

# A Study on the Utilization and Effectiveness of Primary Emergency Care (PEC) Training in Nepal

Conducted by National Health Training Centre and Nick Simons Institute





# Executive Summary

National Health Training Centre (NHTC) and Nick Simons Institute (NSI) designed a six-day comprehensive package called Primary Emergency Care (PEC) Training curriculum for Emergency Department Care providers which was piloted in 2019. The package consists of five modules: a) Basic Life Support, b) Common Medical Emergencies, c) Primary Trauma Care, d) Mass Casualty Management, e) Common Orthopedic Emergencies. This training package is designed to prepare competent emergency service providers that build confidence to deal with all kinds of emergency cases and ultimately boost the quality of care of hospitals. From 2019 till January 2023, 15 batches of training have been completed, graduating 295 health workers. However, the utilization and effectiveness of the PEC training in Nepal need to have evidence as no formal study has been conducted since the pilot training in 2019. This study was conducted to evaluate the effectiveness of the PEC training in improving graduates' knowledge and skills in managing medical emergencies and determine the outcome on organizational service utilization.

The Kirkpatrick Model which is a widely used comprehensive framework for evaluating the effectiveness of training is used in this study. This model consists of four levels: Reaction, Learning, Behavior and Results. This model helps diagnose problems in every stage of training cycle. Retrospective data for reaction and learning phase of the Kirkpatrick model was used to find the learning environment and learning transfer during training sessions. Graduates' knowledge and skills and stakeholders' views are incorporated to find the effectiveness, facilitating, and hindering factors associated with PEC training. Eleven hospitals and 48 PEC graduates were sampled for data collection.

This report examines results in each level (Reaction, Learning, Behavior and Result) of Kirkpatrick model.

**Reaction:** Participants' reactions were assessed through evaluation forms submitted by participants and the training completion report prepared by PEC trainers after completion of each training batch. The reaction towards PEC training was well received by the graduates. The training was perceived to be highly relevant to the work of those providing emergency service, use of effective teaching methods and well managed and organized training programs. There were few feedbacks regarding time allocation for some sessions and practical exposure for some sessions at real hospital setting.

**Learning:** Pretest and posttest assessment scores were analyzed to observe the learning phase of the model.

The mean pretest score was  $52.72 \pm 19.16$  while the mean post-test score was  $88.57 \pm 6.352$ . The mean knowledge of the participants was found to be increased by  $35.85 \pm 17.32$  ( $p < 0.05$ ).

**Behavior:** The survey consisted of questions concerning knowledge related to different medical situations and the appropriate emergency actions to take in each case. Out of the maximum score of 20, the average score of all participants was  $16.18 \pm 2.27$ . The participants scoring below mean was 16 (33.3%) and those having mean and above was 32 (66.7%). The mean difference of knowledge among the cadre of participants was found to be significant at  $p < 0.05$ . Similarly, skills were assessed under four major topics: Basic life saving (BLS), Basic airways, LPA slab application and case on Dyspnea. The mean score for BLS (18 topic) was  $49.04 \pm 3.66$ , Basic airway was (12 topic) was  $32.52 \pm 2.64$ , LPA slab application (15 topic) was  $41.52 \pm 3.27$  and case on Dyspnea (20 topic) was  $54.08 \pm 3.24$ .

**Result:** The enabling environment maintained at the hospital to utilize PEC training skills were observed. The assessment of the influence of the training among the graduates. Assessment was done on the availability of physical facilities, equipment and medicines required for the provision of emergency services. A majority of facilities exhibited promising availability of essential equipment, with a strong emphasis on life-saving tools like ECG machines, AED or defibrillators, and oxygen delivery devices. Facilities generally had well-defined disaster preparedness plans, resuscitation areas, and triage systems in place. However, challenges were identified in the availability of certain basic pharmaceuticals, oral medications like aspirin and atorvastatin, and certain medical supplies like Nasopharyngeal Airway and Laryngeal Mask Airways.

The PEC training was found effective not only in terms of strengthening the ER team by transferring of knowledge and skills to non-attendees in the ER team during case handling but also through interaction sessions which assisted in assuring uninterrupted availability of those services. This study provides evidence that PEC training works when there are adequate human resources and sufficient supplies are in place. Without these challenges, the impact would perhaps have been even greater. This training has contributed not only in instilling motivation and confidence among HWs in managing emergency cases but also emphasized the necessity for ongoing monitoring, evaluation, and follow-up, including refresher training at regular intervals.

# Acknowledgements

We extend our heartfelt gratitude to all individuals and institutions whose invaluable contributions made this Primary Emergency Care (PEC) Training evaluation possible.

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Thank you all for your invaluable contributions and unwavering support.

Sincerely,  
Authors

## Abbreviations

ABCDE	Airway, Breathing, Circulation, Disability, and Exposure
AED	Automated External Defibrillator
APF	Armed Police Force
BLS	Basic Life Support
CPR	Cardiopulmonary Resuscitation
ECG	Electrocardiogram
FGD	Focused Group Discussion
HP	Health Post
IDI	Indepth Interview
KII	Key Informant Interview
LMA	Laryngeal Mask Airways
LMIC	Low-Middle-Income Countries
MDGP	MD in General Practice
MeSu	Medical Superintendent
MO	Medical Officer
NHTC	National Health Training Centre
NPA	Nasopharyngeal Airway
NSI	Nick Simons Institute
PEC	Primary Emergency Care
PHCC	Primary Health Care Center
SOP	Scope of Work

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# Introduction

## Background and Context

Prompt attention to patients experiencing an acute injury or illness that poses an immediate risk to their life or long-term health is crucial (1). Effective Emergency Care can improve health outcomes in terms of mortality and disability reduction (2). It is important to quickly identify the condition and manage it to prevent disability and save the patient's life. The widely accepted approach, the ABCDE (Airway, Breathing, Circulation, Disability, and Exposure) is applicable in emergency medicine for promptly assessing and treating patients who are critically ill(3). Despite the crucial role of emergency care, it is often neglected in Low-Middle-Income Countries (LMIC)(4). Nearly 88 percent of injury-related deaths occurred in developing countries (5). The literature on emergency care in LMICs indicate high patient flow and mortality particularly in sub-Saharan Africa, where a substantial proportion of all deaths may occur in emergency departments (4)-(6). Studies report Road traffic accidents as the major shareholder while falls, burns, poisoning, occupational, and animal-related injuries are other frequent causes of trauma reporting to emergency department in Nepal having serious economic and social costs for families and societies. The most commonly injuries occurred at home environment, streets, and work environment(7). The training of emergency care providers on primary trauma care improve knowledge, skill, confidence among the providers as well as improves the patient outcomes(1),8).

To provide the best possible care to patients, it is crucial to have trained medical teams with updated knowledge, effective communication, and proper procedural skills. It is equally important to assess necessary equipment and medications, and a well-organized system of practice. Primary healthcare providers struggle with providing emergency care due to the diverse range of problems and the infrequency of encountering certain conditions (1). This makes it challenging to stay updated and competent in emergency medicine. There are many international guidelines but cannot be implemented in our settings. Various Emergency Department based trainings were being conducted in silos. Primary Emergency Care (PEC) Training was designed to equip healthcare providers with

the necessary skills and knowledge to manage and stabilize emergency cases in resource limited settings (9).

In Nepal, where access to healthcare is limited in some hospitals and overcrowded in many other hospitals, PEC training program is an essential component in providing quality healthcare to individuals in need. National Health Training Centre (NHTC), under the Ministry of Health and Population responsible for designing and managing all the training programs and Nick Simons Institute (NSI) a local non-government organization, designed a six-day comprehensive package called Primary Emergency Care (PEC) Training curriculum for Emergency Department Care providers which was piloted in 2019. The package consists of five modules: a) Basic Life Support, b) Common Medical Emergencies, c) Primary Trauma Care, d) Mass Casualty Management, e) Common Orthopedic Emergencies. This training package is designed to prepare competent emergency service providers that build confidence to deal with all kinds of emergency cases and ultimately boost the quality of care of hospitals.

From 2019 till January 2023, 15 batches of training have been completed, graduating 295 health workers. These graduates are working in different health facilities all over Nepal(9). However, the utilization and effectiveness of the PEC training program in Nepal need to have evidence as no formal study has been conducted since the pilot training in 2019. Therefore, a study on the utilization and effectiveness of the PEC Training program in Nepal is crucial to evaluate its impact on healthcare providers' knowledge and skills, patient outcomes, and the overall healthcare system.

The findings from this study can guide policymakers, healthcare providers, and stakeholders in making informed decisions regarding the implementation and improvement of PEC training programs in Nepal and similar other resource-limited settings.



## Objectives and Scope

### General

This study aims to evaluate the effectiveness of the PEC training program in improving graduates' knowledge and skills in managing medical emergencies and determine the outcome on organizational service utilization.

### Specific

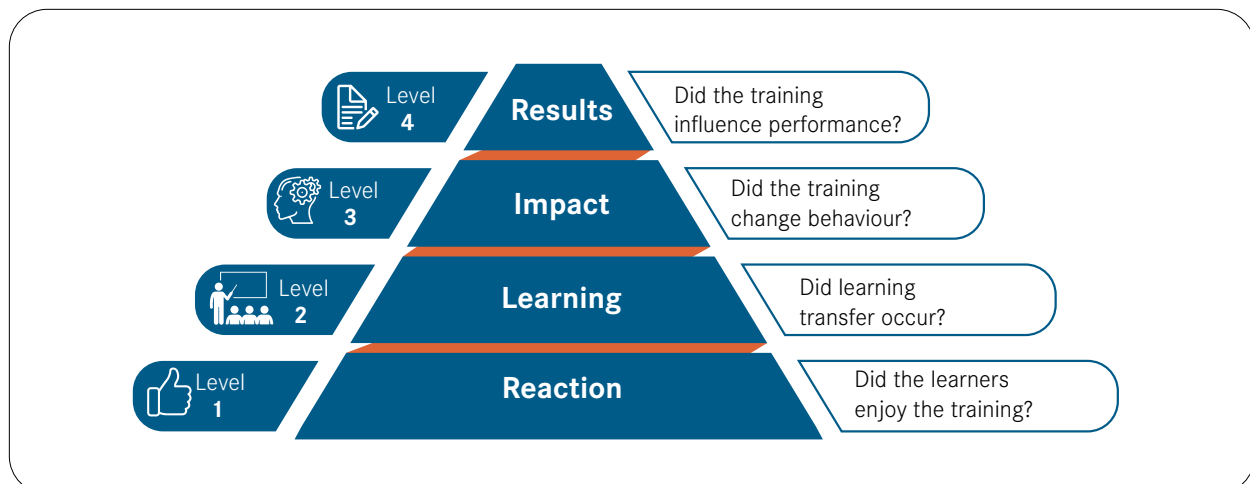
- To identify areas of strength and areas of improvements in PEC training program approach (Level 1: Reaction)
- To evaluate the effectiveness of the PEC training program in improving trainees' knowledge in managing medical emergencies (Level 2: Learning)
- To assess the impact of the PEC training program on trainees' clinical decision-making and their ability to apply learned knowledge and skills in clinical settings (Level 3: Behavior)
- To determine the extent to which the PEC training program improves Organizational change (Level 4: Results).
- To explore the hindering and facilitating factors for PEC graduates to provide training related services.

## Conceptual Framework

A conceptual framework was developed for this study using the Kirkpatrick model. The Kirkpatrick Model is a widely used framework for evaluating the effectiveness of training programs which was created by Donald Kirkpatrick in the late 1950s and consists of four levels: Reaction, Learning, Behavior and Results. Each level builds upon the previous one, providing more meaningful information about the effectiveness of the training program. The first level includes the outcomes regarding graduates' reactions to training approaches and their satisfaction level, while the second level includes assessment of their performance and acquisition of knowledge carried out at the end of training. The outcomes for the first and second levels are for short-term changes. The third level consists of outcomes for the transfer of behavioral change to the actual clinical field brought about by the training approach. Outcomes for the fourth level includes changes in organizational outcomes. The fourth level assesses whether the PEC graduates transferred the acquired knowledge and experience to the clinical setting and has improved the outcomes achieved in patient care. In this study, we used this model to describe the Primary Emergency Care Training package, its effectiveness and utilization of knowledge and skills by PEC graduates.

## Hypothesis

PEC training is an effective training package as the graduates demonstrate an improvement in their knowledge and skills with greater confidence in managing medical emergencies resulting better patient outcomes.





# Methodology

## Study Design

This is a descriptive mixed method study using quantitative and qualitative research design. Using the qualitative approach, this study explores the effectiveness of PEC training packages from a PEC trained and non-PEC trained perspective working in the emergency department. Reaction of the graduates during training period was also explored using retrospective data. Quantitative study design was used to explore the learning during training period using retrospective data and physically observing the knowledge and skill of the PEC graduates and the enabling environment maintained at the working hospitals by the graduates.

## Sampling

### Sample size

For level one, training completion reports and/or training evaluation reports of all 15 batches of PEC training were used. For level two, pre-test, and post-test training evaluation scores of 271 PEC graduates were used as scores of 24 graduates were missing out of a total of 295 participants.

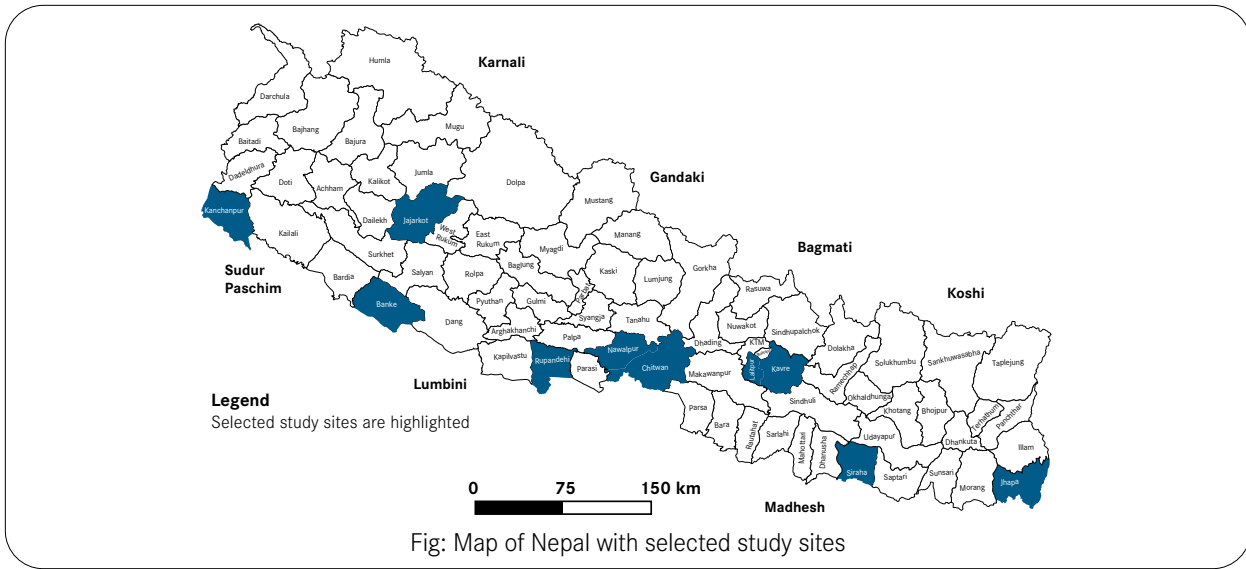
For level three 48 PEC graduates working in 11 hospitals (level four) were sampled. The sampled hospitals were: 7 public hospitals, 1 Academy, 1 community and 2 private hospitals. The sampled PEC graduates were 10 medical officers, 23 nursing staff and 15 paramedics. For qualitative data we reached out to sampled hospitals where semi structured interviews were conducted with 19 PEC graduates, 10 Emergency department in charge, 1 medical superintendent, and 11 focus group discussions with the emergency department team.

## Sampling Strategy

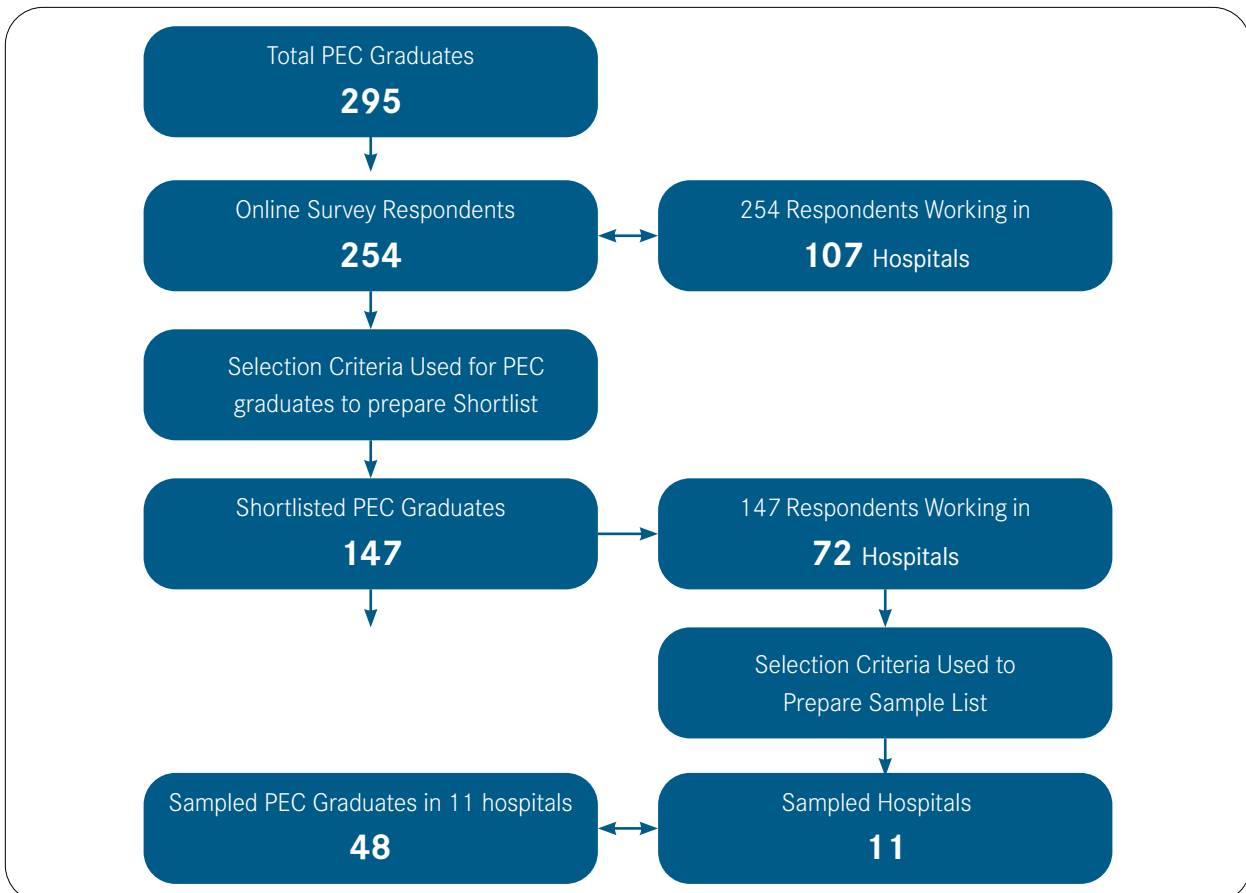
An online survey form was sent to all the 295 PEC graduates, to know about their current working status. A total of 254 (86%) responded to the online survey. It was found that those 254 PEC graduates were working in 107 different hospitals. A short list of PEC graduates was prepared using the following criteria:

- A PEC graduate working in clinical setting
- A PEC graduate handling emergency cases
- A PEC graduate working in a hospital (excluding HP, PHCC, unemployed and studying)
- A PEC graduate having more than six months of experience working in current hospital
- A PEC graduate is working in a current (sampled) hospital immediately after they received training.

First a short list of hospitals was prepared using a shortlisting criterion applied to PEC graduates. The shortlisted 72 hospitals were spread over all seven provinces and of different ownership styles. Considering one hospital for 20 PEC graduates, 11 hospitals were shortlisted. However, to make representatives from all seven provinces, one hospital was sampled even if the number of PEC graduates was below 20. The 11 hospitals were purposively selected considering maximum number of PEC graduates working among hospitals of the respective province, ownership of hospital i.e., public, academy, community, and private hospitals. All the PEC graduates working who met the inclusion criteria within the sampled hospitals were sampled to observe their knowledge and skills. So, a total of 48 PEC graduates for level 3 and 11 hospitals for level 4 of the Kirkpatrick model were sampled for the study.



For qualitative data, we selected one PEC graduate, one ER In charge/medical superintendent, and one focus group discussion with the Emergency department team from each sampled hospital. To have balance between these cadres we selected three cadres (one of each profession) from each sampled hospital purposively. In hospitals where there was more than one cadre of the same profession, we selected one among them who had a maximum number of experiences after receiving training and in hospitals where there were only one cadre available at the time of survey, only one probable candidate was taken for the interview.



## Data Collection Methods

For level 1 and level 2 of the Kirkpatrick model we used retrospective data. For reaction, we used the training reports submitted by the trainers by the end of each training session. Additionally, for the training supported by NSI (11/15 batches) each participant was asked to fill-in a training evaluation form, which captured classroom teaching, practical exposure, and other administrative aspects of the training. The training evaluation reports, or training feedback reports were also reviewed for analysis which were submitted after the end of each batch. Thus, the reaction of participants to the training, their feedback/ comments were also incorporated in the analysis.

Research team physically visited sampled hospitals. The knowledge retention was assessed using knowledge-based questions while the skill retention was assessed through OSCE stations and structured simulation scenarios. Scoring was done based on the structured checklist of the procedures followed by the study participants. The study team provided instant feedback to the participants after the assessments. Enabling environments of the hospital as envisioned by the PEC training package were physically observed and noted. A standard tool to capture skills, knowledge of the PEC graduates and the enabling environment of the sampled hospitals which was developed referring to the PEC training guide and consultation with the PEC training resource persons. Topic guide was developed

for key informant interview and focus group discussions. The tools were pretested at APF hospital, Kathmandu after required revision and uniformity on the question pattern was maintained.

Semi-structured interviews were conducted to understand the experience and perception of PEC graduates regarding the utilization of knowledge and skills gained during the training, the relevance of the training contents, facilitating and hindering factors to utilize the knowledge and skills gained in the training. With the non-PEC working in the emergency department of the sampled hospitals Semi-structured interviews (Medical superintendent or Emergency department, head of department) and FGD (emergency department team-doctors, nurses, and paramedics) were conducted. The objective for conducting Semi-structured interviews and FGD with Non- PEC was to explore the different skills sets PEC graduates had and the effectiveness of such skills in day-to-day work at the emergency department.

**Table 1 Data Collection Tools and Techniques**

SN	Techniques	Tools	Participants	Number	Remarks
1	Online survey	Questionnaire	PEC Graduates	295	For identification and location
2	Retrospective data review	Review of pre-test and post-test evaluation, training completion report and feedback form	PEC Graduates/ Batches	295 (15 Batches)	For Level 1 and 2 Pre-post 271 data analyzed
3	Semi-structured interview and Observation	Interview Questionnaire and Observation checklist	PEC Graduates	48	Level 3 (for knowledge, skill and environment assessment)
4	Observation	Observation checklist	Hospitals	11	Level 3 and 4
4	KII	Topic Guides	MeSu/ER Incharge	11	Level 3 and 4
5	IDI	Topic Guides	PEC Graduates	29	Level 3 and 4
6	FGD	FGD Guide	Non-PEC	11	Level 3 and 4

## Data Management and Analysis Techniques

### Level 1 (Reaction)

The Evaluation reports/training reports were analyzed under five broader standard themes: Relevance, Facilitator's Presentation, Skill level and pace of program and overall program.

### Level 2 (Learning)

Pre-post test scores of training participants were analyzed using paired sample t-tests.

### Level 3 (Behavior) and Level 4 (Result)

#### Quantitative data management and analysis:

Data from the study regarding the work status of PEC graduates, knowledge, skills, and environment assessment were obtained in KOBO form. The data was downloaded in excel and exported to SPSS software. Then, data was checked for outliers, cleaned, and run for required analysis. We used descriptive statistics (frequency, percentage and mean) for demographic, work status, knowledge, and skills of the PEC graduates as well as for hospital environment assessment. The training completion/training evaluation reports were reviewed for the perceptions, and feedback of participants regarding the training. A paired sample t test was applied to pre and post test scores to test the hypothesis. One-way ANOVA was done to identify the mean difference of knowledge and skills of the participants based on the score observed.

#### Qualitative Data Management and Analysis:

Interviews were recorded and transcribed. Respondents were assigned unique identification numbers and data were made anonymous by providing unique codes before coding the transcripts. All recorded qualitative data were translated into English. The interviews were reviewed, and a codebook was prepared. All the transcripts were coded in excel separately for KII and FGDs. A descriptive report of the analysis was prepared by research team members. The verbatim were re-read, reviewed and thematic analysis was done from both the KII and FGDs.

## Ethical Considerations

Ethical clearance for this study was obtained from the Nepal Health Research Council (NHRC) before commencing the study. Informed consent was sought and obtained from all individuals involved in the study. Additionally, we had taken extensive measures to protect the privacy and confidentiality of the study participants. Data were de-identified to prevent breach of individual identification. The researchers created a non-judgmental environment while assessing participants' knowledge and skills. A debriefing and support session was planned at the end of each interview to provide an opportunity for the participants to ask questions and seek additional support related to the training.

## Results

### Level 1: Reaction

Participants' reaction was evaluated using the training evaluation and/or training completion reports. Evaluation reports are the compilation of evaluation forms filled by the participants and training completion report is the report prepared by the trainers of PEC training. The Evaluation form had three sections Administrative, classroom teaching and clinical practice with subjective as well as objective questions. For this study we used participants' reaction to the training evaluation report of 11 batches and training completion report for 4 batches of PEC training.

This section covers the perceived acceptability and relevance of the PEC training program in terms of relevance, facilitator's presentation, skill level and pace of the initial six days PEC training program.

### Relevance

The training program was well accepted and thought to be relevant to match the services provided at the emergency department of a hospital. For some this training has built confidence in handling ER cases compared to before training. Participants suggested this training to be given to all MDGP/EM residency, ER team, especially working in rural areas. There were suggestions from participants for addition of few other contents on the training packages such as Surgical and gynecological emergencies, ACLS among others.

### Facilitator's Presentation

Participants' reaction towards the facilitating skills of the facilitator's presentation was very positive. Most of the participants liked the methodology used for the training (audio visual, practical sessions). Participants could express themselves to ask questions as the sessions were interactive and trainers were friendly and experienced in the content of the training.

### Skill Level

Participants had mixed responses over the time allocated for practical sessions, for some this was enough while for others this was not enough. Some participants viewed that the training is focused more on paramedics rather than all healthcare workers. Some others found difficulty in understanding some technical words used during training, while some suggested preparing a training manual in Nepali language to understand clearly.

### Pace of Program

Almost all the participants realized that the six days of training was not enough for the current PEC curriculum. Most of them said that additional time must be allocated for the practical sessions as they wanted to experience and practice enough at the skill stations. For some participants some sessions were long enough to lose focus while for some others theoretical sessions were too fast for them to catch.

### Overall Training Program Reflection:

Overall, the PEC training was well received by the graduates. It was perceived to be highly relevant to the work of those providing emergency service, use of effective teaching methods and well managed and organized training programs. There were occasional criticisms, which focused mainly on two issues: one- some found the sessions to be too long, losing focus of the content and other was less time allocated for practical sessions. Participants also liked to have real hospital setting experience for some practical sessions such as ABCDE approach, triage management, among others.

### Level 2: Learning

Pretest and posttest assessment scores were analyzed to observe the learning phase of the model. Among the total 295 graduates, pre-post test scores were available of 271 participants and the analysis for this phase (learning) was performed accordingly.

### Pre-post Assessment Using Paired T-test

Among the training participants, the mean pretest score was  $52.72 \pm 19.16$  while the mean post-test score was  $88.57 \pm 6.352$  after providing the training. The mean knowledge of the participants was found to be increased by  $35.85 \pm 17.32$  ( $p < 0.05$ ).

**Table 2 Pre-post Assessment of Knowledge**

Pair of score	Mean	N	Std. Deviation	Std. Error Mean
Pretest score	52.72	271	19.164	1.164
Post-test score	88.57	271	6.352	.386

**Table 3 Paired Test of Knowledge**

Pair 1	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pretest score - Post-test score	-35.856	17.321	1.052	-37.928	-33.785	-34.077	270	.000

### Level 3: Behavior

#### Socio-Demographic Characteristics

Out of the 295 participants who enrolled in the primary emergency care training, 48 participants were sampled. The mean age of the participant was  $31.72 \pm 6.97$  years. Most of the participants were male (25; 52.08%), and a majority (25; 52.08%) fell within the age group of 20–30 years. In terms of their current positions or roles within the facility, most (23;47.92%) were nurses, (15;31.25%) were paramedics, and (10;20.83%) were medical doctors. The participants represented a total of ten districts (table 4).

**Table 4 Socio-demographic characteristics of participants**

Characteristics	Number	Percentage
<b>Age (in years)</b>	Mean age $31.72 \pm 6.97$	
20-30 years	25	52.08
31-40 years	18	37.50
41 years and above	5	10.42
<b>Gender</b>		
Male	25	52.08
Female	23	47.92
Current position/Cadre		
Medical	10	20.83
Nursing	23	47.92
Paramedics	15	31.25
<b>Nature of the employment</b>		
Permanent	19	39.58
Temporary	29	60.42
<b>Type of hospital</b>		
Public	32	66.67
Private	7	14.58
Community	9	18.75
Experience after training (in years)	Mean $1.53 \pm 0.86$	Min=0.58; Max=4.16
Less than 1 year	14	29.2
1 to 2 years	20	41.7
2 years or more	14	29.2
<b>Name of district</b>		
Banke	4	8.33
Chitwan	3	6.25
Jajarkot	1	2.08
Jhapa	2	4.17
Kanchanpur	1	2.08
Kavrepalanchowk	9	18.75
Lalitpur	19	39.58
Nawalparasi east	4	8.33
Rupandehi	1	2.08
Siraha	4	8.33

### Knowledge Assessment

The survey consisted of questions concerning knowledge related to different medical situations and the appropriate emergency actions to take in each case. Out of the maximum score of 20, the average score of all participants was  $16.18 \pm 2.27$ . Out of the 48 participants, 40 (83.33%) of participants correctly knew the child CPR ratios (15:2 for 2 rescuers), 44 (91.67%) recommended placement of hand during chest compression, 45(93.75%) recommended rate of chest compression for adult victim, 28(58.33%) depths of chest compressions for adults. Participants 40 (83.33%) demonstrated strong awareness regarding ruling out acute coronary syndrome via ECG and addressing trauma patients with breathing difficulties respectively. Details of the scoring distribution of participants' knowledge are presented as a summary of question-wise knowledge of the participants during the survey is provided in annex (Table 5).

The participants scoring below mean was 16 (33.3%) and those having mean and above was 32 (66.7%).The mean difference of knowledge among the cadre of participants was found to be significant at  $p < 0.05$ . The disaggregation based on mean shows that the participants from medical cadre (80%) and those from the community hospital (77.8%) had higher level of knowledge. The paramedics were found to have a low level of knowledge as the majority (60%) of them scored below mean knowledge(Table 6).

**Table 6: Disaggregation of Participants Based on Level of Knowledge**

Characteristics	Mean Knowledge	P-value	Level of knowledge	
			Below mean n (%)	Mean and above n (%)
<b>Cadre</b>				
Medical (n=10)	$16.7 \pm 1.8$	0.005*	2(20)	8(80)
Nursing (n=23)	$16.95 \pm 1.8$		5(21.7)	18(78.3)
Paramedic (n=15)	$14.67 \pm 2.5$		9(60)	6(40)
Experience after training (in years)				
Less than 1 year	$16.14 \pm 2.21$	0.652	4(28.6)	10(71.4)
1 to 2 years	$15.9 \pm 2.69$		8(40)	12(60)
2 years or more	$16.64 \pm 1.69$		4(28.6)	10(71.4)
<b>Type of hospital</b>				
Public (n=32)	$16.43 \pm 2.15$	0.125	10(31.3)	22(68.8)
Private (n=7)	$14.57 \pm 2.5$		4(57.1)	3(42.9)
Community (n=9)	$16.55 \pm 2.24$		2(22.2)	7(77.8)
*significant at $p < 0.05$				

### Knowledge Retention: Post test knowledge score Versus Knowledge score during Study Period

Among the 48 PEC graduates sampled for the assessment, the post-test score of 3 participants was missing. So, 45 participants were only included for assessment of knowledge retention. The mean post-test score was  $88.57 \pm 6.352$  after providing the training but the mean knowledge during the PEC study was  $81 \pm 11.706$ . The mean knowledge of the participants was found to be decreased by  $7.15 \pm 12.89$  points. (Table 7 and Table 8).



**Table 7 Post-test Knowledge Score Versace Knowledge Score During Study Period**

Pair of knowledge score (n=45)	Mean	N	Std. Deviation	Std. Error Mean
Post-test knowledge score	88.15	45	4.73	.7049
Knowledge score during study period	81	45	11.706	1.74

**Table 8 Paired T-test on Post-test Knowledge Score Versace Knowledge Score During Study Period**

Pair 1 (n=45)	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Post-test score- knowledge score during study period	7.155	12.89	1.92	3.28	11.03	3.72	44	.001

Participants generally showed a good understanding of PEC related medical concepts such as child CPR ratios, appropriate chest compression locations, and recommended adult chest compression rates however knowledge gaps were evident in understanding the ideal depth of chest compressions for adult victims (58.33% correct) and responding to mass casualty Incidents.

**Skills Assessment**

In general, the participants showed high proficiency skills. Within subgroups cadres of medical profession, health workers having 2 years and more experience after training and health workers working in public hospitals showed satisfactory skills (Mean and above) on most of the provided tasks. The participants from the private hospitals had mean and above level of performance on LPA Slab application. Comparing the mean difference among the skills performed, the difference was not found to be significant among the disaggregation of any skills category (Table 9).

Characteristics	BLS (18)	P-value	Basic airway (12)	P-value	LPA Slab Application (15)	P-value	Dyspnea (20)	P-value
Mean scores	49.04 ± 3.66		32.52 ± 2.64		41.52 ± 3.27		54.08 ± 3.14	
<b>Cadre</b>								
Medical (n=10)	49.6 ± 2.1	0.84	33.2 ± 1.9	0.595	41 ± 3.82	0.796	55.3 ± 2.79	0.391
Nursing (n=23)	49.08 ± 3.14		32.17 ± 2.58		41.82 ± 2.7		53.69 ± 3.59	
Paramedic (n=15)	48.6 ± 5.09		32.6 ± 3.1		41.4 ± 3.73		53.86 ± 2.53	
<b>Experience after training (in years)</b>								
Less than 1 year	47.64 ± 4.73	0.09	32.78 ± 2.32	0.58	41.71 ± 3.14	.089	54.85 ± 2.79	0.5
1 to 2 years	48.90 ± 3.35		32.05 ± 3.26		41.25 ± 3.46		53.55 ± 3.76	
2 years or more	50.64 ± 2.16		32.92 ± 1.89		41.71 ± 3.33		54.07 ± 2.46	
<b>Type of hospital</b>								
Public (n=32)	48.71 ± 3.56	0.12	32.9 ± 2.14	0.08	41.9 ± 2.93	0.06	53.84 ± 3.5	0.18
Private (n=7)	46.85 ± 4.14		31.57 ± 4.42		43 ± 1.29		54.57 ± 1.8	
Community (n=9)	51.88 ± 1.69		31.88 ± 2.57		39 ± 4.33		54.5 ± 2.4	

## Details of each skill observed

### Adult Basic Life Support

Skill assessment results showed that participants demonstrated a high level of competency in several BLS tasks. Notably, participants achieved satisfactory performance in activating the emergency response system (97.2%), Correct compression: hand placement (95.8%) and allowing complete chest recoil between compression (95.8%). However, there were areas where improvement was needed. For instance, less than half (44%) of participants failed to check breathing and pulse (simultaneously) for at least 5 seconds and no more than 10 seconds. Additionally, some individuals (10.4%) had difficulty delivering adequate depth of compression (at least 2 inches) and fewer than half (45.8%) minimizing interruptions during resuscitation efforts had performed only partially satisfactory (Annex, Table 10). Most of the participants demonstrated a satisfactory performance in various aspects of breathing skills such as holding the mask properly with the EC technique (85.4%), ensuring proper positioning to open the airway (85.4%), ensuring a proper seal of the mask (83.3%), and ensuring chest movement while giving breath (89.6%). While a large proportion (23%) could perform only “partially satisfactory” on Switch’s role appropriately after five cycles.

In the domain of AED use, though more than half (52%) of the participants failed to satisfactorily turn on the AED; most of the participants showed satisfactory skills on placing the pads correctly, cleared the patient to analyze, effectively resumed CPR immediately after delivering a shock, ensuring continuous and effective life-saving interventions. In the meantime, a significant number of participants were found not proficiently performing those skills. (Annex, Table 11).

### Basic Airway Management

A substantial proportion of participants demonstrated a satisfactory performance in several basic airway management critical skills. Specifically, in tasks such as preparing the necessary equipment (91.7%), clearing the airway using suction (97.9%), inserting OPA with proper technique (93.8%), hold and seal appropriate size mask with E-C technique (93.8%) and release the bag completely between ventilations. In some of the tasks, a low proportion of participants exhibited unsatisfactory performance. Notably, in performing jaw thrust (12.5%) and ventilating

at the proper rate (10.42%). A remarkable proportion of participants had performed “partially satisfactorily” the skills like performing chin lift and head tilt (41.7%). Similarly, performing jaw thrust and ventilation at proper rate with visible chest rise was not satisfactorily performed by more than half of the participants, which needs to be taken in consideration. (Annex, Table 12).

### Long Arm Posterior Slab Application

There were a total of 17 steps/tasks to be followed under long arm posterior slab application. Three procedures for preparing the patient, four steps for preparing necessary instruments, six procedures for applying posterior slab and last four the post procedure tasks. Overall, there were very few participants who performed unsatisfactorily for some steps such as verbalizing the need for adequate analgesia (4.2%), maintaining limb in appropriate alignment (4.2%), measure the length of required plaster (6.3%) and checking the color, movement sensation and pulse after application of plaster (6.3%).

However, not all the procedures were systematically followed by the participants, resulting in obtaining partially satisfactory scores. To name few steps were neurovascular observation (33.3%), adequate analgesia (25%), maintaining limb in appropriate alignment (27.1%), removing the back slab from the water (18.8%), applying Crepe bandage around the limb (20.8%), maintain the position of limb till the slab hardened (25%) and checking the color, movement sensation and pulse after application of plaster (37.5%). (Annex, table 13, 14 and 15)

### Case Management: Dyspnea

Participants implemented the ABCDE approach, assessed signs of airway and circulation problems, initiated oxygen therapy, Open IV (2 large bore) to address C problem starting NS, Nebulization with Salbutamol/Ipratropium, and performed various medical interventions such as CXR, CBC as well as IV antibiotics flawlessly. A remarkable proportion of participants had trouble verbalizing the use of PPE (41.7%), greeting (62.5%), asking for signs of airway problem (29.2%), looking for disability (AVPU, pupil) and asking for bedside blood glucose (37.5%) as well as proper recording (29.2%). (Annex, Table 16).

## Level 4: Result

### Enabling Environment

The sampled health facilities were observed in the availability of physical facilities, equipment and medicines required for the provision of emergency services. A majority of facilities exhibited promising availability of essential equipment, with a strong emphasis on life-saving tools like ECG machines, AED or defibrillators, and oxygen delivery devices. Furthermore, facilities generally had well-defined disaster preparedness plans, resuscitation areas, and triage systems in place, reinforcing their readiness to handle critical situations. However, challenges were identified in the availability of certain basic pharmaceuticals, oral medications like aspirin and atorvastatin, and certain medical supplies like Nasopharyngeal Airway (NPA) and Laryngeal Mask Airways (LMAs). Annex, Table 17).

### Qualitative Findings

To assess the behavior and probable results of the PEC training 11 FGDs were conducted at 11 different hospitals where the PEC graduates were working. Similarly, 29 interviews were taken including PEC graduates as well as medical superintendent or ER in charge of the hospitals.

The interviews and FGDs were coded into 4 broader themes upon agreement by the research team:

- Service Provided/Quality of emergency health services
- PEC Training effectiveness and utilization
- Enabling Environment
- Feedback for the improvement.

### Service Provision/Quality of Emergency Health Services

#### 1) Hospital Readiness for Service Provision

Comprehensive patient management and basic emergency care services were provided by all hospitals while the referral and private hospitals also provided lab and investigations as well as specialized services like cardiac, surgery, neurosurgery, uro-surgery, neuropsychiatry, and disaster affected cases. Few of the private hospitals and referral hospitals claimed to have highly super specialist services as well as Heli rescue services for patient transport for emergency cases. Most of them reported to have basic equipment, medicines but during mass casualty incidents they have to face short supply of both HR, medicines, equipment and space. Many hospitals experience limited

space and congested ER as the major challenge to deliver quality services to the emergency patients. Maintaining privacy is a great challenge due to constraints in space among most of the hospitals and many of them have curtains and screens on the ER beds to maintain privacy. Overcrowding and staff shortages have added challenges in maintaining privacy of the patients.

*“We perform management to all kinds of patients including cardiac, surgery, neurosurgery, uro-surgery, and neuro-psychiatry cases. In the emergency department, we have all the services. It includes emergency X-ray, emergency investigation and all management to the patient’s visiting emergency. KII\_MO\_Bheri”*

*“Privacy depends upon the patients’ load. As I said before, we had 9 beds here and 3 beds behind; we usually take female patients in behind rooms for ECG and other necessary procedures if they are vacant. Thus, we maintain privacy. But during full beds, we often use screens, but the patients sidewise directly observe and see. We personally feel that patients don’t feel privacy through screening. FGD\_Bhadrapur*

*“The hospital is housed in an old community building, resulting in limited space in the emergency department. There are 8 beds available, with some patients occasionally being placed on the floor due to overcrowding. The hospital lacks a separate ICU and orthopedic department. IDI\_PEC\_Madhyabindu”*

#### 2) Referral System for Services

Due to unavailability of CT/MRI, CT scan and emergency orthopedic services, some hospitals refer to other hospitals. The private referral hospitals have almost all health services with specialist doctors available all 24 hours. The provincial and district hospitals refer to other higher centers due to unavailability of beds, specialists, and the required services for burned cases, poly trauma requiring emergency operation, patient requiring ICU, CT scan services, poisoning cases, cardiac, hemorrhagic SBA, cerebral hemorrhage or spinal injuries, cases requiring intensive care or surgical interventions, neuro-spinal cases. The referral is usually done to hospitals having health insurance program or on patient request. Appropriate referral process was deemed necessary but not adequately followed by many hospitals.

“We refer about 20/25 cases per week. Among those will be extremely serious cases requiring ICU, cases with poly trauma requiring emergency operation, on patients request (due to lack of beds, delay in service giving and take to private hospitals) are referred from us. KII\_MO\_Bheri”

“If a case should be referred, then we consult a doctor to refer a patient in the concerned hospital. IDI\_PEC\_Dhulikhel”

## PEC Training Effectiveness and Utilization

### 1) Participants' Attitude and Motivation for Training

Selection of participants for PEC training by the hospitals were either the turn-by-turn approach or based on the seniority of the staff. Graduates had a positive response towards training and well accepted its importance. They reported that the PEC training helped to enhance the knowledge, skills, practice, and confidence dealing with emergency case management. They recommended this training to be provided to all the ER staff regardless of their cadre. They expressed their motivation due to a desire for enhancing emergency care, upgrading the knowledge and ER management skills. Most of the respondents reported that their skills have been enhanced particularly in intubation, fracture management, AED, ABCDE and BLS.

*“My motivation is that while working in the ER, many varieties of cases come so I lack that much confidence. To develop that confidence, I joined the training. IDI\_PEC\_Mahakali”*

*“I think this training is mainly about life-threatening intervention. Not only during the case in hospital but we must follow up the case after the referral. That feeling developed from the PEC training. IDI\_PEC\_Madhyabindu”*

### 2) Effectiveness of Skills Gained in ER Management

Some of the PEC graduates reported that they found it challenging to work in the emergency room due to a lack of practical skills, but the training was instrumental in enhancing proficiency on prioritizing cases based on severity, Basic life support, ABCDE (Airway, Breathing, Circulation, Disability, Exposure), Chest tube insertion, intubation, mass casualty management, and performing CPR after the training. These in their regular practice proved to be lifesaving during medical emergencies such as snake bites, disaster, and orthopedic emergency. The FGD and KII participants believed the training is highly effective, as it

equips healthcare providers to perform life-saving measures in emergency situations as well as considered PEC highly effective for basic life support, trauma management, and disaster response. The impact of PEC was seen in improved coordination among team members enhancing ER management as well. They mentioned PEC graduates as an added value to the ER team who enhanced the overall management and quality emergency services as well, while other staff also got the opportunity to learn lifesaving skills from them. This improved case management, recovery and managing the caseloads as well.

*“The training is very nice and fruitful. The management of cases at emergencies like trauma (we have many trauma cases); developed our skills. Such treatment, if available at primary level, would be very good. Acute emergency cases can be fast recognized, and their intervention also can be done faster after. It is lifesaving training. KII\_MO\_Siraha”*

*“PEC training brings different skills to the emergency department, ultimately leading to better patient care. IDI\_Madhyabindu\_PEC”*

*“One of the staff, [redacted], after taking the training she takes lots of responsibility. like she does intubation, medications, and many other things. She also teaches us at work. Yeah, I have seen that she has been more responsive than before. FGD\_Bharatpur”*

### 3) Skills Utilization and Transfer

The systematic application of the training has significantly improved patient care. Some of them stressed the benefits of PEC training, including managing cases like road traffic accidents and learning the ABCD approach. The training equips healthcare workers to manage critical patients effectively.

A participant from the referral hospital acknowledged that this PEC training significantly contributed to his effectiveness as a leader and improved decision making in the emergency department. Despite training, some skills like ECG reading are underutilized due to existing staffing patterns and assignments. As there are participants from different levels of hospitals, some of the participants also reported that some skills including fracture, chest tube insertion, intraosseous line, and AED are not utilized as very

few such patients visit and are handled by MO or higher-level staff.

*“Not all the skills are applied. From the nursing perspective; CPR, patient examination (ABCDE), method of ECG, patient observation and monitoring are being applied. But fracture cases, chest tube insertion, etc are not applied. Though a few cases of snake bites, poisoning come here; we treat with the PEC procedure. We have provided better treatment to the cases coming to us. IDI\_PEC\_Bheri”*

There was a mixed response on the difference in service by the PEC graduates. The participants from government hospitals, medical college and community hospitals reported that they felt much positive difference in service delivery by the PEC graduates. But some FGD participants (ER team) from private hospitals reported that they have to work according to the designed SOP of the hospital and not much difference has been seen among the graduated ones though the level of confidence has been improved.

*“I don’t think there are many differences between before and after the training as we follow the SOP. As we are talking about the remote village then we might see some changes but in a hospital like ours we give the best care they can get. As we work together here, we don’t feel that much difference though their confidence on handling cases has improved. FGD\_Mediciti”*

*“The attendees have a bit more knowledge on the specific topic. And he/she corrects and suggests other staff during the treatment procedure. FGD\_Mahakali”*

One of the objectives of the PEC training is to strengthen the ER department not only through building capacity of the health workers but also through the transfer and sharing of knowledge and skills to their colleagues. The transfer of skill by the PEC graduates happened mainly while handling cases as well as in the CME classes.

*“Every attendee of the training teaches us on CME after back from the training. They transfer skills to other staff like for ER management. We have a tag duty team of new and old staff. During duty hour, the senior and more experienced staff teaches the new one. We have a messenger and viber group. If someone attends training, they also inform them about new things in that group. We also share after coming back from the training. FGD\_Mahakali”*

## **Enabling Environment**

### **1) Issue and Challenges with Hospital Environment**

The lack of equipment, basic infrastructure, drugs, and manpower hinder the implementation of the learned skills from the training. In most of the hospitals, there were inadequate clinical staff in the ER department. Though some hospitals had sufficient staff for providing the ER services, non-clinical staff were lacking so they were overloaded with their work. ER staff work diligently to manage patient flow, even extending their shifts if necessary. Senior consultants provided opportunity and support to the junior staff.

*“Teamwork of the ER is good. We tried to fulfill all the demands of the ER. We also removed some of the work burden from the department. For example, Directly Observed Treatment Short-course (DOTs) were given from the ER. After I came, I kept the DOTs unit in a different place by giving responsibility to a paramedic. That was the thing and we maintained it. (KII\_Mesu\_Jajarkot)”*

*“If the hospital administration provides the required equipment at the right time, then it would have been so great to practice the learnt skills. For this hospital administration, hospital development committee, the Provincial government should manage to keep the equipment. Not just the equipment but we need a specialized workforce to give quality service. FGD\_Jajarkot”*

### **2) Satisfaction at Work**

Despite challenges including low salaries, inadequate Human resources and medical equipment, most of the staff working in ER are satisfied with the working environment. Staff are satisfied with the work and get support from colleagues, including doctors, nurses, and paramedics. ER in charge seemed quite satisfied with PEC graduate because of their skill, knowledge and performance after the training.

*“Yeah, I am satisfied with my work. As it is crowded in the ER and lots of work but what I think is that when I do any work then it becomes easy. IDI\_PEC\_Bharatpur”*

*“Relating to work, I am at the borderline of satisfaction. There are some obstacles as well. We cannot be satisfied in all cases. Sometimes we get unsatisfied. For example, Heavy work loads, no promotion, irrelevant work schedule are some cases for non-satisfaction. IDI\_PEC\_Bheri”.*

*“As there is no good salary, the patient party scolds us as it is a government hospital. We have to work quietly. That is hard. So, I feel unsatisfied. (IDI\_PEC\_Bharatpur) “*

## Feedback for the improvement

### 1) Feedback for Training improvement

The PEC graduates, KII and FGD participants highly appreciated the content and efforts made in the training as well as provided valuable feedback on the training. Most of them suggested a follow-up after the training. Many of the KII and FGD participants suggested training for all the staff from the emergency department to ensure uninterrupted quality ER service provision. Some of the participants from the provincial and referral level hospitals suggested extending the duration of PEC to 15 days and including more advanced components like ventilator training, obstetric emergency management and minor surgical procedures. Some of the procedures like ABCDE, triage management during disaster could be better if performed in a real hospital setting. They also suggested extending training at all hospitals over the country.

*“From my point of view, not only PEC, but it should also be advanced with composition of intubation and ventilator for longer duration than a week. It would be better if it was composed of all packages from basic to advanced and running for 15 days. Addition of advanced packages like ventilator training, placing of an intubated patient on type of mood; that is equally helpful in ICU and skills of minor operation would be helpful. KII\_MO\_Bheri”*

*“I think that this PEC training should be given to all the low-level health staff starting from a health post because the first pre-hospital care provider is HP or PHC. FGD\_Bharatpur”*

The participants also recommended training follow-up programs to assess differences between the skills performed by the trained ones. They suggested for conducting refresher trainings followed by the PEC training on certain interval would be very effective.

*“Yeah, there is the difference. for some time, there is a good response and after few days it will go down. After the training there will be no follow-up then there will be a gap. So that will make difficult.yeah, there is some difference in the work, they teach other staffs also. But with the time that changes and back to the state of before. FGD\_Bharatpur”*

### 2) Feedback to Hospital Authorities and the Governments

The study participants emphasized the need for better coordination and policy enforcement at various levels of government to improve emergency care. The KII participants reported that federal and provincial governments could play a major role in organizing such training at different parts of the country so that participants could be benefitted without hampering regular service delivery. They emphasized that the role of all levels of government is crucial to promote such life-saving training and enhance emergency services through adequate budget allocation, coordination, and collaboration with different partners, monitoring the quality of services as well as fulfilling the requirements to deliver quality health services.

*“Central level is providing such training but, in my opinion, the provincial government can arrange such training by allocating a budget for training so the state should also conduct the training. FGD\_Siraha”*

Participants suggested the hospital conduct a need assessment of its staff and such training should be provided to all the health workers. The participants suggested hospital authorities as well as the government to play a supportive role for enhancing training utilization and staff motivation. For the improvement of PEC training, continued communication, coordination, and evaluation between government and hospitals are recommended. Along with regular support, they highlighted the importance of hospital authorities on continuous monitoring, supervision, and evaluation of trained staff.



Most of the participants reported a lack of adequate human resources and physical infrastructures in the hospital in relation to the patient load. Thus, for improving service delivery the hospital authority and related government stakeholders should manage required human resources, budget, and the physical facilities to ensure quality and responsive services through ER at all levels of hospitals.

*“After we get the training then we don’t have the required materials and equipment to perform the task as per the training. The hospital and government should arrange required equipment at the hospital. FGD\_Jajarkot”*

*“Regular monitoring and assessment of trained personnel from hospitals is necessary; only giving training is not enough. That can make the training more effective. As someone has taken the Emergency training but posted to work as for doing just an ECG then the objective is not fulfilled. IDI\_PEC\_Mahakali”*

## Discussion

The PEC training has been deemed crucial in context of developing countries like Nepal where the access to quality health services for the rural/remote people remains limited and barred due to unequitable distribution of skilled HR, equipment and supplies essential to provide emergency live saving services. The study attempted to evaluate the effectiveness of PEC training by observing knowledge and skills of the graduated service providers from all over the country.

Overall, the PEC training package was well received by the graduates. It was perceived to be highly relevant to the work of those providing emergency service. Some participants felt the practical session duration during training sessions was adequate, while others disagreed, possibly due to variations in practical training duration across different batches or the diverse backgrounds of participants (doctors, nurses, and paramedics). Varied academic knowledge and experience levels may have influenced their training satisfaction. Some participants felt the training focused too heavily on paramedics, while others struggled with technical

terminology and suggested Nepali-language manuals for clarity. Recommendations include tailoring participant selection to experience levels, as medical staff may already possess advanced emergency care skills.

Participants in our study praised the PEC training methods and media for boosting their confidence in managing emergency situations like fractures, CPR, COPD, and MI during their duties. They suggested that practical sessions such as ABCDE and triage management would be more beneficial if conducted in real hospital settings, addressing organizational, equipment, and systemic challenges encountered in real practice. Simulated training like this enhances skill development and retention, mirroring real-world scenarios and potential challenges in practice (10,11). In line with our study, Forde Et. al in 2017 reported such emergency care training with real life, onsite simulation-based training led to sustained and increased confidence among the GPs and primary care clinicians in management of emergency situations including anaphylaxis, hypoglycemia, convulsions, choking, asthma, croup, chest pain and cardiac arrest (12). These observations highlight that the combination of methods and media used in PEC training are highly effective.

The mean knowledge of graduates and the skills including BLS, dyspnea were higher among the graduates with experience of 2 and more years was higher. Similar evidence has been reported by studies that clinical experience prior or after training having a positive impact on skills and knowledge retention (13). Opinions varied regarding the performance disparity among PEC graduates. Participants from government hospitals, medical colleges, and community hospitals generally noted a positive difference in service delivery by PEC graduates. However, some FGD participants from private hospitals mentioned adhering to hospital SOPs, with little discernible variation among graduates, although their confidence levels had improved. Recommendations included follow-up training programs incorporating assessment and observation tools to better gauge differences, although the PEC study has partially addressed this gap.



*“I don’t think there are many differences between before and after the training as we follow the SOP. As we are talking about the remote village then we might see some changes but in a hospital like ours we give the best care they can get. So, there is not that much difference. As we work together here, we don’t feel that much difference. FGD\_Medicit”*

The participants as well as non-participants found training very beneficial for managing ER cases, mass incidents, the response and confidence in trained ones have obviously been developed while it has created ripple effect among the untrained health professionals ultimately improving the effectiveness of the department.

*“The attendees have more knowledge on the specific topic and improved skills. And he/she corrects and suggests other staff during the treatment procedure. FGD\_Mahakali”*

On the other hand, one fourth of the PEC graduates were found posted other than ER setting for which they were trained which hampers skill utilization. The limited availability of equipment, space and lack of HR in the ER department but requiring to manage higher caseloads had hampered standard procedures and the application of skills gained in training. While the KII and FGD participants also suggested regular supervision, refresher training for update of the competence and retention of the learnt skills. Reviews of literature reported decay of the acquired skills in many settings over time as professionals skill not being used due to unavailability of cases, equipment and not being posted in the required stations(14,15). If very few such cases are to be handled by the trained ones; peer education, refresher training, video self-instruction are reported to be helpful for skill retention(10).

The observations of the hospitals found that triage systems, resuscitation areas, essential medicines and supplies required for emergency services have been maintained at the hospitals. On the other hand, equally important aspects associated with quality care including physical infrastructures, adequate space, basic pharmaceuticals remains lacking. These observations highlight the need for continued monitoring, resource management, and standardized protocols to ensure consistent and reliable healthcare delivery, especially during

emergencies. The appropriate referral and patient transport are crucial during the emergency conditions, but many hospitals were found not following the referral mechanism. Studies reported that the referral should be systematic and hospital should be informed about the referral which could prevent crucial delays while recording is also equally important after the referral (1).

The PEC training was found effective not only in terms of strengthening the ER team by transferring of knowledge and skills to non-attendees in the ER team during case handling but also through interaction sessions which assisted in assuring uninterrupted availability of those services. It not only developed motivation and confidence in managing emergency cases and mass casualties but also lightened on needed supervision, evaluation, and refresher training for improving the effectiveness of the training as well as quality of service delivery. Though we had limitations of studying the consumers perspective in terms of availability of the ER services. The effectiveness of training was not only in terms of improving skills of providers but also assured the availability of services in those health facilities which has also decreased the cost of treatment and transport for the patients as reported from the FGD and KII participants.

## Limitations

Appropriate hospital emergency records on patient data regarding referral, patient outcomes could not be found. Thus, limited analysis from qualitative data has been generated regarding the level 4 (results) from the study. The original sample size for assessing the knowledge and skills of PEC graduates was 57, specifically including those with one year or more of experience post-training. However, during the field visit, some participants had either departed from the hospital or were absent from their station during the data collection period. Consequently, we adjusted the inclusion criteria to encompass graduates with six months or more of experience, resulting in a revised sample size of 48 for data collection.

# Conclusions and Recommendations

This study of the Primary Emergency Care (PEC) Training program underscores the positive impact of the training on healthcare workers (HWs) in delivering quality emergency care. The study reveals that the content and efforts invested in the training program are highly appreciated, positioning it as an asset in enhancing emergency care services.

The average knowledge score on the post-test (88.15) and the knowledge score at the study's commencement (81) suggest a retention of knowledge over the years of training. Nevertheless, while participants acquired and retained significant knowledge, the hospital's working environment hindered the full application of their skills and knowledge. Factors such as limited human resources, high workload, and insufficient supplies posed challenges, restricting opportunities to apply the acquired skills effectively.

Nevertheless, the training not only instilled motivation and confidence among HWs in managing emergency cases but also emphasized the necessity for ongoing monitoring, evaluation, and follow-up, including refresher training at regular intervals.

To replicate the successes of this training and avoid the challenges, future trainings of this nature should ensure:

- Out of the graduates who responded the survey, one fourth were not utilizing their training related knowledge and skills because of various reasons. One major reason was they were not posted in emergency department. This suggests revisiting participant selection criteria and posting the right person in the right place after training.
- While participants express satisfaction with facilitators' skills and classroom teaching, the heterogeneity of participants (medical, nursing and paramedics) all in the same cohort, requires reconsideration. Content of the package may be revised according to the level of cadres, for example nursing and paramedics in a cohort and medical cadre in different cadre with little advanced course content.

- Challenges such as limited equipment and human resources, high patient loads, and insufficient infrastructure hindering skill utilization are acknowledged. Addressing these issues will fully utilize the knowledge and skills gained.
- Recommendations include extending the duration of PEC, incorporating advanced components like ventilator training, ACLS and minor surgical procedures. Although there are stand-alone trainings for some, incorporating within PEC package would be beneficial.
- Use a comprehensive strategy to continuously assess, improve, and maintain the effectiveness of primary emergency care training. This strategy should include follow-up, periodic monitoring and supervision, and the application of key performance indicators.

To address these challenges and replicate the successes of this training, future training programs should consider revisiting participant selection criteria to ensure proper placement in emergency departments, revising content to suit the heterogeneous composition of participants, addressing equipment and resource limitations, extending the duration of PEC training to incorporate advanced components, and implementing a comprehensive strategy for continuous assessment, improvement, and maintenance of training effectiveness. In summary, the study's findings provide valuable recommendations for enhancing the effectiveness of the PEC Training within Nepal's emergency care context.

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# Annexes

**Table 5 Question-wise Knowledge of Participants (N=48)**

Question	Knew correctly		Did not know correctly	
	n	%	n	%
Child CPR Ratio: 15:2 (2 Rescuers)	40	83.33	8	16.67
Chest Compression: Center of Chest	44	91.67	4	8.33
Recommended rate of chest compression for adult victim	45	93.75	3	6.25
Recommended depth of chest compression in adult victims	28	58.33	20	41.67
Rule out acute coronary syndrome through ECG	40	83.33	8	16.67
Action for 20 years Female with Dizziness, Breathing Issue, Low SPO2	33	68.75	15	31.25
appropriate antidotes for the toxins	46	95.83	2	4.17
Critical Management: Vomiting Blood in 60-year Female	39	81.25	9	18.75
Common cause of airway obstruction	41	85.42	7	14.58
Urgent Action: Trauma Patient, Breathing Difficulty	40	83.33	8	16.67
Patient with 30% flame burn	44	91.67	4	8.33
Intubation Consideration: Need Arises	44	91.67	4	8.33
Secondary survey	36	75.00	12	25.00
Clinical condition of compartment syndrome	34	70.83	14	29.17
Management of open fracture of tibia	42	87.50	6	12.50
<b>Case -based discussion</b>				
"Emergency Alert: Bus Accident with 50 Passengers, 2 km from Hospital at 8 PM"	18	37.50	30	62.50
Triage Category: bleeding (Red)	48	100.00	-	-
Triage category: chest injury (Red)	47	97.92	1	2.08
Triage Category: exposed bowel(yellow)	28	58.33	20	41.67
Triage Category: neck pain (green)	40	83.33	8	16.67

**Table 10 Skill Assessment of PEC Training**

Adult Basic Life Support (BLS)			
Steps/task	Satisfactory n (%)	Partially Satisfactory n (%)	Unsatisfactory n (%)
Assesses: Checks for response	41(85.4)	5 (10.4)	2(4.2)
Activates emergency response system	47(97.2)	-	1(2.1)
Checks breathing and pulse(simultaneously) for at least 5 seconds and no more than 10 seconds	27(56.3)	20 (41.7)	1(2.08)
Correct compression: hand placement	46(95.8)	-	2 (4.2)
Adequate rate: at least 100 compressions/minute but no more than 120/ minutes	40(83.3)	8 (16.7)	-
Adequate depth: deliver compressions at least 2 inches (at least 23 out of 30)	43(89.6)	5 (10.4)	-
Allows complete Chest Recoil in between compressions.	46(95.8)	-	2 (4.2)
Minimizes interruption	24 (50)	22 (45.8)	2 (4.2)

**Table 11 Assessment of Breathing and AED Use (N=48)**

Adult Basic Life Support (BLS)			
Steps/task	Satisfactory n (%)	Partially Satisfactory n (%)	Unsatisfactory n (%)
Holds mask properly: EC technique	41 (85.4)	7 (14.6)	-
Ensure proper positioning to open airway	41 (85.4)	7 (14.6)	-
Ensure proper seal of mask	40 (83.3)	8 (16.7)	-
Ensure chest movement while giving breath	43 (89.6)	5 (10.4)	-
Switch's role appropriately after five cycles.	36 (75)	11 (22.9)	1 (2.1)
AED use			
Turns on AED	23 (47.9)	25 (52.1)	-
Places pads correctly	42 (87.5)	6 (12.5)	-
Clears patient to analyze	40 (83.3)	8	(16.7)
Clears patient to Shock/presses shock bottom	40 (83.3)	7 (14.6)	1(2.1)
Resume CPR immediately after shock	41 (85.4)	6 (12.5)	1(2.1)

**Table 12 Assessing and Managing Basic Airways (N=48)**

Basic Airway Management			
Steps/task	Satisfactory n (%)	Partially Satisfactory n (%)	Unsatisfactory n (%)
Prepare the necessary equipment	44(91.7)	4(8.3)	-
Perform chin lift and head tilt	25(52.1)	20(41.7)	3(6.3)
Perform jaw thrust	16(33.3)	26(54.2)	6(12.5)
Clear the airway using suction	47(97.9)	1(2.1)	-
Choose the appropriate size OPA (guedel)	34(79.8)	11(22.9)	3(6.3)
Insert OPA with proper technique	45(93.8)	3(6.3)	-
Choose the appropriate size NPA(Guedel)	36(75)	10(20.8)	2(4.2)
Insert NPA with proper technique	42(87.5)	5(10.4)	1(2.1)
Hold and seal appropriate size mask with E-C technique	45(93.8)	3(6.3)	-
Ventilate at proper rate (1 breath every 6 secs) with visible chest rise.	14(29.2)	29(60.4)	5(10.4)
Deliver each ventilation over 1 sec	41 (85.4)	5(10.4)	2(4.2)
Release bag completely between ventilations	46(95.8)	1(2.1)	1(2.1)

**Table 13 Long Arm Posterior Slab Application (N=48)**

Long Arm Posterior Slab Application			
Steps/task	Satisfactory n (%)	Partially Satisfactory n (%)	Unsatisfactory n (%)
Explain procedure to guardian or visitor and gain consent to proceed	42(87.5)	6(12.5)	-
Check and document the circulatory state and the nerve supply of the limb (neurovascular observations)	31(64.6)	16(33.3)	1(2.1)
Orthopedic padding	48(100)	-	-
Appropriate width of plaster of Paris (3" or 4")	44(91.7)	3(6.3)	1(2.1)
Elastic bandage (crepe bandage)	47(97.9)	1(2.1)	-

**Table 14 Apply Posterior Slab (N=48)**

Apply Posterior Slab			
Steps/task	Satisfactory n (%)	Partially Satisfactory n (%)	Unsatisfactory n (%)
Verbalize the need for adequate analgesia	34(70.8)	12(25)	2(4.2)
Position and maintain the limb in appropriate alignment and apply the cast pad fully in circular fashion	33(68.8)	13(27.1)	2(4.2)
Measure the length of plaster required depending on the size of the limb, and POP cast is folded layer by layer. Layers required: 12-14 layers	32(66.7)	13(27.1)	3(6.3)
Remove the back slab from the water, squeeze it very gently to remove excess water and straighten it	38(79.2)	9(18.8)	1(2.1)
The slab is then carefully positioned on the limb and smoothed to fit the contours.	36(75)	12(25)	-
Elastic bandage (Crepe bandage) is applied around the limb, evenly and without tension. The limb position should be maintained until the cast is completely set	38(79.2)	10(20.8)	-

**Table 15 Post Procedure Task**

Post Procedure Task			
Steps/task	Satisfactory n (%)	Partially Satisfactory n (%)	Unsatisfactory n (%)
Maintain the position of limb till the slab hardened.	36(75)	12(25)	-
Check the color, movement, sensation & pulses of the distal part of the limb to ensure no possible impairment of the circulation or nerve supply	27(56.3)	18(37.5)	3(6.3)
Keep the limb in triangular sling or arm sling.	44(91.7)	4(8.3)	-
Ask the patient for regular movement of fingers	41(85.4)	7(8.3)	-

**Table 16 Clinical Simulation: Summary of Case Progression and Major Events (N=48)**

		Post Procedure Task			
Scenario progress	Learner's action	Satisfactory n (%)	Partially Satisfactory n (%)	Unsatisfactory n (%)	
Dehydrated Airway -patent	Verbalizes use of appropriate PPE	12(25)	20(41.7)	16(33.3)	
	Greets/ introduces self	10(20.8)	30(62.5)	8(16.7)	
	Uses ABCDE approach	40(83.3)	8(16.7)	-	
Breathing-RR: 32/min SP02-86%,  Decreased air entry LLZ with wheezing Circulation	Asks for signs of airway problem	34(70.8)	14(29.2)	-	
HR :120/min BP=80/40 mm of Hg	Starts O2 to address B problem	41(85.4)	7(14.6)	-	
	Ask for signs of circulation problem	35(72.9)	13(27.1)	-	
	Open IV (2 large bore) to address C problem	43(89.6)	5(10.4)	-	
	Starts NS fast	43(89.6)	4(8.3)	1(2.1)	
	Looks for disability (AVPU, pupil) and asks for bedside blood glucose.	22(45.8)	25(52.1)	1(2.1)	
	Verbalize possibility of CAP and septic shock	31(64.6)	15(31.3)	2(4.2)	
	Take focused history and exam according to the algorithm	30(62.5)	18(37.5)	-	
	ECG	35(72.9)	12(25)	1(2.1)	
	CXR	48(100)			
	CBC	48(100)			
	Medication	Start IV Antibiotics	48(100)		
		Oral Prednisolone or IV Hydrocortisone	40(83.3)	6(12.5)	2(4.2)
		Nebulization with Salbutamol/Ipratropium	46(95.8)	2(4.2)	
		PCM	48(100)		
		Start IV Antibiotics	48(100)		
		Oral Prednisolone or IV Hydrocortisone	40(83.3)	6(12.5)	2(4.2)
		Nebulization with Salbutamol/Ipratropium	46(95.8)	2(4.2)	
	PCM	48(100)			
	Monitoring	Proper recording	34(70.8)	14(29.2)	
	Counseling	Proper counseling to the patient party	42(87.5)	6(12.5)	



**Table 17 Health Facility Checklist (N=11)**

Characteristics	Available and Working n (%)	Not Available n (%)
<b>Triage set up for regular daily cases</b>		
Triage area	8(72.73)	3(27.27)
Triage process	7(63.64)	4(36.36)
Triage category board and information to the public (Red, Yellow, Green) (descriptive flex)	8(72.73)	3(27.27)
<b>Emergency Room Setup</b>		
Resuscitation area /bed identified.	10(90.91)	1(9.01)
Protocols/algorithms printed	7(63.64)	4(36.36)
Monitoring forms for documentation	7(63.64)	4(36.36)
<b>Mass Casualty/Disaster Preparedness</b>		
Disaster preparedness plan	9(81.82)	2(18.18)
Disaster area identified	9(81.82)	2(18.18)
Triage category tags or ribbons	8(72.73)	3(27.27)
<b>Equipment and Supplies</b>		
ECG	11(100)	
AED or defibrillator	9(81.82)	2(18.18)
Suction machine	11(100)	
Nebulizer set	11(100)	
Cardiac monitor	11(100)	
Ultrasound machine	9(81.82)	2(18.18)
Oxygen delivery devices	11(100)	
OPA	10(90.91)	1(9.01)
NPA	4(36.36)	7(63.64)
Ambu bag	11(100)	
LMAs	3(27.27)	8(72.73)
Intubation set	11(100)	
IV cannulas	11(100)	
Cervical collar or alternatives	8(72.73)	3(27.27)
Spinal board	8(72.73)	3(27.27)
Splints	7(63.64)	4(36.36)
<b>Medicines</b>		
Inj. Adrenaline	10(90.91)	
Inj. Atropine	11(100)	
Tab. Aspirin	5(45.45)	6(54.55)
Tab. Atorvastatin	6(54.55)	5(45.45)
Inj. Dextrose (25 or 50%)	10(90.91)	1(9.01)
Inj. Diazepam	10(90.91)	1(9.01)
Inj. Dobutamine	5(45.45)	6(54.55)
Inj. Dopamine	10(90.91)	1(9.01)
Inj. Frusemide	10(90.91)	1(9.01)
Inj. Hydrocortisone	10(90.91)	1(9.01)
Inj. Midazolam	10(90.91)	1(9.01)
Inj. MgSO4	11(100.00)	
Inj. NS	11(100.00)	
Inj. Noradrenaline	10(90.91)	1(9.01)
Inj. PAM	6(54.55)	5(45.45)
Inj. RL	11(100.00)	
Inj. Tranexamic acid	10(90.91)	1(9.01)





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