

# Northumbria Research Link

Citation: Farhat, Hassan, Gangaram, Padarath, Castle, Nicholas, Chaker Khenissi, Mohamed, Bounouh, Sonia, Pullian, Naveen, Khnissi, Mohamed, Gargouri, Imed, Khadhraoui, Moncef, Laughton, James and Alinier, Guillaume (2021) Hazardous materials and CBRN incidents: Fundamentals of pre-hospital readiness in the State of Qatar. Journal of Emergency Medicine, Trauma and Acute Care, 2021 (2). ISSN 1999-7086

Published by: Hamad bin Khalifa University Press

URL: <https://doi.org/10.5339/jemtac.2021.qhc.35>  
<<https://doi.org/10.5339/jemtac.2021.qhc.35>>

This version was downloaded from Northumbria Research Link:  
<http://nrl.northumbria.ac.uk/id/eprint/47520/>

Northumbria University has developed Northumbria Research Link (NRL) to enable users to access the University's research output. Copyright © and moral rights for items on NRL are retained by the individual author(s) and/or other copyright owners. Single copies of full items can be reproduced, displayed or performed, and given to third parties in any format or medium for personal research or study, educational, or not-for-profit purposes without prior permission or charge, provided the authors, title and full bibliographic details are given, as well as a hyperlink and/or URL to the original metadata page. The content must not be changed in any way. Full items must not be sold commercially in any format or medium without formal permission of the copyright holder. The full policy is available online: <http://nrl.northumbria.ac.uk/policies.html>

This document may differ from the final, published version of the research and has been made available online in accordance with publisher policies. To read and/or cite from the published version of the research, please visit the publisher's website (a subscription may be required.)



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

Hassan Farhat<sup>1,\*</sup>, Padarath Gangaram<sup>1,7</sup>, Nicholas Castle<sup>1,7</sup>, Mohamed Chaker Khenissi<sup>1</sup>, Sonia Bounouh<sup>1</sup>, Naveen Pullian<sup>1</sup>, Mohamed Khnissi<sup>1</sup>, Imed Gargouri<sup>2</sup>, Moncef Khadhraoui<sup>3</sup>, James Laughton<sup>1</sup>, Guillaume Alinier<sup>1,4,5,6</sup>

### ABSTRACT

**Background:** Hazardous Materials and Chemical/Biological/Radiological/Nuclear (HazMat-CBRN) incidents represent a serious threat to the population and the environment<sup>1</sup>. 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 topics<sup>2</sup>. 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 setting<sup>3</sup>.

**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

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

<http://dx.doi.org/jemtac.2021.qhc.35>

© 2021 Farhat, Gangaram, Castle, Khenissi, Bounouh, Pullian, Khnissi, Gargouri, Khadhraoui, Laughton, Alinier, licensee HBKU Press. This is an open access article distributed under the terms of the Creative Commons Attribution license CC BY-4.0, which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

كيوساينس  
QSCIENCE

دار جامعة حمد بن خليفة للنشر  
HAMAD BIN KHALIFA UNIVERSITY PRESS

Cite this article as: Farhat H, Gangaram P, Castle N, Khenissi MC, Bounouh S, Pullian N, Khnissi M, Gargouri I, Khadhraoui M, Laughton J, Alinier G. Hazardous materials and CBRN incidents: Fundamentals of pre-hospital readiness in the State of Qatar, *Journal of Emergency Medicine, Trauma & Acute Care* 2021;35 <http://dx.doi.org/jemtac.2021.qhc.35>

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

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

a. Dependent variable: post-test

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

		Coefficients <sup>a</sup>						
Model				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 <sup>b</sup>									
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 <sup>a</sup>	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 <sup>a</sup>	
		N	Mean rank	Sum of ranks	Post-test - Pre-test	
Post-test - Pre-test	Negative ranks	0 <sup>a</sup>	0.00	0.00	Z	-11.721 <sup>b</sup>
	Positive ranks	182 <sup>b</sup>	91.50	16653.00	Asymp. Sig. (2-tailed)	1.00017 × 10 <sup>-31</sup>
	Ties Total	3 <sup>c</sup>	185		a. Wilcoxon signed ranks test b. Based on negative ranks.	

a. Post-test &gt; Pre-test

b. Post-test &lt; 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).

**Disclosures and acknowledgements:** We have No affiliations or involvement within any organization or entity with any related financial interest.

#### REFERENCES

- [1] Lynn M. Prehospital Planning and Response to Sudden Mass Casualty Incidents. In: Lynn M. et al. (eds) Disasters and Mass Casualty Incidents. *Springer, Cham*;2019. p. 11–28.
- [2] Djalali A, Della Corte F, Segond F, Metzger M, Gabilly L, Grieger F, et al. TIER competency-based training course for the first receivers of CBRN casualties: a European perspective. *Eur J Emerg Med.* 2017;24(5):371–376.
- [3] Macintyre AG, Christopher GW, Eitzen, Jr E, Gum R, Weir S, DeAtley C, et al. Weapons of mass destruction events with contaminated casualties: effective planning for health care facilities. *JAMA.* 2000;283(2):242–9.