EVALUATION OF TRAINING EFFECTIVENESS IN PRE-HOSPITAL EMERGENCY CARE IN SELECTED SOUTHERN PROVINCES

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ABSTRACT

Objective: *To evaluate the effectiveness of pre-hospital emergency care training for healthcare workers in selected provinces of Southern Vietnam.*

Subjects and Methods: *A prospective interventional descriptive study was conducted on 120 healthcare workers in several southern provinces. Knowledge, practice, and attitudes toward pre-hospital emergency care were assessed before and after participation in a structured training program. Standardized questionnaires and practical performance assessments were employed as evaluation tools.*

Results: *Among 120 participants, the majority were aged 30 to 40 years (48.3%), with males predominating (61.7%). Following the training intervention, the proportion meeting knowledge requirements increased significantly from approximately 42–49% to 90–94% ($p < 0.001$), except for basic emergency techniques, which showed no significant difference ($p = 0.234$). For practical skills, all competencies improved markedly, with the proportion achieving the required level increasing from 44–48% to over 91%, and all differences reaching statistical significance ($p < 0.001$). Attitudes toward compliance with regulations and safety also improved substantially, from 53–57% before intervention to 96-98% after ($p < 0.05$).*

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Conclusion: *The training program significantly enhanced healthcare workers' knowledge, practical skills, and attitudes regarding pre-hospital emergency care. These findings highlight the feasibility, practical relevance, and scalability of the training model to strengthen pre-hospital emergency response capacity at the local level.*

Keywords: *Pre-hospital emergency care, healthcare workers, response capacity.*

1. INTRODUCTION

Prehospital emergency care (PHEC) refers to emergency medical care provided to patients from the moment emergency services are activated until hospital admission. This continuum typically ranges from initial life-saving measures performed by bystanders to professional on-site management and patient transport conducted by emergency medical services (EMS) systems [1]. The development of an effective prehospital emergency care system plays a crucial role in reducing mortality and minimizing the severity of injuries, particularly in critically ill or injured patients, thereby alleviating the burden of disease and financial costs for individuals, families, and society as a whole. Moreover, strengthening prehospital emergency care networks enhances timely and appropriate access to medical services for patients in need [2], [3]. Nevertheless, several essential components of the prehospital emergency care system, including human resources, information connectivity, clinical protocols, emergency service packages, and the quality of initial emergency care, still require comprehensive review and the establishment of specific standards and regulations. In many provinces and localities, prehospital emergency services remain severely inadequate. There is a shortage of qualified personnel, particularly physicians trained in prehospital emergency care. Coordination mechanisms among primary healthcare facilities, emergency medical centers (EMS 115), and hospitals are limited. Management and dispatch of satellite emergency networks lack flexibility, and sustainable financial mechanisms for emergency centers have not been fully established. Therefore, this study was conducted with the objective of evaluating the effectiveness of training in prehospital emergency care for healthcare workers in several southern provinces of Vietnam.

2. SUBJECTS AND METHODS

2.1. Study Subjects

Healthcare personnel working at primary healthcare facilities in several southern provinces of Vietnam were selected to participate in prehospital emergency care training.

Inclusion criteria

Healthcare professionals who had at least one year of working experience and were currently employed and actively engaged in primary healthcare services were eligible for inclusion in the study.

Exclusion criteria

Individuals who did not meet the above inclusion criteria or who declined to participate in the study were excluded.

2.2. Methods

Study design

This was a prospective interventional descriptive study using a pre- and post-intervention comparison design.

Sample size

The sample size was calculated using the formula for interventional studies:

$$n_1 = n_2 = \frac{\left| Z_{(1-\alpha/2)}\sqrt{2PQ} + Z_{(1-\beta)}\sqrt{p_1q_1 + p_2q_2} \right|^2}{(p_1 - p_2)^2}$$

n_1, n_2: the minimum sample sizes required before and after the intervention, respectively.

$Z_{(1-a/2)}$: the standard normal deviate corresponding to a two-sided confidence level with $\alpha = 0.05$; thus, $Z_{(1-a/2)} = 1.96$.

$Z_{(1-b)}$: the standard normal deviate corresponding to a statistical power of 95% ($\beta = 0.05$); thus, $Z_{(1-b)} = 1,645$.

$q_1 = 1 - p_1$ $\quad q_2 = 1 - p_2$ $\quad P = (p_1+p_2)/2$ $\quad Q = 1 - P$

p1: represents the proportion of primary healthcare workers with adequate knowledge of first aid and prehospital emergency care techniques prior to the intervention. Based on preliminary descriptive data, this proportion was estimated at 0.65.

p2: represents the expected proportion of primary healthcare workers with adequate knowledge of first aid and prehospital emergency care techniques after the intervention, estimated at 0.85.

Substituting these values into the formula yielded a minimum required sample size of 119 healthcare workers. Therefore, a total of 120 healthcare workers were recruited for the study.

Study period and setting

The study was conducted from June 2024 to June 2025 at primary healthcare facilities in several southern provinces of Vietnam.

Study procedures

Baseline assessment of knowledge, skills, and attitudes of primary healthcare workers regarding prehospital emergency care.

Organization of training courses and transfer of professional knowledge and skills in first aid and emergency management of common emergencies, including hemorrhage control and bandaging, fracture immobilization, artificial respiration, cardiopulmonary resuscitation, drowning rescue, and electrical injury management. The training program lasted three weeks (four days per week, totaling 12 days) and was supervised by the principal investigators, with instruction provided by physicians from Military Hospital 175, the 115 Emergency Medical Center, and the Vietnam Society of Emergency and Critical Care.

Post-training evaluation using structured questionnaires assessing knowledge and attitudes, together with practical skill assessments. The evaluation instruments were reviewed and validated by an expert panel.

The knowledge assessment questionnaire was developed to cover five domains: organization and procedures of prehospital emergency care; reporting, coordination, and inter-agency collaboration in prehospital emergency care and patient transport; common medical conditions encountered in the prehospital setting; basic emergency care techniques; and preparation of patients for prehospital transport. Each domain consisted of 10 questions, with satisfactory performance defined as correctly answering at least five questions. Similarly, practical skills were evaluated across four domains, and attitudes were assessed based on three levels of compliance. The scoring criteria were consistent with those used for the knowledge assessment, with satisfactory performance defined as achieving at least five correct responses.

Statistical analysis

Study data were entered and analyzed using SPSS software version 26.0. Categorical variables were expressed as frequencies and percentages, while continuous variables were presented as means ± standard deviations (SD). The McNemar test was applied to paired categorical variables (satisfactory vs. unsatisfactory), with statistical significance set at $p < 0.05$.

Ethical considerations

This study was conducted as part of a national-level research project entitled "Development and evaluation of the effectiveness of a prehospital emergency care model" (Project code: ĐTĐL. CN.51/21), approved under Decision No. 147/QĐ-BKHCN dated January 28, 2021, by the Ministry of Science and Technology of Vietnam. Permission for data use and publication was granted by the project principal investigator. The authors declare no conflicts of interest related to this study.

3. RESULTS

Table 1. Age and sex characteristics of the study participants (n = 120)

Characteristics		Number	Percentage (%)
Age (years)	**< 30**	28	23.3
	30 – 40	58	48.3
	> 40	34	28.4
Sex	**Male**	74	61.7
	Female	46	38.3

Healthcare workers participating in the training were predominantly aged 30–40 years (48.3%), followed by those older than 40 years (28.4%), while participants younger than 30 years accounted for the lowest proportion (23.3%). Males predominated, comprising 61.7% of the sample compared with 38.3% females.

Table 2. Knowledge assessment results of healthcare workers (n = 120)

Assessment domains	Pre-intervention n (%)		Post-intervention n (%)		p
	Adequate (≥ 5 points)	Inadequate (< 5 points)	Adequate (≥ 5 points)	Inadequate (< 5 points)	
Organization and procedures of prehospital emergency care	52 (43.3%)	68 (56.7%)	113 (94.2%)	7 (5.8%)	**< 0.001**

Reporting, coordination, and inter-agency collaboration in prehospital emergency care and patient transport	58 (48.3%)	62 (51.7%)	110 (91.7%)	10 (8.3%)	**< 0.001**
Knowledge of common conditions encountered in the prehospital setting	59 (49.2%)	61 (50.8%)	108 (90.0%)	12 (10.0%)	**< 0.001**
Knowledge of basic emergency care techniques	57 (47.5%)	63 (52.5%)	94 (78.3%)	26 (21.7%)	0.234
Knowledge of patient preparation for prehospital emergency transport	50 (41.7%)	70 (58.3%)	112 (93.3%)	8 (6.7%)	**< 0.001**

After the intervention, the proportion of healthcare workers achieving satisfactory knowledge increased markedly across most domains (90.0–94.2%), compared with 41.7–49.2% before the intervention. These differences were statistically significant ($p < 0.001$), except for the domain related to basic emergency care techniques ($p = 0.234$).

Table 3. Practical skills assessment results of healthcare workers (n = 120)

Domains	**Pre-intervention**		**Post-intervention**		**p**
	Adequate (≥ 5 points)	**Inadequate (< 5 points)**	**Adequate (≥ 5 points)**	**Inadequate (< 5 points)**	
Skills in performing prehospital emergency care procedures	56 (46.7%)	64 (53.3%)	112 (93.3%)	8 (6.7%)	**< 0.001**

Skills in reporting, coordination, and collaboration during prehospital emergency care	54 (45.0%)	66 (55.0%)	110 (91.7%)	10 (8.3%)	**< 0.001**
Skills in performing basic first aid and emergency techniques	58 (48.3%)	62 (51.7%)	113 (94.2%)	7 (5.8%)	**< 0.001**
Skills in patient preparation for prehospital emergency transport	53 (44.2%)	67 (55.8%)	111 (92.5%)	9 (7.5%)	**< 0.001**

The results indicate a substantial improvement in practical skills following training, with more than 91% of participants achieving satisfactory performance across all domains post-intervention, compared with 44.2–48.3% prior to the intervention. All differences were statistically significant ($p < 0.001$).

Table 4. Attitude assessment results of healthcare workers (n = 120)

Assessment domains	**Pre-intervention**		**Post-intervention**		**p**
	Adequate (≥ 5 points)	**Inadequate (< 5 points)**	**Adequate (≥ 5 points)**	**Inadequate (< 5 points)**	
Compliance with regulations and requirements during prehospital emergency care	65 (54.2%)	55 (45.8%)	117 (97.5%)	3 (2.5%)	**< 0.001**

Compliance with principles of patient management and preparation to ensure safe prehospital transport	69 (57.5%)	51 (42.5%)	116 (96.7%)	4 (3.3%)	0.023
Compliance with safety measures during prehospital emergency care and transport	64 (53.3%)	56 (46.7%)	118 (98.3%)	2 (1.7%)	0.018

Healthcare workers' attitudes toward compliance with regulations, safety principles, and emergency management improved significantly after the intervention. The proportion achieving satisfactory attitudes increased from approximately 53.3–57.5% before the intervention to 96.7–98.3% after the intervention, with statistically significant differences ($p < 0.05$).

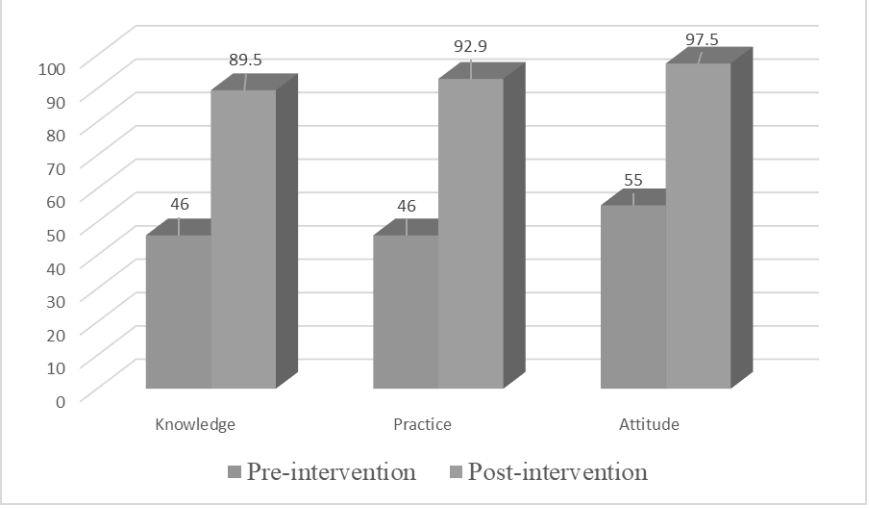

Figure 1. Overall results of the knowledge, practice, and attitude of healthcare workers before and after the intervention

The proportions of participants meeting the required standards for knowledge, practice, and attitude increased markedly after the intervention, rising from 46–55% at baseline to 89.5–97.5% following the intervention.

4. DISCUSSION

Our study showed that the majority of healthcare workers participating in the training were aged 30–40 years (48.3%), followed by those older than 40 years (28.4%), while participants younger than 30 years accounted for the smallest proportion (23.3%). Males predominated (61.7%) compared with females (38.3%). This distribution reflects the characteristics of the healthcare workforce in southern provinces of Vietnam, where the core workforce consists largely of middle-aged personnel with substantial professional experience, and males are more frequently involved in activities related to prehospital emergency care. These findings are consistent with the study by Amaleh et al. (2024), which included 48 healthcare workers with a mean age of 35.29 ± 6.52 years [4].

Following the training intervention, substantial improvements were observed in knowledge, practical skills, and attitudes toward prehospital emergency care. Knowledge attainment increased markedly to 90.0–94.2%, compared with only 41.7–49.2% before the intervention. Practical skills improved from approximately 44–48% to more than 91%, while compliance-related attitudes increased from 53–57% to 96–98%. These results confirm the effectiveness of the training program in the context of local healthcare practice, which still faces multiple limitations and gaps in prehospital emergency services.

In comparison with international studies, our findings are consistent with improvements in knowledge acquisition and professional confidence. Teuben et al. (2024) reported that prehospital emergency training significantly enhanced self-confidence and communication in prehospital trauma management, with 86% of participants reporting increased confidence and 93% reporting improved communication skills [5]. Similarly, Häske et al. (2017) demonstrated that after training, subjective safety perception and skills improved and were maintained even after one year, although knowledge retention tended to decline over time [6]. Amaleh et al. (2024) also reported statistically significant improvements in all skills when comparing pre- and post-training mean scores ($p < 0.05$). Moreover, comparisons between pre-training learning-level scores and behavioral-level scores assessed two months after training showed significant changes across all skills ($p < 0.05$) [4]. Collectively, these findings support the notion that prehospital emergency training has a positive impact not only in

the short term but also potentially in the longer term if appropriately maintained.

However, discrepancies between our findings and those of other studies may be attributed to several factors. In our study, post-intervention assessment was conducted only in the short term, immediately after completion of the training course, whereas many international studies employed longer follow-up periods to evaluate sustainability, such as one year of follow-up [6]. In addition, substantial differences exist across countries in terms of environmental conditions, equipment availability, leadership support, and medical logistics systems. In developed countries, emergency medical services (EMS) are more robust and benefit from regular refresher training, which facilitates higher and more sustained effectiveness in practice. In our training program, although basic emergency care techniques were included, improvements in this domain did not reach statistical significance ($p = 0.234$). This finding may be explained by the fact that many participants were already familiar with basic procedures prior to training, resulting in limited incremental improvement.

Study limitations

Although the study demonstrated initial effectiveness, several limitations should be acknowledged. The pre–post study design without a control group limits the ability to fully control for confounding factors and restricts comparative interpretation. Furthermore, outcome assessment was performed only immediately after training, which does not capture long-term retention of knowledge, skills, and attitudes. To better evaluate the true value of this training model, future studies should incorporate additional outcome indicators, such as on-scene response time, transport time, complication rates, and mortality. Long-term follow-up at 3, 6, and 12 months after training is also necessary to assess the sustainability of training effects. Nevertheless, the present findings suggest that this training model has strong potential for wider implementation, particularly in resource-limited provinces. Scaling up should involve tailoring training content to local conditions, investing in infrastructure, and, importantly, establishing periodic refresher training programs to maintain effectiveness over time.

5. CONCLUSION

The results of this study demonstrate that the training program significantly improved healthcare workers' knowledge and skills in prehospital emergency care. In the context of Vietnam's prehospital emergency system, which remains fragmented and lacks standardized human resource training, this model has proven to be feasible and worthy of further expansion. The study also proposes the refinement of the training model, the development of locally appropriate

prehospital emergency care organizational frameworks, and the establishment of community-based emergency responder networks to enhance the effectiveness of prehospital emergency care and reduce mortality and complications among patients.

REFERENCES

1. Wilson M.H., Habig K., Wright C., et al. (2015). Pre-hospital emergency medicine. *Lancet*, 386(10012), 2526–2534.

2. Carron P.-N., Dami F., Diawara F., et al. (2014). Palliative Care and Prehospital Emergency Medicine: Analysis of a Case Series. *Medicine*, 93(25), e128.

3. Carter A.J.E., Jensen J.L., Petrie D.A., et al. (2018). State of the Evidence for Emergency Medical Services (EMS) Care: The Evolution and Current Methodology of the Prehospital Evidence-Based Practice (PEP) Program. *Healthc Policy*, 14(1), 57–70.

4. Kamgar Amaleh M.H., Heydari S., Nazari P., et al. (2024). Evaluating the effectiveness of the pre-hospital trauma life support (PHTLS) program for the management of trauma patients in the pre-hospital emergency based on Kirkpatrick's evaluation model. *Int J Emerg Med*, 17(1), 13.

5. Teuben M.P.J., Löhr N., Shehu A., et al. (2024). The value of pre-hospital trauma life support courses for medical personnel: a questionnaire study. *Front Med (Lausanne)*, 11, 1345310.

6. Häske D., Beckers S.K., Hofmann M., et al. (2017). Subjective safety and self-confidence in prehospital trauma care and learning progress after trauma courses: part of the prospective longitudinal mixed-methods EPPTC-trial. *Scand J Trauma Resusc Emerg Med*, 25(1), 79.