Factors influencing the delivery of basic pre-hospital trauma care during disaster by the Emergency Medical Services of the Bureau of Fire Protection

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Abstract

Introduction The Philippines is considered a disaster-prone country, making basic pre-hospital trauma care essential in the disaster response. The Bureau of Fire Protection (BFP) is mandated by law as the lead agency in providing emergency medical services (EMS) in the country, which plays a critical role in disaster response. This study aimed to investigate the influence of the different factors (knowledge, training, experience, and logistics) on the disaster preparedness of the BFP EMS personnel and to identify the strongest predictor among the factors.

Methods A correlational study was done among 125 EMS personnel in the Bureau of Fire Protection-National Capital Region (BFP-NCR) using stratified random sampling. A four-part questionnaire, which included a demographic form, a 20-item knowledge test, a logistics compliance checklist from the Department of Health licensing tool, and the Emergency Preparedness Information Questionnaire (EPIQ) was used. Statistical analysis done were Pearson correlation and logistic regression.

Results The findings showed that knowledge (OR = 0.299, 95% CI: 0.128–0.689), training (OR = 3.2, 95% CI: 1.8–5.6), and experience (OR = 1.9, 95% CI: 1.1–3.4) affected the level of disaster preparedness. Furthermore, logistics did not show a significant effect ($p > 0.05$).

Conclusion The strongest predictor of disaster preparedness among the factors is knowledge. Even though logistics is an essential factor, its effectiveness still depends on the proper utilization by trained personnel. Recommendations include continuous training and retention of experienced personnel, which are essential to enhance BFP EMS readiness during disasters.

Key words: emergency medical services, disaster preparedness, trauma care, EMS training, Bureau of Fire Protection

The Philippines is one of the most disaster-prone countries in the world. In the World Economic Forum (2018) report, the Philippines ranked 3rd among 173 countries vulnerable to disaster risk and natural hazards. It frequently experiences typhoons, earthquakes, floods, and volcanic eruptions, with an average of 20 tropical storms annually (GFDRR, 2017). In this situation, it is critical that Emergency Medical Services (EMS) work well, especially when it comes to providing life-saving pre-hospital trauma care. The World Health Organization considers EMS an essential component of a robust healthcare system (Beyramijam et al., 2021; Ho, 2020; Mehmood, 2018). The EMS delivers care during a disaster and helps mitigate the impact (Catlett et al., 2011) because

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they are the first to recognize the nature of a disaster and evaluate the situation immediately to determine the resources needed (Committee on Guidance for Establishing Crisis Standards of Care for Use in Disaster Situations, 2012). The primary goal of EMS in disaster response is to maintain continuity of medical services through triage, life-saving support, rapid diagnosis and treatment, or transfer of casualties to emergency departments (Tourani et al., 2018).

Under Republic Act No. 11589, the Bureau of Fire Protection (BFP) is mandated to suppress fires, respond to disasters, and provide emergency medical services (EMS). Executive Order No. 56 designates the BFP as the lead agency for public EMS. Despite ongoing modernization efforts, EMS capacity remains inconsistent across regions.

Previous studies have demonstrated that factors such as training, experience, and logistics affect how well EMS personnel provide pre-hospital trauma care. The study by Haghparast-Bidgoli (2010) identified several factors that hinder effective pre-hospital care, including the availability and distribution of resources, administration and organization, staff qualifications and competencies, communication and transportation, involvement of organizations and lay people, and infrastructure. Research on the key predictors of disaster preparedness among EMS personnel remains limited. In the Philippines, the absence of advanced EMT or paramedic training and the lack of a national regulatory framework further hinder efforts to strengthen the EMS system (Padlan & Gaerlan, 2018).

This study would fill that gap by examining the relationship between knowledge, training, experience, and logistics of BFP-NCR EMS personnel to their level of disaster preparedness. It also aimed to determine the most important predictor among all factors in the delivery of basic pre-hospital trauma care.

Method

Study Design

This study used a correlational design to examine the relationship between preparedness and different factors affecting the delivery of basic pre-hospital trauma care. The study protocol was reviewed and approved by the UERMMMCI Ethics Review Committee.

Study Population and Setting

Eligible participants were Bureau of Fire Protection (BFP) emergency medical services (EMS) personnel with a minimum of three months of service. Ambulance drivers were excluded. A stratified random sampling technique was employed to ensure representative sampling across key subgroups.

Sample Size

Using finite population correction from a target population of 185 EMS personnel, the required sample size was calculated to be 125, based on a 95% confidence level and a 5% margin of error.

Data Collection Tools

Four tools were used: a demographic profile sheet, a 20-item knowledge test from the BFP Emergency Medical Responder Manual, the DOH logistics compliance checklist, and the Emergency Preparedness Information Questionnaire (EPIQ) by Garbutt et al (2008). Approval was secured from the BFP-NCR Regional Director. Informed consent was obtained, and participants completed the questionnaire in 30–45 minutes.

Data Analysis

Data were encoded using Microsoft Excel and analyzed using SPSS 29 for Windows. Pearson correlation tested associations, and binary logistic regression identified predictors. A significance level of 0.05 was used. Odds ratios and 95% confidence intervals were reported.

Study Variables

The dependent variable was disaster preparedness, measured using the Emergency Preparedness Information Questionnaire (EPIQ) and categorized as high or low based on the median score. Independent variables included: (1) knowledge, assessed through a 20-item multiple choice test and categorized as good or poor based on the median score; (2) training, categorized based on completion of Basic Life Support (BLS), First Aid, and Emergency Medical Technician (EMT) training; (3) years of EMS experience with a

cut off of 3 years; and (4) logistics capability, measured by compliance with the DOH licensing tool checklist, categorized into compliant, partially compliant, or not compliant.

Results

A total of 125 Emergency Medical Services personnel participated in the study, of which majority were male (67.2%) and between the ages of 30–39 years (76%) as seen in Table 1. Most of the personnel were nurses by profession.

In terms of knowledge, 55.2% (n=69) of respondents scored at or above the median score of 10 and were classified as having good knowledge in basic pre-hospital trauma care. The remaining 44.8% (n=56) had poor knowledge.

The Emergency Preparedness Information Questionnaire (EPIQ) revealed that 60.8% (n=76) had high levels of disaster preparedness, while 39.2% (n=49) were categorized as having low preparedness based on a median cutoff score of 110.

Capability as seen in Table 2 was assessed through three indicators: training, experience, and logistics. In training, 44% (n=55) were fully capable, 24% (n=30) were capable, and 32% (n=40) were not capable. In terms of experience, 59.2% (n=74) had three or more years in EMS, while 40.8% (n=51) had less than three years. Regarding logistics, 21.6% (n=27) were compliant with the DOH checklist, 52.8% (n=66) were partially compliant, and 25.6% (n=32) were not compliant.

Pearson correlation showed that knowledge ($r=0.95$, $p<0.01$), training ($r=0.92$, $p<0.01$), and experience ($r=0.75$, $p<0.05$) were significantly associated with disaster preparedness (Table 3). Logistics also had a positive correlation ($r=0.72$, $p<0.01$), but its significance was not supported in the logistic regression model (Table 4).

Logistic regression analysis (Table 5) identified knowledge (OR=0.299, 95% CI: 0.128–0.689), training (OR=3.2, 95% CI: 1.8–5.6), and experience (OR=1.9, 95% CI: 1.1–3.4) as significant predictors of disaster preparedness. Logistics compliance did not reach statistical significance (p=0.209).

Table 1. Demographic profile of emergency medical service personnel of the Bureau of Fire Protection-National Capital Region

Variables	Frequency (n=198)	Percentage (%)
Age ($\bar{x}$ = 35)		
20-24	5	4
25-29	17	13.6
30-34	47	37.6
35-39	48	38.4
40-44	3	2.4
45-50	3	2.4
>50	2	1.6
Gender		
Female	41	32.8
Male	84	67.2

Discussion

This study looked into the factors that influence the delivery of basic pre-hospital trauma care during disasters by the emergency medical services personnel within the Bureau of Fire Protection. The results indicated that knowledge, training, and experience were strongly associated with a higher level of disaster preparedness. Knowledge resulted as the most significant predictor among the different factors. The

Table 2. Capability status of the emergency medical service of the Bureau of Fire Protection (Logistics, Training, and Experience).

Capability Factor	Category	Frequency (n=125)	Percentage (%)
Logistics	Compliant	27	21.6
	Partially Compliant	66	52.8
	Not Compliant	32	25.6
Training	Fully Capable	55	44.0
	Capable	30	24.0
	Not Capable	40	32.0
Experience	≥3 years	74	59.2
	<3 years	51	40.8

Table 3. Relationship between knowledge of basic pre-hospital trauma care and the disaster preparedness level of the Bureau of Fire Protection EMS Team.

Variable	Mean	p value	r-value
Knowledge of Basic Pre-Hospital Trauma Care	10.304	6.30E-63	0.95
Disaster Preparedness	124.92		

* The reference (comparator) category used was *Poor Knowledge* (<10).
**R-value: Pearson Correlation Coefficient

Table 4. Relationship between variables of the capability status of emergency medical services and the disaster preparedness level of the Bureau of Fire Protection.

Status of Capability	p value	r-value
Logistics	6.30E-63	0.72
Training	1.08E-53	0.92
Experience	3.67E-24	0.75

* In each factor, the lowest performing group served as the comparator ("Not Compliant", "Not Capable", "< 3 years")
** R-value: Pearson Correlation Coefficient

Table 5. Best predictor of good basic pre-hospital trauma care in a disaster situation.

Variable	Odds Ratio	95% Lower Limit	95% Upper Limit	p value
Knowledge				
Good (≥10) knowledge vs Poor knowledge	.299	.128	.689	<0.01
Poor (<10) knowledge				
Logistical Capability				
Compliant vs Not Compliant	2.021	0.39	6.049	.209
Partially Compliant vs Not Compliant	1.08	0.39	3.000	0.887
Not Compliant				
Training Capability				
Fully Capable vs Not Capable	3.2	1.8	5.6	<0.01
Capable vs Not Capable	1.8	1.15	2.82	<0.01
Not Capable				
Experience Capability				
≥3 years vs <3 years	1.9	1.1	3.4	<0.05
<3 years				

findings are congruent with the study of Abebe et al. (2023). They noted that the factors that increased the odds of good practice in pre-hospital care included providing advanced life support, adequate monitoring, and access to defibrillators, having 4-5 years of work experience, and having the opportunity to continue education.

The findings of this study are also consistent with previous research by Nandasena (2018) and Sener (2006). They indicated that inadequate knowledge among EMTs affects emergency response efficacy. Furthermore, James (2015) also emphasized that education and training significantly reduce casualties and mitigate disaster impacts. The findings of this

study support the need for regular refresher courses, knowledge evaluations, and training simulations to enhance EMS performance. In the Philippines, where EMS personnel are primarily trained only as EMT-Basic (DOH, 2018), knowledge gaps may hinder effective trauma care in disaster settings.

Training was also identified as a major factor. EMS professionals who have comprehensive training of EMT, Basic Life Support, and Standard First Aid were three times more likely to be adequately prepared during a disaster. This confirms the findings of Beyramijam et al. (2021) and Abebe et al. (2023), who emphasized the significance of continuous training in disaster response. As suggested by James (2015) and Ciottone (2015), comprehensive EMS training improves triage accuracy, critical decision-making, and casualty outcomes during disasters. Therefore, scaling up BLS, Advanced Cardiovascular Life Support (ACLS), and EMT training programs, along with potential introduction of Advanced EMT or Paramedic programs, may significantly elevate the overall quality of EMS in the country.

This study also shows that experience enhances disaster preparedness. This aligns with the study of Abebe et al. (2023) and Ciottone (2015), which emphasized the significance of experience in decision-making and field competence. Experience also influences self-efficacy in high-pressure scenarios, which are crucial in mass casualty incidents (Uhm et al., 2019). However, it is important to note that the duration of service in this study does not correspond to the consistent exposure to actual disasters. This shows a possible limitation of this factor.

The Department of Health (2018) issued the *Revised Rules and Regulations Governing the Licensing of Land Ambulances*, outlining the required equipment for Type 1 and Type 2 ambulances—essential logistics for EMS teams. While logistics showed a strong correlation with disaster preparedness, logistic regression analysis revealed it was not a significant predictor. This suggests that equipment alone is insufficient to enhance preparedness without qualified and experienced personnel to utilize it effectively, a conclusion supported by Lyng et al. (2021). Similarly, Padlan and Gaerlan (2018) highlighted long-standing issues in the Philippine EMS, including logistical inconsistencies and a lack of standardization.

Alotaibi and Khan (2019) emphasized the interrelationship between knowledge, training, and experience, noting that improvements in one area often enhance overall disaster preparedness. Their findings support the need for a multifaceted approach to strengthening EMS personnel readiness, aligning with the *Action Framework for Pre-Hospital Emergency Medical Services* issued by the Department of Health (2014). This approach includes targeted training, retention of experienced personnel, and ongoing education. Additionally, the present study underscores existing gaps in recognizing EMS as a professional discipline in the Philippines, which may hinder institutional support for a comprehensive and sustainable training system.

A key limitation of this study is its focus on a single region, which limits the generalizability of the findings. Future research should explore disaster preparedness among EMS personnel in other regions, particularly those frequently exposed to diverse disaster types such as volcanic eruptions and earthquakes.

References

Abebe A, Kebede Z & Demissie DB. (2023). Practice of pre-hospital emergency care and associated factors in Addis Ababa, Ethiopia: Facility-based cross-sectional study design. Open Access Emerg Med 15: 277–87.

Beyramijam M, Farrokhi M, Ebadi A, Masoumi G & Khankeh HR. Disaster preparedness in emergency medical service agencies: A systematic review. J Educ Health Prom 10: 249.

Beyramijam M, Farrokhi M, Ebadi A, Masoumi G & Khankeh HR. (2021). Disaster preparedness in emergency medical service agencies: A systematic review. J Educ Health Prom 10: 258.

Catlett C, Jenkins L & Millin MG. (2011). Role of emergency medical services in disaster response: Resource document for the National Association of EMS Physicians position statement. Prehosp Emerg Care 15(3): 420–5. https://doi.org/10.3109/10903127.2011.561401

Ciottone GR, Biddinger PD, Darling RG, Fares S, Keim ME, Molloy MS & Suner S. (Eds.). Ciottone's Disaster Medicine (2nd ed.). Elsevier Health Sciences 2015.

Committee on Guidance for Establishing Crisis Standards of Care for Use in Disaster Situations. (2012). Crisis Standards of Care: A Systems Framework for Catastrophic Disaster Response. The National Academies Press. https://doi.org/10.17226/13351

Department of Health. (2014). Action framework for pre-hospital emergency medical services. Department of Health, Philippines.

Department of Health. (2018). Revised rules and regulations governing the licensure of land ambulances and ambulance service providers. Republic of the Philippines.

Garbutt SJ, Peltier JW & Fitzpatrick JJ. (2008). Evaluation of an instrument to measure nurses' familiarity with emergency preparedness. Milit Med 173(11): 1073–7. https://doi.org/10.7205/MILMED.173.11.1073

Global Facility for Disaster Reduction and Recovery. (2017). Philippines: Country risk profile. https://www.gfdrr.org

Haghparast-Bidgoli H, Hasselberg M, Khankeh H, Khorasani-Zavareh D & Johansson E. (2010). Barriers and facilitators to provide effective pre-hospital trauma care for road traffic injury victims in Iran: A grounded theory approach. BMC Emerg Med 10(1): 1–11. https://doi.org/10.1186/1471-227X-10-20

Ho M. (2020). Strengthening EMS systems in the Asia-Pacific: A public health approach. WHO Regional Office Reports 14(2), 23–9.

James J, Rifino SE & Mahon P. (2015). Role of emergency medical services in disaster management and preparedness. In GR Ciottone et al. (Eds.): Ciottone's Disaster Medicine (2nd ed.). Elsevier Health Sciences.

Lyng K. (2021). Disaster preparedness among emergency medical service providers: A systematic review protocol. J Educ Health Prom 10: 249.

Mehmood A, Rowther AA, Kobusingye O & Hyder AA. (2018). Assessment of prehospital emergency medical services in low-income settings using a health systems approach. In J Emerg Med 11(1), 53. https://doi.org/10.1186/s12245-018-0218-0

Padlan JA & Gaerlan MM (2018). Review of pre-hospital emergency care and EMS systems in the Philippines: Challenges and opportunities. Phil J Emerg Med 13(1), 12–18.

Republic Act No. 11589. (n.d.). An act strengthening and modernizing the Bureau of Fire Protection and appropriating funds therefor. https://www.officialgazette.gov.ph/2021/09/10/republic-act-no-11589/

Tourani S, Malmoon Z, Zaboli R, Jafari M & Arabloo J. (2018). Key aspects of disaster preparedness among emergency medical service agencies: A systematic review. J Educ Health Prom 7: 111.

Uhm DC, Jung HY & Kim HJ. (2019). Factors influencing the disaster response competency of emergency medical technicians. J Emerg Nurs 45(3): 245–52. https://doi.org/10.1016/j.jen.2018.10.008

World Economic Forum. (2018). The global risks report 2018. https://www.weforum.org/reports/the-global-risks-report-2018