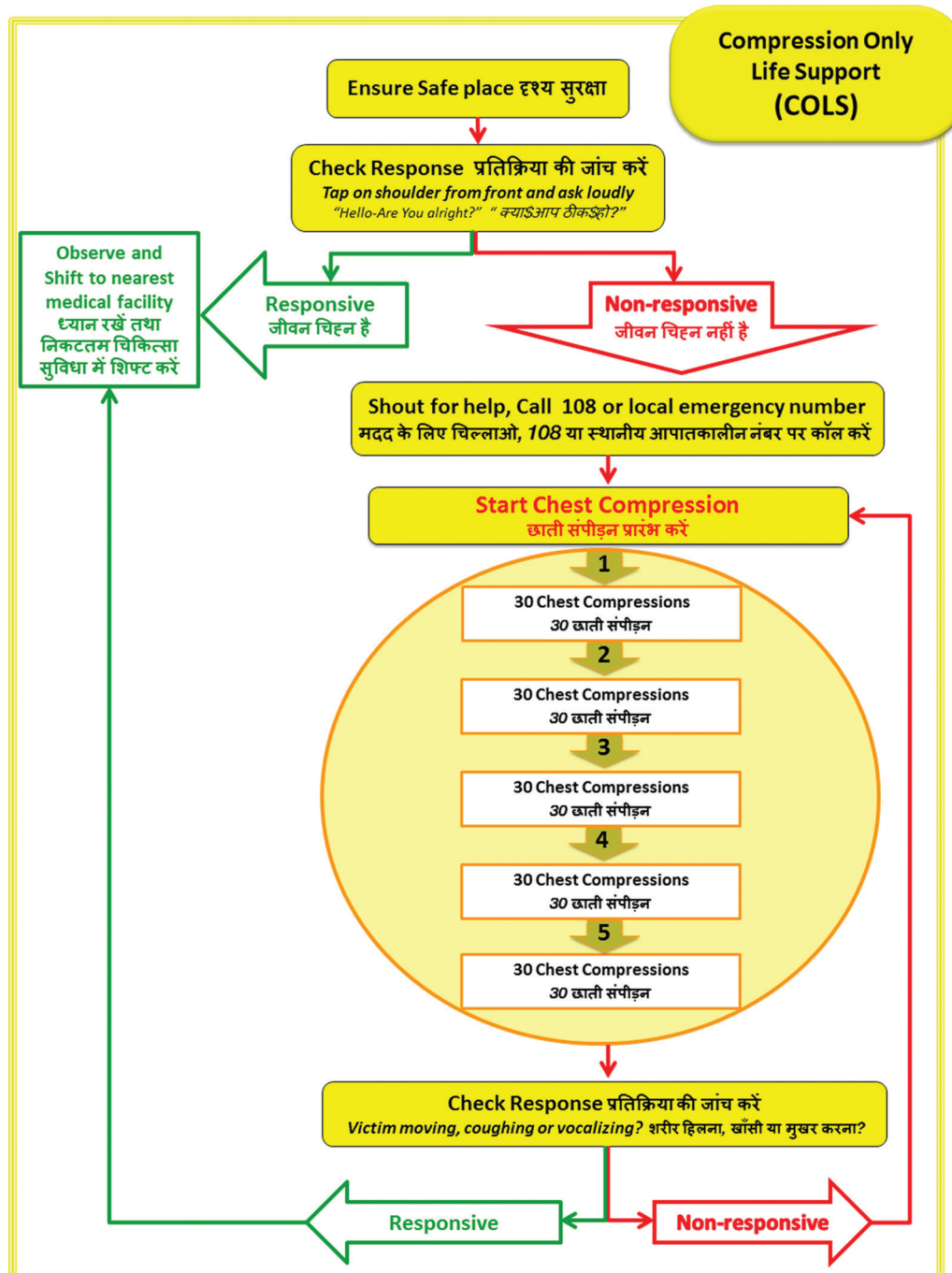


Figure 2: Compression-only life support (COLS) algorithm

Early chest compression

Once cardiac arrest is recognized, the rescuer should place the victim supine with his back over a hard flat surface or over the ground and start providing chest compression immediately. Cycles of 30 chest compressions should be initiated. This guideline suggests identification of centre of chest by identifying the xiphoid process (lowest end of breastbone) and keeping heel of the hand 2 fingers above it for chest compression.

COMPRESSION-ONLY CARDIOPULMONARY RESUSCITATION

In the traditional CPR, the sequence of resuscitation was airway, breathing and circulation (ABC), but it was recently changed to circulation, airway and breathing (CAB).^[8] Compression-only CPR is very simple and a layperson can do it.^[9-16] In fact, one need not even take a formal CPR training to understand how to perform this type of resuscitation. The rescuer should start compressions over the chest. The hands should be placed on the lower half of the sternum (centre of the chest) and compress at a regular rhythm. The effective chest compression should be started with 30 compressions in one set. The rescuer should chant the count loudly 1,2,3,.....,30 to maintain the speed and number of chest compressions. The rate of chest compressions should be 120/min and compression depth should be at least 5 cm but not more than 6 cm. The rescuer should allow complete chest recoil between compressions without lifting hands from the chest but should not lean on the victim's chest. There should be minimum interruptions during chest compressions.^[8,9]

The target group for compression-only life support

COLS apply to bystanders, who do not know CPR well, or are reluctant to perform rescue breaths.

Duration for compression-only life support

If the rescuer is alone, he/she should continue chest compression for 5 consecutive cycles (30 compressions in each) or more till there is a sign of return of spontaneous circulation (movement of any part of the body, coughing or vocalizing), the rescuer gets exhausted or medical help arrives. If there is more than one rescuer, then they should exchange hands after every 5 cycles till there is a sign of return of spontaneous circulation or medical help arrives. The aim of COLS is to provide continuous uninterrupted chest compressions to improve the survival and neurological outcome.^[10]

Lateral position of the victim after return of spontaneous circulation

If the victim is revived or there is return of spontaneous circulation, then he/she should be placed in either left or right lateral position.

Transfer of the victim for better medical help

The victim needs definitive medical care and management of the underlying aetiology of the cardiopulmonary arrest and so should be shifted to nearest health-care facility. The COLS needs to be continued till medical help arrives (ambulance service) or victim is handed over to a medical care facility or victim becomes responsive (moving, coughing or vocalizing).

DISCUSSION

Over the last few decades, many studies have evaluated the usefulness of rescue ventilation during adult CPR and raised questions for its integral part of resuscitation algorithm.^[6-16] The authors of these studies concluded that the chest compression-only CPR is either equivalent to or better than standard CPR with rescue ventilation.^[14-16] Two recent studies also favour the importance of dispatcher-assisted chest compression-only CPR, though these were statistically non-significant. One of the studies in 1941 patients with cardiac arrest found 14% increased survival to hospital discharge (1.5% absolute increased survival, $P = 0.31$) with compression-only CPR.^[6] The other study reported a 24% improved 30-day survival (1.7% absolute increased survival, $P = 0.29$) among 1276 patients with cardiac arrest given hands-only CPR.^[7]

In a primary meta-analysis, where three randomised trials' data were pooled, chest compression-only CPR was associated with improved chance of survival compared with standard CPR (14% [211/1500] vs. 12% [178/1531]; risk ratio, 1.22; 95% confidence interval [CI]: 1.01–1.46). The absolute increase in survival was 2.4% (95% CI: 0.1–4.9).^[17] This meta-analysis revealed that compression-only CPR was superior to standard bystander CPR in out-of-hospital cardiac arrest. The most plausible explanation for the high success rate associated with uninterrupted, high-quality compressions-only CPR^[13,18,19] is decreased hands-off time. Continuous uninterrupted coronary perfusion maintained possibly increases the probability of a successful outcome.^[11] In addition, with compression-only CPR, one avoids rescue

breaths during CPR, which is fairly time-consuming for layperson.^[20] These considerations could be the main reason to increase the compression: ventilation ratio for standard BLS, from 15:2 to 30:2, in the 2005 AHA resuscitation guidelines.^[20]

Moreover, the chest compression-only CPR is easier to teach, learn and perform compared to the fairly complex standard CPR algorithm. Providing high-quality chest compressions in witnessed cardiac arrest rather than to provide oxygenation and ventilation during the 1st min needs to be emphasized.^[20] However, compression-only CPR may not be effective in cardiac arrest following drowning, trauma and asphyxia. Traditional CPR may improve the survival in such a case.^[21] Similarly, in paediatric out-of-hospital cardiac arrest, where the primary cause is usually of respiratory origin, traditional CPR may be beneficial.^[22]

The AHA gave priority to chest compression over airway management and changed the sequence of resuscitation from ABC to CAB in 2010.^[8] Further, the AHA was also of the opinion that compression-only CPR is as effective as the full CPR.^[7] In fact, the AHA has tried to emphasize more on compression-only CPR to get more people to participate, if they should witness a collapsing victim.

The Australian Resuscitation Council (ARC) guidelines for CPR currently recommend that an untrained or unwilling to perform CPR rescuer should deliver continuous uninterrupted chest compressions. The ARC is of opinion that any attempt at resuscitation is better than no attempt.^[23] The Canadian Red Cross also recognizes the need of compression-only CPR. They accepted it as an acceptable alternative for those who are unwilling, unable, untrained or are no longer able to perform full CPR. Compression-only CPR is the preferred method for members of the public who witness an adult suddenly collapse.

SUMMARY

The international guidelines developed in nations with better medical infrastructure and advanced resuscitation equipment are usually followed. Despite consensus on the benefits of compression-only CPR, none of the international bodies developed an algorithm based on compression-only CPR. This could be probably because of the easy accessibility of emergency medical services and increased level of awareness among natives of these countries. India lacks an indigenously designed

guideline tailored to the limited facilities available in a large part of the country. People in India are hesitant to provide mouth-to-mouth breathing to resuscitate, especially if the victim is unknown. A large section of the Indian populace does not have access to training in CPR. Considering the limitations in emergency medical services in India and the advantages of compression-only CPR, establishing COLS as a resuscitation algorithm for layperson/bystander is the need of the hour.

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Conflicts of interest

There are no conflicts of interest.

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