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Hazardous materials and CBRN incidents: Fundamentals of pre-hospital readiness in the State of Qatar

Hassan Farhat^{1,*}, Padarath Gangaram^{1,7}, Nicholas Castle^{1,7}, Mohamed Chaker Khenissi¹, Sonia Bounouh¹, Naveen Pullian¹, Mohamed Khnissi¹, Imed Gargouri², Moncef Khadhraoui³, James Laughton¹, Guillaume Alinier^{1,4,5,6}

ABSTRACT

Background: Hazardous Materials and Chemical/Biological/Radiological/Nuclear (HazMat-CBRN) incidents represent a serious threat to the population and the environment¹. They require a pre-hospital medical response system well equipped and supported with logistics and clinicians with appropriate knowledge and skills to prevent exposure and mitigate risks. Our aim is to determine if the Hamad Medical Corporation Ambulance Service (HMCAS) fulfils the pre-hospital readiness requirements for such incidents.

Methods: This cross-sectional study was performed in HMCAS. An online survey assessed staff behaviour and knowledge in relation to HazMat-CBRN incidents. Responses were obtained on health risks and pre-hospital medical management of related threats in Qatar. Based on the results, a training module "HazMat Incident Management" was prepared with pre-/post-activity assessments. The results were explored using a multivariate linear regression and non-parametric Wilcoxon test for paired samples. Specialized Emergency Management (SEM) staff opinion about this training was assessed through an online survey. Both surveys' validity and reliability tests were conducted. Ishikawa cause and effects diagram was built for the identification of the factors leading to a pre-hospital successful response to HazMat-CBRN incidents.

Results: HMCAS has the proper logistics and plans to manage potential HazMat-CBRN incidents. The knowledge survey demonstrated that the pre-hospital medical staff information about this topic needs reinforcement. The multivariate linear regression (Table 1) and non-parametric Wilcoxon test (Table 2) demonstrated that this was obtained thanks to the implemented training module. The course satisfaction survey showed not only a big interest in this activity but also staff recommended more related topics². Earlier-RSDAT (Recognition, Safety, Decontamination, Antidot, Transport) is a tool proposed as a response acronym to build a successful risk-based response for HazMat CBRN incidents in pre-hospital setting³.

Conclusion: HMCAS fulfils the readiness requirements for safe and effective response to potential HazMat-CBRN incidents in Qatar. The RSDAT response matrix might help in mitigating pre-hospital response risks.

Keywords: HazMat-CBRN, risk, readiness, environment, response

¹Hamad Medical Corporation Ambulance Service, Doha, Qatar
²Faculty of Medicine, University of Sfax, Sfax, Tunisia
³Higher Institute of Biotechnology, University of Sfax, Sfax, Tunisia
⁴School of Health and Social Work, University of Hertfordshire, College Lane, Hatfield, HERTS, AL10 9AB, United Kingdom
⁵Weill Cornell Medicine – Qatar, Doha, Qatar
⁶Faculty of Health and Life Sciences, Northumbria University, Newcastle upon Tyne, United Kingdom
⁷Faculty of Health Sciences, Durban University of Technology, P O Box 1334, Durban, 4000, South Africa
*Email: Hfarhat1@hamad.qa

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Table 1. Multivariate linear regression (Anova, coefficients and model summary)

Model	Sum of squares	Df	ANOVA ^a			Sig.
			Mean square	F		
1	Regression	10.550	4	2.637	0.890	0.471 ^b
	Residual	533.504	180	2.964		
	Total	544.054	184			

a. Dependent variable: post-test

b. Predictors: (constant), status, gender, position, pre-test

Coefficients ^a								
Model		Sum of squares	Df	Standardized coefficients	T	Sig.	95.0% Confidence interval for B	
							Beta	Lower bound
1	(Constant)	10.244	1.692		6.053	0.000	6.905	13.584
	Pre-test	0.028	0.052	0.040	0.534	0.594	-0.074	0.129
	Gender	0.779	0.564	0.103	1.382	0.169	-0.333	1.892
	Position	0.063	0.099	0.047	0.634	0.527	-0.133	0.258
	Status	0.748	0.786	0.071	0.952	0.343	-0.803	2.300

a. Dependent Variable: Post-test

Model summary ^b									
Model	R	R square	Adjusted R Square	Std. error of the estimate	Change statistics				
					R square change	F change	df1	df2	Sig. f change
1	.139 ^a	0.019	-0.002	1.722	0.019	0.890	4	180	0.471

a. Predictors: (constant), status, gender, position, pre-test

b. Dependent variable: post-test

Table 2. Wilcoxon signed ranks test

Ranks					Test statistics ^a	
	N	Mean rank	Sum of ranks		Post-test - Pre-test	
Post-test - Pre-test	Negative ranks	0 ^a	0.00	0.00	Z	-11.721 ^b
	Positive ranks	182 ^b	91.50	16653.00	Asymp. Sig. (2-tailed)	1.00017 × 10 ⁻³¹
	Ties	3 ^c			a. Wilcoxon signed ranks test	
	Total	185			b. Based on negative ranks.	

a. Post-test > Pre-test

b. Post-test < Pre-test

c. Post-test = Pre-test

Ethical approval statement: This study has been approved by the HMC Medical Research Centre as a quality improvement/audit project (Ref: MRC-01-20-372).

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