

# A Study of First Aid Knowledge Acquired by Pre-Hospital Trauma Technician Trainees in a Tertiary Care Hospital: A Retrospective Observational Study

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## Abstract

**Aim:** Pre-hospital trauma students first aid skills assessment at various stages of training. **Design:** Retrospective observational study. **Material and Methods:** In our study, First Aid skills and knowledge were assessed of five batches of Pre-hospital Trauma Technicians. From each batch twenty students were pre-tested for knowledge in Basic Life Support Skills (BLSS) work shop. These Pre-hospital trauma technician students were from science stream, high school Pass out, who were selected on the basis of merit and counseling, the consent of students was obtained after an explanation of nature and purpose of study. These students were assessed as follows: (1) As fresher during ten days orientation program. (2) As pre-hospital trauma students (8-month completion) (3) As Pre-hospital Trauma technician interns, posted at PGIMER, Dr RML Hospital, New Delhi and its ambulances (11 month). **Statistical Analysis:** Quantitative variables were compared using Kruskal Wallis and Mann Whitney test was used for comparison between two groups. Jonckheere-Terpstra Test was used for comparison across various time periods. A p value of <0.05 was considered statistically significant. **Results:** In our study, statistically significant improvement in performance was seen after 8 months and again statistically significant improvement was seen at 11 months completion of Pre-hospital Trauma Technician training Program. **Conclusions and Recommendation:** Our Study shows that teaching along with practical work enhances first aid skills and performance. Repeated teaching and learning by doing practical work enhances performance. Practising lifesaving skills periodically is significant for good performance outcome.

**Keywords:** Golden Hour; First Aid; Accountability; Questionnaire.

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## Introduction

According to WHO "Global Status Report on Road Safety 2013" more than 1.2 million people die in road accidents every year and as many as 50 million are injured [1].

Systematic and integrated approach adopted towards management of trauma cases can prevent deaths and disabilities due to road accidents to a large extent. Extending appropriate care during the period between injury and initial stabilization of

the patient is the most critical period for patient's survival. Quick first aid, rapid transportation of the victim and initiation of treatment within golden hour [2] by a trained person are pre-requisites of trauma care management.

The Pre-hospital trauma technician is an integral part of trauma systems and among the first responders for trauma victims. The Pre-hospital trauma technicians are the first responders in emergency and accident situations and are required to undertake the following:

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- Assess the extent of injury
- Stabilise the patient
- Strive to transfer the patient to the nearest trauma care facility within the golden hour [2]

This is a course meant to have qualified pre-trauma technicians to be employed for BLS/ACLS ambulances placed across the highways of entire country, this programme was initiated by Director General Health Services of India [3]. These technicians undergo 9 months of training followed by 3 months of internship in tertiary care hospital and in BLS/ACLS ambulance.

Interactive classroom teachings followed using following teaching aids:

- CPR mannikin
- Intubation mannikin
- IV-line mannikin
- Airway management equipments
- Splints, cervical collar, spinal boards, tourniquets, catheter, chest tubes
- Audio-visual presentations of various trauma cases
- Ambulance posting- BLS, ACLS
- Ambu bag
- Respiratory aids
- Models for practical training

They are qualified paramedics to impart first aid and transfer people from site of accident to nearest trauma centre. The prompt and proper provision of emergency care and rapid transport of injured victim from the scene of injury to a health care facility can save lives, reduce the incidence of short-term disability and dramatically improve long-term outcome.

## Materials and Methods

In our study, we assessed knowledge of First Aid skills of five batches of Pre-hospital Trauma Technicians over a period of five years (2014-2018). From each batch twenty students were pre-tested for knowledge in a Basic Life Skills workshop. These Pre-hospital trauma technician students were science stream, high school pass outs who were selected on the basis of merit and counselling. The consent of students was obtained after an explanation of nature and purpose of study. These students were assessed by standardized questionnaire as follows:

1. As fresh students during ten days orientation program of the course (Group A).

2. As pre-hospital trauma students at 8-month completion (Group B).
3. As Pre-hospital Trauma technician interns at 11months (Group C).

The same instructor trained all groups, to overcome intra observer bias. The instructor had relevant qualification for training Basic lifesaving skills Knowledge and skills of participants were tested before the educational intervention. Fresher's did not have previous knowledge of Basic Life Support whereas the other groups had knowledge of Basic Life support. Check for Scene safety, check for response, call for help, check for Circulation, Airway and breathing within 10 seconds, check for effective chest compressions on manikins with minimal interruption and application of AED after its arrival were taught to them. Assessment was done through a standard questionnaire [4] with ten multiple choice questions with four options each. Each question carried one mark with maximum score of ten and minimum of zero. Same questionnaire was used for assessment at the above the above said time interval.

### Standard Questionnaire

1. In general, a splint should be....
  - a. Loose, so that the victim can still move the injured limb.
  - b. Snug, but not so tight that it slows circulation.
  - c. Tied with cravats over the injured area.
  - d. None of the above.
2. A victim has lost a lot of blood through a deep cut in his leg. He is breathing fast and seems pale and restless. He is probably....
  - a. Having a stroke.
  - b. Having a heart attack.
  - c. In shock.
  - d. Choking.
3. What would you do when caring for a seizure victim?
  - a. Remove nearby objects which might cause injury.
  - b. Place small objects such as rolled up piece of cloth between victims teeth.
  - c. Try to hold person still.
  - d. All of the above.
4. You should suspect that a victim has head and spine injuries for-
  - a. An accident involving a lightning strike.

- b. A person found unconscious for unknown reasons.
  - c. A fall from height greater than victim's height.
  - d. All of the above.
5. A victim has a large piece of glass sticking out of her leg. You should?
- a. Leave the glass in her leg and control the bleeding.
  - b. Call local emergency phone number.
  - c. Remove the glass and control the bleeding.
  - d. Both a and b.
6. What would be your first concern at the scene where a person has been seriously burned?
- a. Check for scene safety first.
  - b. Check victims breathing and pulse.
  - c. Call local emergency phone number.
  - d. Cooling the burned area.
7. How can you reduce the risk of disease transmission when caring for open, bleeding wounds?
- a. Wash your hands immediately after giving care.
  - b. Avoid direct contact with blood.
  - c. Use protective barriers such as gloves or plastic wrap.
  - d. All of the above.
8. Where is the carotid artery located?
- a. Inside the wrist just above the hand.
  - b. On the neck to the right or left side of the windpipe.
  - c. Behind the knee cap.
  - d. Inside the arm between the elbow and shoulder.
9. For an infant who is choking, you would perform....
- a. The Heimlich maneuver.
  - b. CPR
  - c. Back blows and chest thrusts.
  - d. Hold the infant upside down and strike between the shoulder blades
10. You approach a victim that is unconscious and wearing a medical alert tag indicating a diabetic condition. You would:
- a. Begin Rescue Breathing
  - b. Begin CPR
  - c. Administer the victim's insulin

- d. Check victim for breathing & pulse

**Answers:** 1(b); 2(c); 3 (a); 4 (d); 5(d) ;6(a); 7(d); 8(b); 9(c); 10(d).

*Type of Study:* Retrospective Observational study.

### **Statistical Analysis**

#### *Sample Size*

In the absence of previous study, Cohen's effect size is used to calculate sample size of one sample with a continuous outcome variable. To detect medium scale ES (.65) for difference in marks with respect to time, the minimum required sample size with 80% power of study and two-sided alpha of 5% was 19 patients per group. So sample size taken is 300 (20 per group for each year). Formula used

$$n \geq (2 * (Z_{\alpha} + Z_{\beta})^2) / (ES)^2$$

Where  $Z_{\alpha}$  is value of Z at two-sided alpha error of 5% and  $Z_{\beta}$  is value of Z at power of 80% and ES is effect size.

#### *Analysis*

Continuous variables were presented as mean  $\pm$  SD and median. Normality of data was tested by Kolmogorov-Smirnov test. If the normality was rejected then non-parametric test was used. Quantitative variables were compared using Kruskal Wallis test (as the data sets were not normally distributed) between three groups and Mann Whitney test was used for comparison between two groups. Jonckheere-Terpstra Test was used for comparison across various time period. A p value of <0.05 will be considered statistically significant. The data will be entered in MS EXCEL spreadsheet and analysis will be done using Statistical Package for Social Sciences (SPSS) version 21.0.

### **Results**

Comparison of data shows (Table 1) average marks increased from 2.7 $\pm$ 0.98 (group A) to 6.35 $\pm$ 1.18 (group B) to 9.1 $\pm$ 0.64 (group C) in 2014 with significant p value of <0.0001.

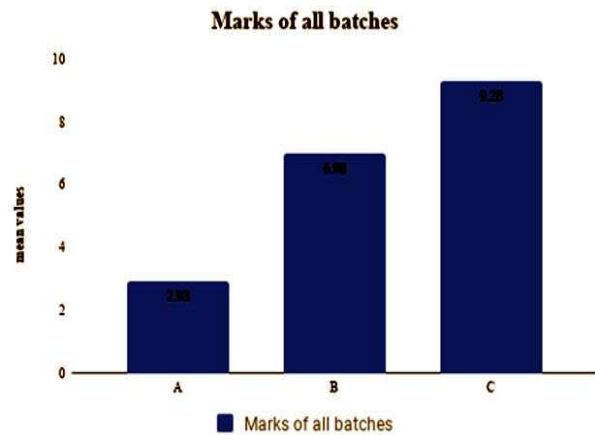
Similarly average marks increased from 2.9 $\pm$ 0.97 (group A) to 6.75 $\pm$ 1.65 (group B) to 9.15 $\pm$ 0.88 (group C), 2.9 $\pm$ 0.97 (group A) to 7.25 $\pm$ 1.55 (group B) to 9.5 $\pm$ 0.69 (group C), 3.25 $\pm$ 0.91 (group A) to 7.3 $\pm$ 1.53 (group B) to 9.15 $\pm$ 0.88 (group C), 2.9 $\pm$ 0.97 (group A) to 7.25 $\pm$ 1.55 (group B) to 9.5 $\pm$ 0.69 (group C) in

2015, 2016, 2017, 2018 respectively with significant p values <0.0001.

Pre-hospital Trauma Students (Group A), Basic lifesaving skills were found much below the desired optimum skills. The Knowledge in Group B is significantly increased, and furthermore in Group C. This reflects that both learning and knowledge retention is possible by repeated and structured learning strategies.

### Discussion

Retention of Knowledge is a long-term problem in medical sciences. Studies suggest that approximately two-third to three-fourth of knowledge is retained after one year, with a further



Graph 1: Showing comparison of average marks of all batches

Table 1: Showing comparison of marks across different groups

	A	B	C	P value	A vs B	A vs C	B vs C
<b>(I) 2014 Batch</b>				<.0001	<.0001	<.0001	<.0001
Sample size	20	20	20				
Mean ± Stdev	2.7 ± 0.98	6.35 ± 1.18	9.1 ± 0.64				
Median	3	6	9				
Min-Max	1-4	5-8	8-10				
Inter quartile Range	2 - 3	5 - 7.500	9 - 9.500				
<b>(II) 2015 Batch</b>				<.0001	<.0001	<.0001	<.0001
Sample size	20	20	20				
Mean ± Stdev	2.9 ± 0.97	6.75 ± 1.65	9.15 ± 0.88				
Median	3	6	9				
Min-Max	1-4	5-9	7-10				
Inter quartile Range	2 - 4	5 - 8	9 - 10				
<b>(III) 2016 Batch</b>				<.0001	<.0001	<.0001	<.0001
Sample size	20	20	20				
Mean ± Stdev	2.9 ± 0.97	7.25 ± 1.55	9.5 ± 0.69				
Median	3	8	10				
Min-Max	1-4	4-9	8-10				
Inter quartile Range	2 - 4	6 - 8	9 - 10				
<b>(IV) 2017 Batch</b>				<.0001	<.0001	<.0001	0.0001
Sample size	20	20	20				
Mean ± Stdev	3.25 ± 0.91	7.3 ± 1.53	9.15 ± 0.88				
Median	3	8	9				
Min-Max	1-5	4-9	7-10				
Inter quartile Range	3 - 4	6 - 8.500	9 - 10				
<b>(V) 2018 Batch</b>				<.0001	<.0001	<.0001	<.0001
Sample size	20	20	20				
Mean ± Stdev	2.9 ± 0.97	7.25 ± 1.55	9.5 ± 0.69				
Median	3	8	10				
Min-Max	1-4	4-9	8-10				
Inter quartile Range	2 - 4	6 - 8	9 - 10				

Combined average marks for all the years can be seen in table 2 and graph 1

Table 2: Showing combined average marks for all years

	A	B	C
Marks of all batches	2.93	6.98	9.28

decrease to slightly below fifty percent in the next year [5].

Human memory is imperfect; thus, periodic review is required for the long-term preservation of knowledge and skills. Forgetting is influenced by the temporal distribution of study. For more than a century, psychologists have noted that temporally spaced practice leads to more robust and durable learning than massed practice. Teachers commonly introduce material in sections and evaluate students at the completion of each section [6].

A prerequisite for achieving optimum lifesaving skills is lifelong learning so that own practice performance will improve. Continuous medical education is essential for retaining and updating knowledge [7].

Interactive and clinical based learning is the most effective form of learning. All medical professionals should devise strategy to deliver life skills effectively. Assessment of knowledge periodically through workshop and conferences is also essential. Accountability [8] is necessary to deliver high standard of care of patient.

A self-regulated profession holds its members accountable to the public it serves for the continuous development of the competencies they profess to hold. A central component of competence is professionalism, which requires lifelong learning that leads to improved performance in practice. Any profession accomplishes accountability by providing its members periodic measurement of performance using reliable and valid instruments and judging performance against evidence-based standards, providing graduate and continuing medical education (CME) programs that advance members knowledge and skills to meet these standards, and publicly certifying those who do so. [9,10] Educational institutes can provide the opportunity for lifelong learning by including the programme of continuing medical education (CME) [11].

Self-assessment, as used in CME, could more accurately be called "guided self-audit," which refers to the activities physicians personally perform to assess their level of competence. Self-audit is an active process of looking systematically at the product of the physician's work (as in chart reviews) or clinical judgments (as in answering multiple choice questions) in contrast to the potentially more passive process of self-rating performance on a clinical examination or solution of a clinical problem. This latter process involves

guesswork rather than the analysis of data.

Uncovering a gap in knowledge or in clinical performance motivates self-directed professionals to take action to correct it. When the gap is discovered through self-assessment or self-audit, it seems to have more impact than one exposed by someone else. The American Board of Internal Medicine's initial experience with physicians completing a practice improvement module, which includes self-audit of medical records to calculate quality of care measures. When physicians received their results in structured feedback, they saw and felt the gap in their performance compared with their impression that they were doing much better. Because physicians personally collected the data for measurement, they saw the gaps in performance for individual patients and the structured feedback for the sample was powerful and credible [12].

Integrated education is crucial to meet the conditions for efficient and effective continuing education [12]. In our study we imparted both theory and hands on skill training to our students.

Pre-hospital Trauma Students (Group A), Basic lifesaving skills were found much below the desired optimum skills. This reflects that Pre-Hospital care in developing world is at nascent stages. The knowledge of first aid skills is lacking in high school pass out children. The result of the study shows that fresher's who were high school pass out were deficient in life saving skills so basic lifesaving skills should be made compulsory for all students as a part of School Curriculum.

The Knowledge in Group B is significantly increased, and furthermore in Group C. This reflects that both learning and knowledge retention is possible by repeated and structured learning strategies.

Currently, there is lack of central body, which can govern paramedic education in developing countries. Awareness of Pre-hospital care and first aid skills in common public is negligible [13].

First responder in a pre-hospital scenario could be a nonprofessional or paramedic. Therefore, it is essential that common public be trained in basic lifesaving and first aid skills.

Patient care in a pre-hospital casualty is challenging in terms of equipment, resources and work force. Improvement of Pre-hospital care is essential for preventing deaths in first golden hour of disease or injury.

## Conclusion

Our Study shows that learning first aid skills can enhance performance. Learning of knowledge and retaining it are both important for optimum performance. Practising Lifesaving skills periodically is significant for good performance outcomes. In Pre-hospital Scenario public knowledge in life saving skills is essential to manage victims of trauma and injury. First Aid training should be compulsorily included in Schools and colleges. Public should be thought about the Good Samaritan act, and have willingness to help fellow citizens. Setting up a Paramedical Council is of paramount importance to set accountability of Pre-hospital Trauma Technicians in the developing world. Also, it is essential to for Pre-hospital trauma technicians to undergo certifications exams and Licenses and continuous medical education and keep their knowledge up to date.

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