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Improving paramedic preparedness to mass casualty incidents: an implementation study using PARIHS framework

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ABSTRACT

It has been observed that healthcare workers, prehospital care providers, as well as other frontline responders, are often made responsible to be both willing and able to provide a timely response in the events of disaster. Even though Kuwait is situated in a politically conflicting zone where the country has witnessed several major incidents, prehospital care providers are still not given standardized preparation training to respond to these incidents of disaster. There is also a lack of evidence related to the ambulance staff's preparedness status in Kuwait to manage disasters. Moreover, to evaluate the socio-contextual factors related to the implementation procedures of mass casualty training, limited studies have been conducted in the existing body of literature. Problem: This study has tried to address the problems or barriers that are undermining the preparedness of prehospital care providers under the events of disaster or mass causality by utilizing the PARIHS model.

Keywords: *Paramedic, Disaster Medicine, Mass Casualty, Professionalism, PARIHS Framework, Leadership*

1. INTRODUCTION

It has been observed that emergency medical services (EMS) often play a crucial role under planning, recovery, and providing timely responses while dealing with the events of disaster.[1] In this regard, agencies related to prehospital care are typically made responsible to deal with such incidents or major disasters. This is because in these situations their role typically exceeds in comparison to normal or every day cases of emergencies in which they are required to attend to a single patient. Moreover, they are also considered as first responders who deal with disturbing or stressful situations which also sometimes compels them to work under risky or hazardous weather conditions. [2]

In such disastrous incidents, it is also considered highly important for prehospital care providers to act swiftly to provide the utmost benefits to their patients by also maintaining their own safety, as well as the safety of others who are found on the scene. To do this, they are required to set control and command, triage, provide treatment to victims, and transfer these victims/patients at the nearby healthcare facilities.[3]

Thus, one can infer that without modern and effective healthcare system under prehospital settings, people can suffer from additional or preventable mortality and morbidity under the occurrence of major incidents.[4] In this regard, the interest in creating and providing robust service related to medical emergencies and empowering prehospital care staff can be considered as a highly significant issue related to public policy. In such issues, key stakeholders that are impacted after the occurrence of a casualty/disastrous incident include the healthcare officials, government institutions, health professionals, national security agencies, as well as other businesses.[5]

There is also a consensus that appropriate training should be given to the prehospital care providers so that they can provide adequate responses by utilizing a formal major incident management command system.[6] This approach is usually described as an organized process for managing resources and personnel during the occurrence of a mass casualty event.[7] Thus, the main objective of this study is based on implementing a training intervention to enhance the awareness and knowledge of paramedics and EMTs under the Kuwait Emergency Medical Service (KEMS).

It has also tried to enhance the preparedness of prehospital care providers related to managing such mass casualty events. By using the PARiHS framework, the study has also assessed the socio-contextual factors that are hindering the appropriate implementation

of mass casualty training under a prehospital setting. Finally, by introducing a training program associated with the mass casualty, the study has tried to increase both the confidence and knowledge of prehospital providers in providing adequate responses under the crisis situation.

2. METHODS

This research has utilized a mixed methodology[8] for which a case study was used to carry out qualitative analysis, while the quantitative analyses were conducted by making post-test and pre-test evaluations of the effectiveness of MCIs training that was implemented in KEMS. The case study method was used to obtain information and study the political, economic, and social factors that are currently prevailing in Kuwait and impacting the effectiveness of prehospital care providers. Whereas, for quantitative analysis, post-test and pre-test evaluations were made by using PARiHS framework.[9]

This framework can be described as a setting or an environment under which healthcare services are offered to the patient. It can also be defined as an environment where change practices are used and evidence is implemented. However, in this study, a modified/updated PARiHS framework was used to offer clear operational and conceptual definitions, practical information, and data about the realities of application and measurement approaches. Moreover, the framework involved the use of four modified steps related to gathering data, creating and testing educational programs, conducting analyses of the collected data, and refining/reviewing the program based on the results of the analyses.[10]

The framework was utilized as an intervention to enhance the preparedness of prehospital caregivers. Furthermore, under this design, questionnaires were used to collect data and while conducting the pre-test analysis, performance, and situations in which prehospital caregivers work were examined, including thessir competence and quality of services. From different ambulance districts of Kuwait, thirty-one participants were also chosen (by using convenience sampling method) who were asked to fill the questionnaires and they were also given disaster management training under the Kuwait EMS department.

In addition to this, after the implementation of this training program which was created by considering the framework of PARiHS, post-analysis was made to again assess the potential improvements under the competence and quality of services that are provided by prehospital caregivers. The utilization of mixed research also helped in gaining more information related to creating effective intervention strategies.

To analyze the quantitative data under this study, SPSS software edition 22 was used (which is provided by IBM).[11] This also includes the implementation of a dependent t-test to assess the mean difference under the knowledge scale between immediate post-tests/pre-test results and delayed post-test scores. Standard deviations and means were utilized to comprehend the responses of the patients towards post-training and pre-training surveys where the p-value of <0.001 was considered statistically significant. Similarly, t-test, repeated measures analysis of variance, as well as one-way ANOVA test were also utilized to study and analyze the collected data in this research.

3. RESULTS

The results of the first intervention indicated that changes under the knowledge at the mean score were substantially higher, immediately after the implementation of this intervention at $t(30) = -15.3$, $p < 0.01$. The mean score of the participants for twenty multiple-choice questions was higher (i.e., 12.35) under the pre-test results in comparison to post-test results (i.e., 18.19). Whereas, the lowest mark that was recorded in the pre-intervention was 6 but it was increased to 14 as per the post-test results. Many respondents were also able to score 20 marks within the post-tests, indicating that the training was effective to enhance the knowledge of participants about MCIs management (see appendix 1).

After the first intervention, the results of the second follow-up intervention also revealed that the changes under the knowledge of the respondents at the mean score were substantially higher immediately after the implementation of this intervention at p-value ($0.000 < 0.01$). The mean score in the 20 multiple choice questions under the post-test was observed to be around 18.19. Whereas, after this post-test training, the lowest score of 2 was increased to 14 marks in comparison to the lowest score of 6 under the initial pre-intervention of the first training program. Moreover, many respondents were also found to score as high as 20 marks, indicating the effectiveness of the training in enhancing their knowledge about MCIs management.

At the end of the training under the second intervention, participants were also given another test after 3 months and the combined results of all these tests indicated a noteworthy difference within the knowledge assessment scores of all three occasions (i.e., 3 months post- intervention, pre-test, and post-test). After the implementation of the second training course, an increase can be observed under the mean score by 19.80. Moreover, the results are also highlighting significant differences under the attempts that were made in all the three tests at p- value < 0.01. Furthermore, the scores indicating improvements under the results of both post-test 1 and 2 were also recorded at $t(30) = -5.1$, $p < 0.001$ (see appendix 2).

4. DISCUSSION

The test results related to the first intervention showed that the training course (having a duration of five hours) was more beneficial in meeting the training requirements of prehospital care providers at KEMS. These benefits were also evident under the training sessions, including the results that were obtained from the course evaluation report. Score comparison before and after the intervention also indicated that the training sessions were able to improve both the awareness and knowledge of the prehospital care providers. The overall evaluation of the facilitation factors and context of these training sessions was conducted by using the PARIHS assessment tool and the ratings for each of these facilitation factors and context has been provided in table 3 (see appendix 3).

Similarly, the results of the second training course were also able to confirm the value and worthiness of the MCIs preparedness training for enhancing the awareness and knowledge of prehospital care providers. The first intervention was found to positively impact both the participants, as well as other paramedics' understanding and knowledge about MCI. This positive impact was also verified from the applications that were sent to the planning department that was part of the training courses. This, as a result, helped in raising the awareness of the significance of these training sessions and convinced both the first-line managers and directors of KEMS to provide support in carrying out the second training course.

The cultural and contextual enhancement further facilitated the implementation procedures for the second training session/course. The results of this experimental intervention also helped in formulating a novel constructive and receptive culture in KEMS that has the potential to foster collaboration and coordination for future training projects. However, the findings of these experiments also revealed that the submission of the training course as a standardized training procedure under the authority of the KEMS department could have further helped in strengthening the intervention. This, in turn, would have helped in achieving continuous quality improvements. The results of the assessments that were conducted by using the PARiHS framework to measure the effectiveness of the second intervention have been provided in appendix 4.

However, this study is not without its limitations. For instance, one such limitation is related to the small size of the sample that can compromise the external validity of the above findings and their generalization in the larger population.[12] Moreover, the inferences that have been made in this study are also limited to the prehospital care settings, thus the results obtained from the analyses cannot be generalized on other types of respondents. Future studies on this topic should try to narrow down the analysis to conducting more specific evaluations like determining the significance of management and technology in enhancing the skills of healthcare workers and improving the performance of the prehospital care sector.

5. CONCLUSION

Due to the growing number of emergency incidents in Kuwait, the need for well-trained prehospital care providers cannot be overlooked. Emergency incidents from explosions, terrorist attacks, and major accidents all require a well-educated and experienced workforce at the scene to properly handle MCIs.[13] The Ministry of Health in its efforts to ensure preparedness in managing mass causality events should ensure that proper and well-trained prehospital providers are employed in ambulance centers. Training of staff also stands to be the best method of preparing for emergencies.

For help care providers, it is essential for the Ministry of Health to enhance their professionalism and competence through approaches such as continuous education. Moreover, this study has demonstrated that the EMS provider's interests of enhanced knowledge should be encouraged by health authorities such as the Ministry of Health and other healthcare organizations that are committed to implementing training programs. Furthermore, improper coordination and collaboration between different departments in health facilities is captured as one of the barriers to effective training of EMS providers despite the EMS providers' interest in being trained. EMS should, therefore, ensure sufficient training manpower to deal with manmade and natural disasters. Similarly, as reflected in the PARiHS framework evaluation, it is evident that consistent training of the prehospital caregivers should be the foundation of improving the skills and professionalism of these individuals. However, for this to take effect, it is important for organizations to adopt effective leadership and management strategies. In summary, this research has established that there is a need for consistent training among prehospital care providers which is related to improving their abilities to deal with disasters and mass casualty catastrophes. Important aspects of enhancing these individuals' skills include effective management and performance appraisal which improves their motivation. Thus, it can be concluded that it is important for emergency medical services departments that they always ensure lifelong learning among the prehospital caregivers and improve on leadership and management approaches that can aid in enhancing the welfare of the patients and reduce the mortality rates.

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APPENDICES

Appendix: 1

Table 1: Comparison between pre and posttests results

	N	Minimum	Maximum	Mean	SD
Pretest results	31	6	18	12.4	2.8
Posttest results	31	14	20	18.2	1.9

Appendix: 2

Table 2: The posttest knowledge score after the second training

	N	Minimum	Maximum	Mean	SD
Posttest results	31	18	20	19.8	0.5

Appendix: 3

Table 3: Results of PARiHS culture and facilitation Assessment for the first intervention

PARiHS construct and sub-elements	First Intervention
Context	
Leadership	Low – Leadership support the MCIs training.
Culture	Low – Low awareness, local environment is unsupportive, limited opportunity for innovation.
Evaluation	Mixed – Some auditing of and/or feedback on group and/or individual performance.
Context assessment	**Low context (C)**
Facilitation	
Characteristics of facilitator and style	High – Exhibition of commendation of respect, credibility, and empathy.
Role of facilitator	High- Participants reported that facilitator a flexible. Well defined and clearly role to support implementation.
Facilitation assessment	**High facilitation (F)**
Overall ratings of PARiHS constructs	**LC, HF**

Appendix: 4

Table 4: Results of PARiHS Assessment for the Second Intervention

PARiHS construct and sub-elements	First Intervention
Context	
Leadership	Mixed – Majority of leadership support the MCIs training. Still conflict present and incoordination.
Culture	Mixed- Awareness improved, local environment became more supportive, the intervention perceived positively.
Evaluation	Mixed – Some auditing of and/or feedback on group and/or individual performance.
Context assessment	**Mixed context (C)**
Facilitation	
Characteristics of facilitator and style	High – Exhibition of commendation of respect, credibility, and empathy.
Role of facilitator	High- Participants reported that facilitator a flexible. Well defined and clearly role to support implementation.
Facilitation assessment	**Mixed facilitation (F)**
Overall ratings of PARiHS constructs	**MC, HF**

