AOJ Public Health

Research Article

Open Access

Development and Validation of a Tool to Identify the Gaps in Emergency Management Competencies among Personnels Involved in Public Health Emergency Management in Qatar

Volume 1 Issue 1 – 2026

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Received: January 01, 2026 **Published:** March 17, 2026

Citation: Jesha Mohammedali Mundodan. Development and Validation of a Tool to Identify the Gaps in Emergency Management Competencies among Personnels Involved in Public Health Emergency Management in Qatar. AOJ Pub Health. 2026;1(1):18–29.

Abstract

To build the competencies of the public health workforce in Qatar, continuous training and36 performance improvement should be rigorously advocated for. To meet these objectives a team of experts, including disaster management specialists, andbiostatistician/epidemiologist convened to develop the required tools addressing varying roles, responsibilities, and proficiency levels within the target audience. The team conducted comprehensive literature review of articles on competency development, competency frameworks, and training needs assessment studies. Following an iterative procedure of reviewing, drafting, and editing, two questionnaires were developed: one targeting frontliners and the other targeting supervisors. The tools were developed in English. A total of 12 domains were formulated. Each domain consisted of several items that explained knowledge, skills, and behaviors relevant to measuring the domain. The number of items in frontliners and supervisors' tools were 63 and 86, respectively. The newly developed tools underwent validation and were piloted. The validation resulted in nine competencies and their respective 39 items in the frontliners' tool. While all 12 domains/competencies were retained for the supervisors' tool with their respective items 5 77. In-addition necessary adjustments to the items were made to ensure clarity and comprehension of the items in the tool.

Keywords: Measurement, Public health, Emergency planning

Introduction

With the increasing threat of hazardous events at local, national, and global levels, an effective workforce for emergency and disaster risk management (EDRM) in local, national, and international communities is urgently needed. Under the International Health Regulation (IHR, 2005), countries are requested to strengthen their emergency preparedness and response efforts for the early detection and timely response to public health emergencies.[1]The recent COVID-19 pandemic has shown the gaps in emergency management that have a devastating impact on the population's health and the country's economy.[2,3] The pandemic has proven that no country is immune to emergencies, and a robust public health workforce is a must, regardless of their development status. A competent emergency management workforce is crucial to prevent, prepare for, and effectively respond to public health emergencies.

International standards on education and training in the field for disaster management emphasize that education and training programs should be both multidisciplinary and transdisciplinary and based on a modular approach.[4] This strongly implies that the definition of relevant competencies must consider the wider audience the education and training might include. However, there are no universally accepted set of competencies for EDRM workforce.

Review of literature conducted through different search engines, including but not limited to medical databases, revealed that vast majority of articles reviewed still reported competencies directed to the health care sector. Among the studies that included multidisciplinary competencies, that of the American Medical Association Center for Public Health Preparedness and Disaster Response provides a comprehensive consensus- based set of competencies that integrates all the health specialties involved in disaster medicine and public health.[5]

To build the competencies of the public health taskforce it is crucial to identify the gaps in competencies and determine the training needs of personnels involved in public health emergency management and based on these results activities can be recommended to fill the gaps identified. However, no validated tool was found during literature search, to identify the gaps in emergency management competencies.

these results activities can be recommended to fill the gaps identified. However, no validated tool was found during literature search, to identify the gaps in emergency management competencies.

Objective

To develop validated tools (questionnaires) to identify the gaps in emergency management competencies: one targeting frontliners and the other targeting supervisors among the workforce of key stakeholders in Qatar both health and non-health sectors.

Methodology

Tools Development

A team of experts, including disaster management specialists, and a biostatistician/epidemiologist were convened to develop tools to assess the gaps in competencies based on public health emergency management and training needs.

Through comprehensive literature review of articles on competency development, competency frameworks, and training needs assessment studies a pool of items was developed by a team of experts, including disaster management specialists, and a biostatistician/epidemiologist. The tools were drafted after a comprehensive literature Review, [6,11] including articles on competency development.[12,15] The review was also supplemented with the review of frameworks and documents disseminated by professional organizations, which included competencies frameworks such as "the Council of Linkages (CoL) Core Competencies for Public Health Professionals"[16], "Civil Defense Emergency Management Competency Framework (CDEM),"[17] "Clinical Leadership Competency Framework,"[14] "FEMA Next Generation Core Competencies"[15] "Enhanced WHO global competency model"[18] and CDC Public Health Emergency Preparedness – Core Competencies for EU Member States.[19] Following an iterative process that involved review, comment, and extensive editing, competencies were finalized. A total of 12 competencies were formulated as seen in Table 1. Each competency / domain consisted of several items that explained knowledge, skills, and behaviors relevant to measuring the domain.

Table1. Public health emergency management competencies

Domains	Number of items in the domain	
Frontliners		**Supervisors**
Perform assigned Emergency Management roles in accordance with existing organizational plans.	4	5
Demonstrate effective emergency management planning.	4	11
Demonstrate effective emergency preparedness	9	9
Demonstrate effective incident Management	6	6
5. Implement effective risk communication during all phases of emergency management (prevention, preparedness, response, recovery).	5	9
6.Demonstrate knowledge and skills of surveillance processes	8	6
7.Establish and maintain relationships with key individuals, partner organizations and communities.	5	7
8. Endorses the principles of legal considerations, human rights and ethics of public health across the job functions of emergency management.	4	5
9. Demonstrate knowledge of safety measures and precautions that must be implemented in public health emergencies.	4	5
10.Demonstrate knowledge of principles and practices for the management of the population affected by a public health emergency.	4	5
11.Demonstrates appropriate knowledge, skills, and abilities of patient care during public health emergencies	3	3

Disaster response demands a large workforce with diverse professional disciplines, subspecialty categories, and levels of professional experience and cultural expertise. Two levels of proficiency in emergency management were identified within an organization: frontline workforce and supervisors/ managers, as shown in Box 1, adapted from the Council of Linkages (CoL) Core Competencies for Public Health Professionals.[15]

1) The frontliners are the personnels at the forefront of emergency management. Their tasks may include, data collection, analysis, risk management, resource management, communication, laboratory work, outbreak investigation and fieldwork, surveillance, environment safety, border control and other organizational tasks. Examples of frontliners include public health responders, physicians, pharmacists, nurses, civil defense (fire fighters, search and rescue teams), and armed forces (policemen, and military). These individuals are not in supervisory roles or management positions.

2) Emergency management personnels with senior management and leadership responsibilities including program leader, team leader, supervisor, chair of department/unit, director, etc. They are usually in the backseat of the response rather than the frontlines. Their responsibilities may include developing, implementing, evaluating, and improving programs; supervising and mentoring staff; establishing and maintaining partnerships with other organizations and the community, advocating for program resources; making policy recommendations and providing subject matter expertise. Two tools were developed in English, one targeting frontliners and the other targeting supervisors. The number of items in frontliners' and supervisors' tools were 63 and 86, respectively. The newly developed tools underwent validation to determine whether the tools measure what they intend to measure and were pilot tested to improve comprehension and clarity of items.

Validation of tool

Questionnaire validation is an essential step, ensuring that the instrument accurately measures the construct under study. To assess the face validity and content validity, the tool was shared with twenty three Subject Matter Experts (SME) in the field of public health emergency management, affiliated with national organizations such as Qatar Ministry of Public Health, regional and global public health organizations including the Eastern Mediterranean Public Health Network (EMPHNET), World Health Organization (WHO), Center for Disease Control and Prevention (CDC), and UK Health Security Agency (UKHSA), as well as academic institutions like the International Academy of Public Health (IAPH), University of Baghdad, Ras Laffan College, Qatar and Qatar University. The experts were asked to rate the significance of each item to its respective domain either as: essential, or important but not essential, or not necessary. The SME were asked to comment on the clarity of the items. The responses received from experts were entered into two separate excel sheets, one for the frontliners' tool and the other for the supervisors' tool. Two researchers meticulously evaluated feedback regarding the clarity of the items and collaboratively implemented revisions upon reaching mutual agreement on necessary changes and enhancements. In-addition a column was added to the competency table, that allows the responders to choose if the item is not applicable to their current job functions.

Analysis

The Lawshe method was used to measure the content validity of the survey questionnaire.[22] Content Validity Ratio (CVR) for each item was calculated.

$$\mathbf{CVR} = \frac{n_e - (\frac{N}{2})}{\frac{N}{2}}$$

CVR: Content Validity Ratio

ne = Number of "essentials" for an item.
N = Number of experts

If all responders agree that the item is "essential," then the CVR will be computed as one.

When the number saying essential is more than half, the CVR is between zero and 0.99.The CVR is a negative value when the number saying essential is less than half. The Content Validity Index (CVI) was calculated to sum up the average score per competency for each questionnaire. The CVI is the average score of the retained items' CVR.

The minimum content validity value per item depends on the number of experts/panelists. In-fact the value decreases with increasing number of experts. Since 11 experts out of 23 per questionnaire responded, the cut-off point for CVR is 0.59. This means that items scoring equal to or above 0.59 are retained, while items scoring less than 0.59 are omitted. In case of missing data, the mode of the results, per item, was used to replace a missing value.

Piloting: The tools were pilot tested among a sample of the target audience in Qatar. The primary objective of the pilot test was to assess the clarity of the tool and eliminate any ambiguity. For pilot testing, the tools were shared among a sample of the target audience in Qatar (20 frontliners and 20 supervisors/managers), chosen at random. The participants were asked to comment on the clarity of the items, and if the directions for filling out the questionnaire were clear, and the time required for completing the questionnaire. A total of 15 questionnaires were received from frontliners, and a total of 15 from the supervisors. Comments on the clarity of the tools were collated and the necessary adjustments were made.

Results

Content Validity of the Frontliners' tool: Supplementary Table 1 presents the CVR findings for each item in the frontliners' tool and showcases the retained competencies alongside their CVI. The CVR ratio ranged from -0.64 to 1.00. A total of 40 items were retained, while the rest (N=23) were omitted. Only one item was retained in Domain 12 (Possess leadership skills), the item was 'I can contribute positively to team morale.' However, Domain 12 was excluded alongside its respective item because the item could not be reallocated to other domains, as other domains were distinct from Domain 12. Overall, 3 competencies were excluded:

1) Demonstrate effective emergency management planning,
2) Establish and maintain relationships with key individuals, partner organizations and communities,
3) Possess leadership skills.

Supplementary Table 1: Content Validity Ratio for each item in the frontliners' tool

Item Number	Item description	Content Validity Ratio (CVR)	Retained or omitted (The CVR minimum value used is 0.59)
Item 1		1.00	Retained
Item 2		0.64	Retained
Item 3		0.09	Omitted
Item 4		-0.09	Omitted
Item 5		0.27	Omitted
Item 6		0.09	Omitted
Item 7		0.09	Omitted
Item 8		-0.27	Omitted
Item 9		1.00	Retained
Item 10		0.64	Retained
Item 11		0.64	Retained
Item 12		1.00	Retained
Item 13		0.64	Retained
Item 14		0.64	Retained
Item 15		0.27	Omitted
Item 16		1.00	Retained
Item 17		0.64	Retained
Item 18		0.82	Retained
Item 19		0.82	Retained
Item 20		1.00	Retained
Item 21		1.00	Retained
Item 22		1.00	Retained
Item 23		1.00	Retained
Item 24		1.00	Retained
Item 25		1.00	Retained
Item 26		0.45	Omitted
Item 27		0.27	Omitted
Item 28		0.09	Omitted
Item 29		1.00	Retained
Item 30		1.00	Retained
Item 31		1.00	Retained
Item 32		0.45	Omitted
Item 33		0.27	Omitted
Item 34		0.64	Retained
Item 35		0.64	Retained
Item 36		0.64	Retained
Item 37		-0.64	Omitted
Item 38		0.27	Omitted
Item 39		0.27	Omitted
Item 40		-0.09	Omitted
Item 41		0.45	Omitted
Item 42		0.64	Retained
Item 43		0.64	Retained
Item 44		0.64	Retained
Item 45		0.82	Retained
Item 46		1.00	Retained
Item 47		1.00	Retained

Item 48		0.82	Retained
Item 49		1.00	Retained
Item 50		0.60	Retained
Item 51		0.64	Retained
Item 52		1.00	Retained
Item 53		1.00	Retained
Item 54		0.64	Retained
Item 55		1.00	Retained
Item 56		1.00	Retained
Item 57		0.27	Omitted
Item 58		0.64	Retained
Item 59		0.09	Omitted
Item 60		0.09	Omitted
Item 61		0.09	Omitted
Item 62		-0.27	Omitted
Item 63		0.45	Omitted

The validation resulted in nine competencies and their respective 39 items. Table 2 showcases the retained domains, alongside their CVI. The CVI scores of retained items ranged from 0.78 to 1.00.

Table 2. Public health emergency management competencies that were retained during the validation process, alongside their Content Validity Index.

Competencies	**Content Validity Index*** (Values are rounded to the nearest two decimal points.)
Perform assigned Emergency Management roles in accordance with existing organizational plans.	0.82
Demonstrate effective emergency preparedness	0.78
Demonstrate effective incident management	0.94
Implement effective risk communication during all phases of emergency management.	1.00
Demonstrate knowledge and skills of surveillance processes.	0.82
Endorses the principles of legal considerations, human rights and ethics of public healtha crossthe job functions of emergency management.	0.69
Demonstrate knowledge of safety measures and precautions that must be implemented in public health emergencies.	0.96
Demonstrate knowledge of principles and practices for the management of the population affected by a public health emergency.	0.81
Demonstrates appropriate knowledge, skills and abilities of patient care during public health emergencies	0.88
*Content Validity Index(CVI):Average Content Validity Ratio(CVR)of retained items.	

Content Validity of the Supervisors' tool: Overall, all 12 competencies/domains were seen as essential components of emergency management. Supplementary Table 2 shows the CVR for each item. Hence, a total of 79 items were retained after the validation process and only seven items were omitted, as their CVR fell below 0.59, as shown in Supplementary Table 2. The CVR ranged from -0.09 to 1.00.

Supplementary Table 2: Content Validation results for the supervisors Training Needs Assessment (TNA) tool based on the responses of 11 experts

Item Number	Item description	Content Validity Ratio (CVR)	Retained or omitted (The CVR minimum value used is 0.59)
Item 1		1.00	Retained
Item 2		1.00	Retained
Item 3		0.82	Retained
Item 4		1.00	Retained
Item 5		1.00	Retained
Item 6		1.00	Retained
Item 7		0.82	Retained
Item 8		0.82	Retained
Item 9		0.82	Retained
Item 10		0.64	Retained
Item 11		0.82	Retained
Item 12		1.00	Retained
Item 13		0.82	Retained
Item 14		0.82	Retained
Item 15		1.00	Retained
Item 16		1.00	Retained
Item 17		1.00	Retained
Item 18		1.00	Retained
Item 19		1.00	Retained
Item 20		1.00	Retained
Item 21		0.82	Retained
Item 22		1.00	Retained
Item 23		0.64	Retained
Item 24		1.00	Retained
Item 25		1.00	Retained
Item 26		0.45	Omitted
Item 27		1.00	Retained
Item 28		1.00	Retained
Item 29		1.00	Retained
Item 30		1.00	Retained
Item 31		1.00	Retained
Item 32		1.00	Retained
Item 33		1.00	Retained
Item 34		1.00	Retained
Item 35		0.82	Retained
Item 36		0.82	Retained
Item 37		0.45	Omitted
Item 38		1.00	Retained
Item 39		0.27	Omitted
Item 40		1.00	Retained
Item 41		1.00	Retained
Item 42		0.64	Retained
Item 43		1.00	Retained
Item 44		0.64	Retained
Item 45		0.45	Omitted
Item 46		1.00	Retained
Item 47		0.82	Retained
Item 48		0.82	Retained

Item 49		0.82	Retained
Item 50		0.64	Retained
Item 51		0.82	Retained
Item 52		0.64	Retained
Item 53		0.45	Omitted
Item 54		1.00	Retained
Item 55		1.00	Retained
Item 56		1.00	Retained
Item 57		1.00	Retained
Item 58		1.00	Retained
Item 59		1.00	Retained
Item 60		1.00	Retained
Item 61		0.82	Retained
Item 62		1.00	Retained
Item 63		1.00	Retained
Item 64		0.82	Retained
Item 65		0.82	Retained
Item 66		-0.09	Omitted
Item 67		1.00	Retained
Item 68		1.00	Retained
Item 69		0.82	Retained
Item 70		0.82	Retained
Item 71		0.82	Retained
Item 72		1.00	Retained
Item 73		1.00	Retained
Item 74		0.82	Retained
Item 75		1.00	Retained
Item 76		1.00	Retained
Item 77		1.00	Retained
Item 78		1.00	Retained
Item 79		0.82	Retained
Item 80		0.45	Omitted
Item 81		1.00	Retained
Item 82		0.64	Retained
Item 83		0.64	Retained
Item 84		1.00	Retained
Item 85		0.82	Retained
Item 86		1.00	Retained

The following were the items that were omitted from the questionnaire:

- I can support risk characterization (epidemiological characteristics of pathogens) (Domain four)
- I can develop risk communication plans (Domain five).
- I can ensure that strategic goals and objectives are considered when communicating risk (Domain five).
- I can adapt an existing surveillance system for a newly emerging pathogen (Domain six)
- I can lead the establishment of credible relationships at the appropriate levels of partner organizations and community groups (Domain seven).
- I can procure and manage medical products, vaccines and technology (Domain ten).
- I am aware of the importance of organizational change for performance improvement (Domain 12).

The following items “I can effectively lead diverse groups towards a shared vision” and “I can inspire and influence staff through leading by example” which fell in domain 12, have been omitted since they are similar to another item; “I can lead diverse groups

towards a shared vision", making the total number of retained items 77. Table 3 shows the retained competencies/domains and their respective CVI. The CVI scores of retained items ranged from 0.76 to 1.00.

Table 3: Public health emergency management competencies that were retained during the validation process, alongside their Content Validity Index.

Competencies	Content Validity Index
Perform assigned Emergency Management roles in accordance with existing organizational plans.	0.96
Demonstrate effective emergency management planning.	0.87
Demonstrate effective emergency preparedness	0.94
Demonstrate effective incident management	1
Implement effective risk communication during all phases of an emergency management.	0.95
Demonstrate knowledge and skills of surveillance processes.	0.86
Endorses the principles of legal considerations, human rights and ethics of public health across the job functions of emergency management.	0.76
Demonstrate knowledge of safety measures and precautions that must be implemented in public health emergencies.	1
Demonstrate knowledge of principles and practices for the management of the population affected by a public health emergency.	0.96
Demonstrates appropriate knowledge, skills and abilities of patient care during public health emergencies	0.91
Demonstrates appropriate knowledge, skills and abilities of patient care during public health emergencies	0.82
Possess leadership skills	0.91
*Content Validity Index (CVI): Average Content Validity Ratio (CVR)of retained items. **Values are rounded to the nearest two decimal points.	

Ethical Approval

The study received ethical approval from the Institutional Review Board (IRB) at the Eastern Mediterranean Public Health Network (EMPHNET) (IRB Protocol Number: 2024/5/E1) on May 15, 2024, confirming compliance with ethical guidelines and regulations.

Discussion

To be effective, education and training require consensus on a set of core competencies with curricula based on a well-defined package of knowledge and skills. The term competency embraces the set of knowledge, skills, and attitudes necessary to effectively and efficiently accomplish a task. Literature review revealed a lack of consensus even among the terminology. A competency statement includes a broad description of a task; performance objectives describe a specific outcome that workers are expected to accomplish as a result of their work activity.[23] Integrating core competencies into disaster preparedness and response training can lead to a training program focusses on application and demonstration of skills and abilities necessary for response.[24] Over the last decade, several competencies sets for professionals working in disaster response and humanitarian assistance have been developed; however, some of them remain published as grey literature. A Systematic Review on the Core Competencies in Disaster Management and Humanitarian Assistance, by Gallardo AR, multisector approach including Health care sector, Public/social welfare sector, Consumer goods/operational sector, Social workers, Volunteers, Humanitarian personnel, Crisis managers, Disaster workers, Military health care providers, Disaster medicine professionals, Public health professionals, Disaster health care professionals, Acute care medical professionals, Occupational and environmental physicians, Surgeons, Hospital personnel, Nurses Health students and other Sectors.[25] Various organizations and universities have developed competencies for health professionals and other emergency responders.[6] The number of competency-based training programs has increased over
the past decade, especially in the United States. Previous study showed, in fact, that only 61% of the educational and training initiatives offered in European countries have a competency-based curriculum design.[26]

Conclusion

To build the competencies of the public health taskforce in Qatar, continuous training and performance improvement should be rigorously advocated for and integrated at the organizational level. A team of experts conducted a comprehensive literature review of articles on competency development, competency frameworks, and training needs assessment studies. Following an iterative procedure of reviewing, drafting, and editing,12 domains were formulated. Each domain consisted of several items that explained knowledge, skills, and behaviors relevant to measuring the domain. The newly developed tools underwent validation to determine whether the tools measure what they intend to measure and were pilot tested to improve comprehension and clarity of items. The validation resulted in two questionnaires: one targeting frontliners and the other targeting supervisors with nine competencies and their respective 39 items in the frontliners' tool.While all 12 domains/competencies were retained for the supervisors' tool with their respective items 77. The final tools were piloted to assess the clarity of the tool and eliminate any ambiguity, and necessary modifications were made based on the responses.

Acknowledgement

None.

Conflicts of Interests

All the authors declare no conflict of interest.

Funding

This research was funded by Ministry of Public Health, Qatar.

Authorship contribution statement

Conceptualization, Design: 1,2
Literature Search: 2
Data Collection and Processing: 1, , 2,
Data Analysis and Interpretation: 2,
Manuscript Writing: 2
Critical Reviews: 1,

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