Active bleeding control pilot program in India: Simulation training of the community to stop the bleed and save lives from Road Traffic Injuries


**ARTICLE INFO**

**Keywords:** Bleeding control, Simulation, Road traffic injuries, Lay first responder training

**ABSTRACT**

**Introduction:** Road Traffic Injuries (RTI) are one of the toughest public health challenges confronting India. An estimated 40% of RTI deaths are due to uncontrolled bleeding. Stopping the bleeding in the first few minutes is crucial for meaningful survival considering the delays between the RTI and definitive trauma care. Our objective was to develop and implement a lay first responder Active Bleeding Control (ABC) program to help RTI victims along two high risk corridors using simulation methodology.

**Methods:** ABC is a multi-partner collaboration pilot program with government and non-governmental agencies. Therefore, using EMS and Police geolocation data, two corridors of 50 kms of highway with high risk of RTI were identified in Medchal district (population 2.5 million) near Hyderabad city, India. In depth interviews with 22 potential lay first responders were conducted in 2019 to understand the barriers for helping RTI victims. Simulation training modules were developed using a step-by-step scenario script and a 90-min curriculum including a video. A low cost ‘stop the bleed kit’ was developed and distributed among volunteers. Data collection to capture use cases, barriers and facilitators to program success is ongoing.

**Results:** All 22 respondents reported having witnessed many life-threatening RTI in the area, and had no previous knowledge, training or skills in bleeding control. 1005 ABC volunteers have now been simulation trained to stop the bleed. Of these, 162 have self-reported helping RTI victims on the selected highway corridors. The ABC pilot program shows that by training lay first responders to assess and arrest bleeding, passive RTI bystanders can be converted into active ‘try-standers’.

**Conclusion:** The ABC program has the potential to create a much-needed community of trained citizens to help save lives from RTI in India.

1. Introduction

Road Traffic Injuries (RTI) and deaths are one of the toughest public health challenges confronting India. During 2018, India lost 151,417 lives due to RTI. Uncontrolled bleeding is the number one cause of preventable death from trauma. Exsanguination on scene and massive blood loss is estimated to account for nearly 40% of RTI trauma related deaths. For every RTI death, 10–50 more people may be estimated to be...
India had a crude death rate of 15.9 and age standardized death rate of 17.2 per 100,000 population due to RTI in 2017. As a signatory to the Brasilia declaration, India is committed to halve the fatalities by 2020. Paradoxically, there has been a rise of 2.4% deaths per year. In 2017, the years of life lost (YLLs) and years lived with disability (YLDs) for RTI in India at all ages was 14 million and 2 million respectively. Besides, the YLLs due to RTI accounted for 89.2% of the RTI disability adjusted life years (DALYs) in India, whereas this proportion was 69.5% in the Organization for Economic Cooperation and Development (OECD) countries because of better trauma care.

Trauma care is one of the under-addressed problems that India is facing, and very few victims receive treatment at the crash scene. A study in Puducherry reveals that only 21% of the injured were able to reach the trauma center within the first hour. There is no structured system of trained lay first responder care in India, leading to the loss of the precious first few minutes in trauma management. Although “free 108 ambulances” services (108 is the free emergency telephone number in several states in India) are provided in most states in India, nearly half of the injured are being taken to hospitals by untrained by-standers or relatives, by unequipped taxis or auto-rickshaws, or by bus. Besides, even though ambulances may reach the crash site in about 10 min in certain Indian cities, it can sometimes take 20–30 min, due to challenging roads, terrain, and traffic. In a study on pre-hospital pediatric trauma conducted at Hyderabad, 23% of the pediatric RTI victims died before an ambulance arrived. Lack of a trained first responder appears to be the weakest and most difficult link in the chain of trauma survival during the golden hour. It is also important to have an environment at the crash site that is conducive to a quick assessment of the injured person, and smooth activation and shifting to an ambulance. Another study in Hyderabad found that mob behavior of by-standers who may be emotionally aggravated could hamper pre-hospital care which can be detrimental to the patient.

Thind et al. mention that where no formal prehospital system exists, the first tier of care may be composed of laypersons in the community who have been taught basic first aid techniques. In India, lay responders such as auto-rickshaw drivers, shop keepers, police, bus drivers and security guards often quickly reach the crash scene, many potential lifesaving minutes before trained healthcare providers. Teaching them simple techniques like calling the ambulance, applying direct pressure and applying simple tourniquets to stop the bleeding could therefore save many lives.

To address this gap, GVK Emergency Management and Research Institute (GVK EMRI), Pediatric Simulation Training and Research Society (PediSTARS) India in collaboration with Children’s Hospital of Philadelphia (CHOP), Public Health Foundation of India (PHFI), Police and Transport Department (Government of Telangana), Road Safety Club Hyderabad, with advice from USA National Stop the Bleed Program Coordinator and former senior advisor, US Department of Health & Human Services, and Emergency Medicine (Systems Optimization) from Kingston, Canada, launched a pilot program “Active Bleeding Control” (ABC) in Medchal District, near Hyderabad, Telangana, India.

This paper describes the birth of the ABC program in 2019, through (i) the recruitment of ABC volunteers as lay first responders along selected highway corridors; and (ii) the development of a simulation curriculum and low cost kit for training them to assess and arrest bleeding, and convert passive “by-standers” to active “try-standers”.

2. Methods

This is a cross sectional study design, using qualitative methodology.
2.1. Study setting and sample-

Due to a high burden of RTI, Medchal district (Population 2.4 Million) near Hyderabad city in Telangana State (Population 35 Million) was selected for the pilot program. [Fig. 1]. Twenty-two individuals responded to in-depth interviews and 1005 volunteers were trained in the ABC program (total sample size 1027).

Selection of highway corridors for intervention: Using EMS and Police geolocation data, 2 corridors of 50 km of highway were designated as the study area. The District Transport Officer obtained RTI secondary data from the Police Department and we obtained data from GVK EMRI ‘108 Ambulance’ trauma cases. These data were analyzed to identify hotspots (RTI prone spots along highways) and blackspots (500 m stretches on highway where five RTI involving serious injuries/fatalities or ten fatalities took place during the past 3 years). The study area of 50 km includes- Corridor1- National highway 44 from Suchitra circle to Kallakal Village (25 km), and Corridor2- State highway 1 from Alwal to Thurkapally village (25 km) (Fig. 2 and 3).

2.2. Data collection

Recruitment of lay first responders as ABC volunteers along selected corridors, and understanding their perception of barriers in helping RTI victims: Using purposive sampling, 30 individuals were identified and approached for in-depth interviews (IDIs), for a better understanding of perception of barriers in helping RTI victims. Inclusion criteria was that individuals must be most likely to attend to RTI victims due to their physical proximity to the highway. All 22 people who were contacted, consented to be recruited as respondents for IDIs.

Data collection was carried out in 2019. In addition, traffic police and GVK 108 free ambulance drivers/pilots were also interviewed to understand issues with respect to crowd management during RTI.

2.3. Instruments

Interviews were carried out in the local language (Telugu), using a set of open and closed ended questions. [Supplementary material Box 1. Examples of questions used to guide interviews].

2.4. Data analysis

In-depth Interview notes were transcribed verbatim and translated into English. Open coding was done and codes were grouped into categories, and themes were identified as stipulated by Graneheim and Lundman (2004). Manual thematic analysis was done based on exploring both predetermined themes and looking for any new issues raised by the participants.

Simulation training of trainers and ABC volunteers: A total of 1005 ABC volunteers were trained. Inputs from collaborating partners and trauma experts were taken to develop the ABC kit and a 90-min simulation curriculum including a 7-minute video. Handouts describing step by step of the training, with photographs were distributed to trainers and volunteers. The ABC Core team developed a step-by-step simulated scenario script. It included calling for ambulance help; structured and
clear information that needs to be given to the ambulance dispatch center; scene safety; identifying life threatening bleeding; stopping the bleeding with pressure and tourniquet, crowd control and handing over to the ambulance crew on arrival.

2.5. Ethics-

This study was approved by the Institute Ethics Committee of the Indian Institute of Public Health Hyderabad and GVK EMRI (Approval ID: IIPHH/TRCIEC/149/2018)

3. Results

3.1. Perception of barriers in helping RTI victims

Table 1 shows the profile of the respondents of the in-depth interviews and Table 2 describes the selected themes and quotes from in-depth interviews with potential lay responders during the field visits. All 22 respondents reported having witnessed many life-threatening RTI in the area, and had no previous knowledge, skills or training in bleeding control. They were excited about the training and described the barriers for helping RTI victims and the crowd control methods they use at the crash site.

3.2. Simulation training

a) Developing a 90-min Simulation Curriculum and low cost ABC kit:

With inputs from experts, a low cost ABC kit (US $3) was developed, consisting of gauze, dressing pads, gloves, mask and a locally developed tourniquet.

A 90 min training curriculum including a 7 min video with clear instructions was created. After developing the script, rehearsals were performed by the core team after allocating roles as ‘victim’, ‘caller’='volunteer' and ‘trainer’. Roles were swapped and changes were made till a consensus was reached. Once the practice of roles reached a reasonable level of confidence among themselves, the training video was developed (Fig. 4).
Table 2
Selected themes and quotes from in-depth interviews with potential lay responders during the field visits.

<table>
<thead>
<tr>
<th>Theme, sub theme</th>
<th>Response/quotes for IDI</th>
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<tbody>
<tr>
<td>1. Witnessing RTI</td>
<td><strong>a) How often</strong>: All respondents had witnessed at least one RTI on that highway per month.</td>
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<td><strong>b) Assistance provided</strong>: Moving the victim and vehicle aside, offering water, washing the wound, using a handkerchief or cloth to tie injured area, calling the ambulance and victim’s family</td>
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<td>2. Training</td>
<td><strong>a) Previous training</strong>: No previous training, knowledge, skills</td>
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<td><strong>b) Interest in training</strong>: Curious and excited about training</td>
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<td><strong>c) Response to ABC program description</strong>: Leader. Petrol bunk staff and shop vendors agreed for placement of kits but reluctant to send their employers for training</td>
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<td><strong>d) Training site</strong>: On-site training was preferred citing time constraints and loss of wages.</td>
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<td><strong>e) Motivation for training</strong>: altruism, benefits of a quick response to RTI</td>
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<td>“We have to help each other, cannot leave a victim just like that!”</td>
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<td>“If we don’t help other human beings, there’s no meaning to life”</td>
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<td>“Someone helped me, I am grateful to him, it led me to help others. I rush to the crash site and help without any hesitation.”</td>
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<td>3. Barriers</td>
<td><strong>a) Lack of skills, confidence</strong>: “Don’t know how to stop bleeding and how to recognize severity”</td>
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<td>“We do things based on what we think helps a victim, without knowing if its right. We want to learn correct techniques”</td>
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<td>“We have no equipment. Even if we did, don’t know how to use it”</td>
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<td><strong>b) Pressure from passengers</strong>: “My auto was already full of passengers when it happened. I helped them, called the ambulance, but my passengers got impatient and asked me to start”</td>
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<td>Sometimes, they leave without paying for the trip, as I am busy helping”.</td>
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<td><strong>c) Police harassment</strong>: “When I call an ambulance, or transport a victim to the hospital, my number is noted and police call me. It’s even more problematic if the victim dies”</td>
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<td>“I had to testify in court. My job is transporting thousands of people every week, it’s not easy remembering details from severeyear ago”</td>
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<td><strong>d) Fear</strong>: Two people were unable to help because of their fear of blood</td>
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<td><strong>e) Previous bad experience</strong>: “I took a victim to the hospital 3 years ago but his relative lodged a complaint against me. The police looked at the medicolegalaccrerecord which showed that I had brought the victim, and without confirming, asked me to pay INR1500 (US $20) as compensation to the victim. I was angry and ever since, I am wary of RTI victims. I help, but with suspicion and caution.”</td>
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<tr>
<td>4. Crowd management by GVK Free 108 Ambulance Pilots, EMT technicians</td>
<td>“It is very chaotic at the crash site. People crowd and take photos, talk all the same time, asking what hospital the patient will be taken to. Some help and offer water. In rural areas, there are less helpers”.</td>
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<td>“The pilot has to be assertive, and say confidently: we are here to save lives, please let us do our work”.</td>
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<td>“It is not easy with heavy patients, night time crashes and multi casualty incidents. The EMT handles severe cases, the pilot helps with less severe ones. Police orby-standers support us if we have to extricate using a crane.”</td>
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<td>“We use PA system and announce like this: vehicle with license plate no. please move the person in red shirt, please make way.”</td>
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<td>“The police use a PA system to disperse off crowds. They are in uniform; people listen because they use sirens and wireless sets to quickly convey instructions”</td>
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<td>5. Other issues, suggestions</td>
<td>“We have to answer many questions onthe location, status of the injured, and are torn between helping victims and serving our passengers, who urge us to move on quickly”.</td>
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<td>ID cards may avoid possible issues with Police</td>
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b) 25 Train the Trainers (TtT):

Twenty-five EMT trainers from GVK EMRI were trained in the TtT in March 2019. Standardized patients and ABC video was used for the simulation training. They were also trained on how to stop the bleeding without ABC kit; using available materials such as shawl, belt and shirt.

c) Pilot training of 74 ABC Volunteers at GVK EMRI:

The 25 trainers trained 74 lay first responders (ABC volunteers) including police and auto-rickshaw drivers at GVK EMRI with supervision from the ABC core team. Training was for 90 min and volunteers had to demonstrate all the steps in bleeding control and use of the ABC kit. The Supreme Court order of Good Samaritan Law to provide legal immunity to helpers of RTI victims was emphasized during the training. Immediate feedback was also obtained from trainers and ABC Volunteers during pilot training, to refine the technique and modify the field training accordingly (Table 3).

d) Field Training of 931 Volunteers at their work place:

As it was challenging for the volunteers to come to GVK EMRI campus for training, 47 trainings were conducted (20 attendees per training) at the work place of volunteers (total 931 people trained at their workplace). All volunteers were provided with ABC kit and the handout with step by step description of ABC in English and Telugu.

e) Motivating the community:

Trainers with previous experience in EMT training were recruited as field workers to motivate the public along the 2 corridors. Newspaper, television and radio was used to sensitize the public. Social media (WhatsApp) group was created to motivate the volunteers regularly to help RTI victims. Every month, a ‘best volunteer’ is selected, recognized and rewarded in the community for saving lives. (Supplementary material III)

Hospital data on patient outcomes after receiving pre-hospital care from ABC volunteers is ongoing, along with feedback from ABC volunteers on challenges faced while helping RTI victims. Regular field visits for refresher training is also underway. Until now, 162 RTI victims have been helped by the ABC volunteers in various road crashes along the 2 intervention corridors selected, and relevant data is being analyzed.

4. Discussion

The ABC pilot program has recruited and trained 1005 lay first responders from the community and created locally acceptable simulation curriculum and a low-cost (38) kit. This was after taking in-depth feedback on barriers, lack of knowledge and skills in bleeding control from the lay public who were eager to be trained along the two selected highway corridors. It has engaged the community and created a cadre of 1005 volunteers “try-standers” with equipment, curriculum and support to help stop the bleed for RTI victims. Local instructors “own” the program, contextualized to local language and culture.

The key aspect of the ABC program was also to develop an efficient, cost effective ‘ABC stop the bleed kit’. It was to be locally developed, with inputs from trauma experts, to ensure affordability, sustainability and scaling up, and the cost of US $3 is testimony to this. Similarly, this program developed the training curriculum with iterative steps while shooting the video, and after thoroughly noting feedback from trainers as well as EMTs.

According to WHO, many fatal injuries may be prevented or their severity reduced by adequate prehospital trauma care. Without prompt prehospital care, many people who might otherwise survive their injuries may die at the scene or en route to the hospital. WHO estimates that nearly 2 million lives could be saved every year if timely emergency
Care given in low-income group countries matches the care given to injury victims in high-resource countries. The cost-effectiveness estimates of Kobusingye and others show that in a population of 1 million, a system of trained laypersons and paramedics is highly cost-effective at US$170 to avert one death.

Data collection on patient outcomes and impact of training is ongoing. It may be too early to fully assess the impact of the ABC program, but initial findings are encouraging. Until now, 162 RTI victims have been helped by the ABC volunteers and it shows that even in countries with limited resources, by-standers can be trained and motivated to stop life-threatening bleed.

Public education and reinforcement of the behavior to celebrate and normalize it is essential for success. We are therefore continuing to equip, retrain, motivate by-standers, akin to the “You are the help until help arrives”.

Empowering the community will have the additional benefit of helping them identify and address hazardous conditions in their local environment. We hope that trained volunteers will contribute to community preparedness and resilience by enhancing the community’s capacity to arrest bleeding even during mass-casualty events.

Study limitations- This study is limited to two corridors of 50 km of highway in one district in Telangana State, with limitations in generalizability. We have limited data on RTI victims who are not assisted by the ABC program, and their hospital outcomes. Even with the involvement of Transport department, there were delays in getting data on hotspots. Strengths of the study- The collaboration is strong, with multiple agencies and role clarity, and funding has been secured for all 3 phases of the program. This pilot program demonstrates a workable model of training lay first responders in a high RTI area of India.

Future directions- The recruitment of volunteers/by-standers is initially along the length of the two selected corridors, and is planned to be extended radially. Based on these study results, it will be useful for future studies to understand barriers faced by trained volunteers in bleeding control on RTI victims and collect outcome measures on effectiveness of such trainings.

5. Conclusion

The ABC pilot program has shown that it is possible to create low-cost training and stop the bleed kit for the lay public and local community. Early results of the pilot training to 1005 volunteers are encouraging, with 162 of them helping RTI victims on the selected highway corridors. This is one of the first collaborative initiatives to use simulation training in a low-resource setting like India to reduce mortality and morbidity from RTI. Data collection to capture use cases, barriers and facilitators to program success is ongoing. By training lay first responders to assess and arrest bleeding, we can convert passive RTI “by-standers” to active “try-standers”.

<table>
<thead>
<tr>
<th>Theme</th>
<th>Feedback from trainers</th>
<th>Feedback from ABC Volunteers</th>
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<tr>
<td>Training, technique related</td>
<td>It was a challenge to keep to time and complete all parts of the training/ practise key messages, without rushing.</td>
<td>“What to do in case of multiple bleeding points in same patient, if it is there is nose bleed/head injury”</td>
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<td>“Should they cut clothes, should scissors be part of the kit?”</td>
<td>“How to do bleeding control for an unconscious patient; use of pressure points; presence of open fracture; benefits to limb elevation”</td>
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<td>Suggestion for field training</td>
<td>“It is best to use the video whenever possible, with three steps-Play the full video once, then pause, practise, and put it all together”.</td>
<td>“Can a volunteer use help from other by-standers, it is not seen in the video”</td>
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<td>WhatsApp video; Flip-charts; programer; mobile phone, laptop, Photo slide show, mock injury can be used.</td>
<td>“How to stop bleed if the patient is being taken to hospital in a private vehicle”</td>
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<td>Mixing of groups during training, hesitation helping women</td>
<td>“Should we mix the groups- male/female, and occupations? It is difficult to do so in a community setting, it may be possible only in college settings”.</td>
<td>Cultural issues in bleeding control were apparent: “We hesitate to attend on female victims- they may misunderstand us”</td>
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<td>“How much of the injured part should we expose especially in women?”</td>
<td>“How much of the injured part should we expose especially in women?”</td>
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<td>Other issues-Worry about causing harm</td>
<td>“Attending to extreme ages, or injured pregnant woman is difficult”</td>
<td>We worry about causing harm and fractures”</td>
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<tr>
<td></td>
<td>“If ambulance doesn’t come for an hour, how long do we wait?”</td>
<td>“If ambulance doesn’t come for an hour, how long do we wait?”</td>
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</table>
Acknowledgements

We acknowledge International Network for Simulation-based Pediatric Innovation, Research, & Education (INSPIRE) for the valuable inputs in conducting the program; GVK EMRI- Aruna Gimkala, Ajender, Ravinder Odela: senior EMT trainers for data collection and training; Children’s Hospital of Philadelphia, University of Pennsylvania Institute for Advanced Study of India (UPIASI)- Tishya Sethi; World point- John Amanto for help with funding; and Cyberabad Commissionerate of Police, Hyderabad, India, for providing injury data and support given to the train traffic police.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.cegh.2021.100729.

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