

# Disaster Preparedness among Health Professionals and Support Staff: What is Effective? An Integrative Literature Review

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## Abbreviations:

EMT: emergency medical technician  
EPIQ: Emergency Preparedness Information Questionnaire  
MMAT: mixed-method appraisal tool  
PPE: personal protective equipment  
RN: Registered Nurse  
START: Simple Triage and Rapid Treatment System

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## Abstract

**Introduction:** It is important that health professionals and support staff are prepared for disasters to safeguard themselves and the community during disasters. There has been a significantly heightened focus on disasters since the terrorist attacks of September 11, 2001 in New York (USA); however, despite this, it is evident that health professionals and support staff may not be adequately prepared for disasters.

**Report:** An integrative literature review was performed based on a keyword search of the major health databases for primary research evaluating preparedness of health professionals and support staff. The literature was quality appraised using a mixed-methods appraisal tool (MMAT), and a thematic analysis was completed to identify current knowledge and gaps.

**Discussion:** The main themes identified were: health professionals and support staff may not be fully prepared for disasters; the most effective content and methods for disaster preparedness is unknown; and the willingness of health professionals and support staff to attend work and perform during disasters needs further evaluation. Gaps were identified to guide further research and the creation of new knowledge to best prepare for disasters. These included the need for: high-quality research to evaluate the best content and methods of disaster preparedness; inclusion of the multi-disciplinary health care team as participants; preparation for internal disasters; the development of validated competencies for preparedness; validated tools for measurement; and the importance of performance in actual disasters to evaluate preparation.

**Conclusion:** The literature identified that all types of disaster preparedness activities lead to improvements in knowledge, skills, or attitude preparedness for disasters. Most studies focused on external disasters and the preparedness of medical, nursing, public health, or paramedic professionals. There needs to be a greater focus on the whole health care team, including allied health professionals and support staff, for both internal and external disasters. Evaluation during real disasters and the use of validated competencies and tools to deliver and evaluate disaster preparedness will enhance knowledge of best practice preparedness. However, of the 36 research articles included in this review, only five were rated at 100% using the MMAT. Due to methodological weakness of the research reviewed, the findings cannot be generalized, nor can the most effective method be determined.

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## Introduction

There has been a considerably heightened focus on preparation for disasters within health care since the terrorist attacks of September 11, 2001 in New York (USA). Other recent global disasters include pandemics and natural disasters, including tsunamis, earthquakes, and hurricanes.<sup>1</sup> Health professionals and health support staff have a responsibility to respond to disasters to preserve the safety of the community.<sup>2-5</sup> Internal disasters affect health services, whereas external disasters impact the need for health care; for example, infectious disease outbreaks or other mass-casualty incidents.<sup>6-9</sup> Health professionals include the professions of nursing, medicine, dentistry, pharmacy, other allied health

professionals, paramedical or emergency medical technicians (EMTs), public health workers, hospital scientists, and other occupations which are commonly considered to be health professionals. Support staff include the non-health professional staff who work in health care services, including cleaners, security guards, orderlies, nursing assistants, food services assistants, cooks, chaplains, clerical staff, and other staff commonly considered health support staff.<sup>5,10</sup>

This integrative literature review aimed to review both qualitative and quantitative research to gain a current understanding of research conducted and the current state of knowledge.<sup>11,12</sup> The review will be used to inform future research and the development of knowledge which can be used by health services, professionals, or disaster planners to better prepare health professionals and support staff for disasters.

## Report

### Methods

A keyword search from January 1, 1980 to the present, using Cumulative Index of Nursing and Allied Health Literature (CINAHL; produced by EBSCO Information Services; Ipswich, Massachusetts USA), Medline database via OVID (US National Library of Medicine, National Institutes of Health; Bethesda, Maryland USA), JBI Connect (Johanna Briggs Institute; University of Adelaide; South Australia), Cochrane database (The Cochrane Collaboration; Oxford, United Kingdom), ERIC (Educational Resource Information Centre; Institute of Education Sciences; Washington, DC USA), and ProQuest Social Sciences Journals (Ann Arbor, Michigan USA) was conducted in February 2015. The articles selected from the above searches (based on title, keyword, and abstract review) resulted in a total of 117 articles after duplicates were removed (Table 1).

Eighty-two articles were discarded during full reading and quality appraisal of articles primarily as they were not on the topic (eg, focused on health services rather than professionals/support staff); they were not primary research articles; or they did not receive a mixed-method appraisal tool (MMAT) score of 50% or higher when quality appraised. The MMAT has been developed to appraise qualitative, quantitative, or mixed-method studies.<sup>13</sup> For the purposes of this review, research articles needed to achieve a MMAT score of 50% or higher to be included. This provided a balance of including quality research and having adequate volume to allow a broad exploration of themes and methods identified in existing research. A total of 36 primary research articles were included in the integrative review.

Review and analysis of the main themes, research methods, and findings was undertaken for 36 articles, including the identification of gaps in knowledge. A data table was created based on this review, which is available from the primary author.

## Results

Thirty-six articles were selected for inclusion in the review, of which 28 articles were quantitative, eight were qualitative, and there were no mixed-method studies. Only five articles were rated as 100% using the MMAT and a further 15 were rated at 75% (missing one of the criteria). Sixteen were rated at 50% (missing two criteria), and studies rated below this were not included in the review (Table 2). Overall, there was a lack of quality of research articles that reported investigating preparation of health professionals and support staff for disasters.

Of the 28 quantitative researches evaluating disaster preparedness interventions only, two were randomized controlled trials.<sup>8,14</sup> One was a small study of only 14 emergency medical residents,<sup>14</sup> and in the second, participants were selected from one university nursing school.<sup>8</sup> Although participants were randomized into a control or intervention group, the results were not generalizable due to the bias created by the small sample size or the selection pool of participants.<sup>8,14</sup>

The majority of quantitative studies included in this review were pre- and post-test studies or post-test studies using a convenience sample and a single cohort.<sup>4,5,7,9,15-26</sup> These studies demonstrated that any intervention improves perceived disaster preparedness or knowledge/behavior in disasters exercises or post-tests. A weakness of these studies was that they involved a single, non-randomly selected sample, and the interventions couldn't be compared to other interventions for effectiveness. Therefore, the results couldn't be generalizable due to the non-random selection and single group design. The interventions couldn't be validated as they were not compared to a control group.<sup>2,4,5,7,9,15-26</sup>

The remaining 10 quantitative studies collected data using surveys or tests which evaluated the health professionals' or support staff's attitudes, knowledge, perceived knowledge, or intended behaviors towards disasters.<sup>1-3,10,27-32</sup> The studies were non-randomized, convenience samples, so caution was required before applying these learnings to disaster preparedness at other sites and in other contexts.<sup>1-3,10,27-32</sup>

Eight of the research articles included in the literature review were qualitative articles, and of these, three collected data using questionnaires or surveys with qualitative open-ended questions; three included interviews; and two involved focus groups (Table 3).<sup>6,33-39</sup> A strength of these studies was that they were able to identify data on the preparedness needs of health professionals, including those that had participated in disasters or from those considered to be experts.<sup>6,33-39</sup>

### Analysis

The content and methods of disaster preparedness were extracted from the research articles. In terms of content, studies evaluated types of preparedness programs and assessed health professionals' knowledge and skills they believed they need, either in anticipation for or following disasters. Broadly, some studies identified that either clinical or technical disaster skills combined with structural disaster knowledge are important.<sup>5,9,16,21,24</sup> Some studies focused on only clinical or technical disaster preparedness.<sup>6,16,29,33</sup> Additionally, some studies identified that content could be based on national or international competencies.<sup>20,25,33,38,39</sup> The methods of disaster preparedness programs included online learning, didactic, self-learning, disaster exercises, or blended learning involving more than one method of teaching or learning. All of the methods of preparation led to an improvement in perceived disaster preparedness, disaster knowledge, or attitudes.<sup>3-5,7-9,14,15,17-26,29,37</sup>

Two pre-developed tools were used and repeated in the quantitative research articles included in the review to measure preparedness or perceived preparedness for disasters. One tool, the "Emergency Preparedness Information Questionnaire" (EPIQ), focuses on the measurement of perceived preparedness of nurses for disasters.<sup>3,15,28</sup> A second tool, the "Simple Triage and Rapid Treatment System" (START), focuses specifically on measuring performance during disaster triage for health professionals.<sup>14,26</sup>

Primary research also measured attendance at work during disasters or perceived willingness to attend work for health

<b>Database</b>	<b>Cumulative Index of Nursing and Allied Health (CINAHL)</b>
Search Terms	Disaster Planning or Disaster Preparedness or disaster training or disaster professional development and evaluation or outcomes of education and health professionals or nurses or medical or doctors or allied health or hospital staff.
Limitations	Published after January 1 <sup>st</sup> 1980, English language, Research.
Findings	206 articles were identified in database.
Heading/Keyword Review	132 articles selected for abstract review.
Abstract Review	73 articles were selected for full reading and quality appraisal.
<b>Database</b>	<b>Medline via Ovid</b>
Search Terms	Disaster Planning or Disaster Preparedness or disaster training or disaster professional development and evaluation or outcomes of education and health professionals or nurses or medical or doctors or allied health or hospital staff or ancillary staff.
Limitations	Published after January 1 <sup>st</sup> 1980, English language, human subjects.
Findings	317 articles identified in database.
Heading/Keyword Review	135 articles selected for abstract review.
Abstract Review	66 articles were selected for full reading and quality appraisal.
<b>Database</b>	<b>JBI Connect (Johanna Briggs Institute)</b>
Search Terms	Disaster.
Limitations	Nil.
Findings	Four articles were identified in database.
Heading/Keyword Review	Two articles selected for abstract review.
Abstract Review	Two articles were selected for full reading and quality appraisal.
<b>Database</b>	<b>Cochrane Database</b>
Search Terms	Disaster.
Limitations	Nil.
Findings	157.
Heading/Keyword Review	19 articles selected for abstract review.
Abstract Review	Nine articles were selected for full reading and quality appraisal.
<b>Database</b>	<b>ERIC Via ProQuest (Educational Resource Information Centre)</b>
Search Terms	Disaster Planning or Disaster Preparedness or disaster training or disaster professional development and evaluation or outcomes of education and health professionals or nurses or medical or doctors or allied health or hospital staff or ancillary staff.
Limitations	Published after January 1 <sup>st</sup> 1980, English language, human subjects.
Findings	20.
Heading/Keyword Review	One article selected for abstract review.
Abstract Review	One article selected for full reading and quality appraisal.

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Table 1. Literature Review Search Strategy (*continued*)

<b>Database</b>	<b>ProQuest Social Sciences Journals</b>
Search Terms	Disaster Planning or Disaster Preparedness or disaster training or disaster professional development and evaluation or outcomes of education and health professionals or nurses or medical or doctors or allied health or hospital staff or ancillary staff.
Limitations	Published after January 1 <sup>st</sup> 2009, review, literature review, data, reference document, peer review, English language.
Findings	2019.
Heading/Keyword Review	25 articles selected for abstract review.
Abstract Review	Six articles were selected for full reading and quality appraisal.
Studies from all databases for full reading and quality appraisal – 117 (After duplicates removed)	
<b>Total Included in Integrative Review:</b> 36 (relevance to topic <sup>a</sup> & MMAT score > 50% <sup>b</sup> )	

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**Table 1** (continued). Literature Review Search Strategy

Abbreviation: MMAT, mixed-method appraisal tool.

<sup>a</sup> Research articles, focused on preparation of health professionals or support staff

<sup>b</sup> 50% MMAT score determined for inclusion after consultation with doctoral supervisors.

Mixed-Method Appraisal Tool (score is a percentage)	No. of Research Articles
• 50%	16
• 75%	15
• 100%	5

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**Table 2.** MMAT Ratings of Reviewed Literature

Abbreviation: MMAT, mixed-method appraisal tool.

professionals and support staff. The factors influencing this could vary and will be outlined later; however, this was important to consider as significant numbers of staff may not attend work during disasters, which would influence the capacity of health systems to effectively manage disasters.<sup>3-5,10,20,23,27,29,30,32</sup>

The main themes were extracted from the research articles included in the review. There was evidence that health professionals and support staff are underprepared for disasters.<sup>3-6,15,20,24,26-29,32,36,37</sup> These themes are elaborated upon in the following discussion.

**Discussion**

*Health Professional and Support Staff Preparedness*

Research studies indicate that health professionals and support staff may not be adequately prepared for disasters. Studies often cited an increased focus on disaster preparedness following the terrorist attacks of September 11, 2001, so this underpreparedness may be in spite of an increased focus on preparedness in recent years. It is important to note that most research conducted has been evaluating nursing, medical, public health, or ambulance staff, so there is less understanding of other health professionals and support staff preparedness or disaster knowledge.<sup>1,3-6,15,20,24,26-29,31,36,37</sup>

The health care response for various types of disasters can be different. Health professionals and support staff may vary in their

Methodology	No. of Studies
<b>Quantitative</b>	28
• Randomized Control Trial (RCT)	2
• Pre-/Post-test (Single Group or Non-randomized)	14
• Post-test (Single Group or Non-randomized)	2
• Survey/Questionnaire (No Intervention)	10
<b>Qualitative</b>	8
• Survey	3
• Interviews	3
• Focus Groups	2
<b>Mixed Method</b>	0

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**Table 3.** Methodology in Reviewed Literature

level of preparedness or perceived level of preparedness depending on the type of disaster. Several surveys of nursing and medical staff in the United States, Jordan, China, Israel, Hong Kong, and Iran indicate that while perceptions of preparedness can be low for disasters, health professionals and support staff can feel less prepared for one form of disaster over another or with aspects of managing disasters.<sup>1,3,5,15,24,27-29,31</sup> For example, three studies which all used the EPIQ tool to evaluate perceived preparedness of nurses in relation to a range of disaster situations identified that while preparedness was generally low, nurses felt less prepared for biological disasters and quarantine procedures.<sup>3,15,28</sup>

The perceived or actual knowledge or skills required for disasters may be inadequate, even for tasks which may be considered routine during normal care. For example, EMTs felt unprepared to use a respiratory mask during a bioterrorism exercise and

physicians, nurses, and EMTs were unable to accurately triage trauma patients using the START system during exercises.<sup>4,26</sup> It is important that health professionals and support staff are prepared to use skills in the disaster situation when the outcomes of not being prepared may be more significant for the patient or health care worker.<sup>4,26</sup>

The skills needed to care for patients in the disaster situation can also be different than in routine settings.<sup>6,36</sup> During care in remote locations following earthquakes, Registered Nurses (RNs) can feel overwhelmed and underprepared to provide the care required. The injuries can be beyond the scope of normal emergency nursing care, and this can be confounded by working in the absence of normal hospital resources.<sup>6,36</sup>

During disasters, it is necessary to work outside normal practice areas and with disciplines and specialists that one does not normally work with. It is important that health professionals and support staff are also prepared for the psychological aspects of disasters. Staff may not be adequately prepared to cope with psychological aspects of disasters; for example, providing psychological support.<sup>6,37</sup>

Staff must also be prepared to care for themselves and their families during disasters. Staff may need to walk for hours, carry heavy equipment, sleep in tents, use improvised bathroom facilities, and eat food from ration packs.<sup>6,33</sup> A study of support or ancillary staff identified the main concern following disaster training was how to tell their family members that they would be involved in providing disaster care.<sup>5</sup> Physical fitness, practice in disaster environments, and personal disaster planning will likely improve performance in these situations.

The research conducted, to date, indicates that, despite an increased focus on disaster preparedness in recent times, health professionals and support staff could further improve their preparedness for the safety of the community and themselves. There is a need to further evaluate the preparedness of health professionals and support staff to determine their level of preparedness for disasters of various types. It is important to understand the preparedness of all health care disciplines, which may be required to provide disaster care, and it is noted that the research reviewed was limited to a focus on medical, nursing, paramedical/EMT, and public health staff.<sup>4,5,29</sup>

#### *Disaster Content*

Disaster education programs outlined and evaluated in the research articles can be broadly divided into three types of programs: those that are based on established competencies;<sup>15,20,25,38,39</sup> those that cover clinical or technical knowledge;<sup>4,16,26</sup> and programs which cover clinical, technical, or structural disaster knowledge.<sup>5,9,15,17,19–22,24,25,34,39</sup> An additional area of content, which is predominantly explored in qualitative research which allowed health professionals with experience working in disasters to highlight important skills for them, is that of non-clinical and non-technical skills or abilities that can enhance the performance of health professionals during disasters. These skills could be described as the human skills, such as resilience, team work, and physical fitness, that enable health professionals to work well in disasters.<sup>6,33</sup>

#### *Established Competencies*

Using training programs based on national standards or competencies to prepare staff can have benefits for both the community and health professionals and support staff. The community needs

to be aware that they are safe to receive care from health professionals or facilities at all times, including during disasters.<sup>38</sup> Health professionals also benefit when they have defined standards to learn and work from. If a different level of care is to be provided during times of disaster, then it will protect both the health professional and the community if this level of care is advocated as part of training or preparation based on national standards or competencies.<sup>20,25,38</sup>

A good example to highlight this is the care provided during pandemics or mass-casualty disasters. If patients are given different care during disasters, as it is perceived to be in interest of the individual or community, then it is best that this is based on a national competency rather than the individual clinical opinion of individuals, aid groups, or institutions.<sup>20,25,38</sup> During the international response to the 2010 Haiti earthquake, it has been noted that some aid groups were not providing care to usual standards, including having properly qualified personnel or equipment to perform the expected care required, including sterilization of equipment between procedures.<sup>38</sup> It is important that during times of disaster, health professionals and support staff are properly qualified and prepared for and perform to national or international standards.

#### *Clinical or Technical Skills*

To help individual patients during disasters, health professionals and support staff need the clinical or technical skills to provide this care.<sup>4,16,26</sup> Pre- and post-test quantitative single cohort studies suggested training programs provide useful information for health professionals related to clinical or technical skills. An example of a clinical skill which is important during mass-casualty disasters is triage. Effective triage means that the greatest number of patients will receive life-saving treatment within the time frame required by each disease or condition.<sup>26</sup> Training programs designed to improve disaster triage for nursing, EMT, or medical residents significantly improved triage accuracy in post-test or virtual reality simulated exercises in three studies.<sup>2,14,26</sup> Triage and other clinical skills, including hydration and pain management, were improved by 30% in a post-test following disaster burn care education.<sup>16</sup> While there is no research demonstrating improved performance in real disasters, theoretically, if clinicians applied the learnings to a real disaster, lives could be saved.

Another example of an essential clinical skill to reduce mortality and morbidity during bioterrorism or a pandemic is the wearing of masks and other personal protective equipment (PPE) for paramedics and EMTs. Following the respective educational programs designed to provide information on when to wear PPE, paramedics and EMTs scored significantly higher in post-test studies evaluating decisions on when and how to wear masks. As EMTs were more confident when to wear PPE, the studies also demonstrated an improvement on the intention of the health care workers to report to work.<sup>4,23</sup> If these results were translated to a real-life disaster situation, the lives of health workers and the community could be saved through less transmission of pandemic or bioterrorism organisms.

#### *Clinical or Technical Skills and Disaster Management Structures*

Courses which cover both disaster skills and structural knowledge can increase the post-test scores of the participants. It is important that health professionals and support staff are prepared in both the structural aspects of disasters management; for example, communication lines during disasters, and also the technical or clinical

skills, such as triage. A number of research articles evaluated participants' perceptions or knowledge following completion of disaster preparedness courses which focus on clinical, technical, and disaster management structures. These studies were not randomized, there were no control groups, and the course content was often based on nonstandard competencies, so the true benefits would need to be evaluated knowing the generalizability and accuracy of the training programs.<sup>5,9,15,17,19-22,24,25,34,39</sup> An additional benefit of teaching structural disaster information is that the health professionals and support staff will have some knowledge of their role within the organization during disasters. This includes, for example, who to communicate with, where to source resources from, and improving collaboration with other health professionals or staff for all types of disasters.<sup>24,34</sup> The technical or clinical content of disaster preparation may vary depending on the role of the employee; however, all groups need to know about disaster communication structures. Providing this preparation before disasters occur can promote the ability and willingness of support staff to work during disasters as staff need to know their organization is prepared for disasters.<sup>5</sup>

#### *Human Skills*

None of the disaster preparedness courses evaluated in research literature covered the non-clinical, non-technical, or non-structural disaster skills or knowledge. These skills, however, are important to promote health professionals and support staff to function effectively during disasters. Qualitative research reviewed, which enabled health professionals to answer open-ended questions, has highlighted some important human skills.<sup>6,33,35,36</sup>

"Austere environment skills" require health professionals to maintain their own health while living in rough conditions, which may include sleeping in tents, digging a latrine, and undertaking practical hygiene should showers not be available.<sup>33</sup> The ability to work well within a team, work with different occupational groups, be physically fit, and stay positive in difficult circumstances are essential if the health professionals are to protect their own wellbeing and provide optimal care for the community.<sup>6,33,35,36</sup> It is important to prepare health professionals and support staff to develop these non-clinical, non-technical, and non-structural human skills if health professionals and support staff are going to function effectively during disasters and prevent mortality and morbidity.

#### *Disaster Preparation or Training Methods*

*Multiple or Blended Methods of Training*—Using blended training methods can improve the performance and knowledge of health professionals and support staff. It is possible to impart or receive different types of knowledge or skills using different delivery methods.<sup>4,20-22,24,25</sup>

As demonstrated in the next four studies to be highlighted, using disaster exercises or practical training is common preparation for disasters. As it is unpredictable when disasters will occur, disaster exercises allow staff to practice for disasters which can enhance decision making, practical skills, and promote collaboration between staff and external agencies. Exercises can be costly and labor intensive; however, they can be effective, particularly when paired with other forms of training. Most exercises also include handouts, plans, or didactic lectures to brief participants.<sup>21,22,24</sup>

Courses or training sessions involving nurses, physicians, administrators, and EMTs which included disaster exercises or practical

training and didactic lectures were evaluated in a pre-/post-test single cohort studies. Post-tests identified significantly increased scores which included measures of triage, PPE, communication, and incident command system knowledge.<sup>4,21,22,24</sup>

In two single cohort, pre- and post-test studies involving public health nurses, participants received didactic training supported by either online learning modules or handouts of sample plans and competency expectations. Post-tests in both studies indicated the programs had improved the confidence and knowledge public health nurses had to respond to disasters.<sup>20,25</sup> Lectures, in-services, workshops, handouts, and more recently online learning modules are common forms of preparation which can help prepare staff for disasters.

The criticisms of didactic courses, workshops, discussions, and disaster exercises are that they can be expensive and labor intensive to run.<sup>14</sup> Clinicians, academics, and other health professionals and support staff are also generally busy and managing the time to leave the workplace to attend lectures or exercises may not be practical.<sup>9</sup>

*Self-Learning*—Self-learning, using books, videos, or computer-based online learning may have time and cost advantages, provided educational needs are also met or exceeded. Most studies that have been completed have been pre-/post-test single cohort studies, measuring primarily physicians, nurses, and EMTs. All studies have demonstrated improved outcomes following participants undertaking the self-learning activity.<sup>5,7-9,14,15,17,26</sup>

One study conducted by Thorne et al<sup>5</sup> is significant as it compared four non-randomly assigned groups undertaking different versions of disaster training and it focused on support staff. Participants were assigned to four groups; workbook, video, lecture, and small group discussion. The work book and video were self-directed learning and the lecture and small group discussion were instructor-guided. All groups recorded statistically significant improvements in attitude and knowledge questions. There was no significant difference in outcomes between the four learning groups. Therefore, the self-directed workbook or video are as effective as the two more expensive options which required an expert facilitator and group teaching.<sup>5</sup> In studies evaluating self-directed learning strategies, including a hospital disaster education video, reading a government disaster manual, or a paper-based bioterrorism learning package, have also been demonstrated to be effective to improve post-test or survey outcomes for medical and nursing professionals.<sup>9,15,17</sup> Notably, the video which was designed for emergency medical registrars was only 15 minutes in length and could easily be fitted into the busy clinical workload.<sup>9</sup> The government disaster manual was a pre-existing document and therefore the cost would be minimal.<sup>15</sup> Preparedness for health professionals and support staff can be both cost effective and realistically scheduled into a clinician's busy workload while still providing required learning outcomes.

Self-learning involving online or virtual reality can also be effective for health professionals to prepare for disasters. Online learning or virtual reality can replace or partially replace the need for actual disaster exercises or other forms of training or preparedness that may be labor intensive and expensive to repeatedly deliver within health care.<sup>7,8,14,26</sup>

Emergency medicine residents were compared in pre- and post-tests results and triage performance in a live disaster exercise and a virtual reality disaster exercise with identical parameters.

Both virtual reality and live exercises improved disaster performance with no significant difference.<sup>14</sup> A non-randomized study to measure the performance of nurses and disaster management graduates effectively measured disaster performance between groups using online gaming simulation.<sup>7</sup>

Online learning packages can also improve disaster knowledge. Registered Nurses randomly assigned to a computerized bioterrorism learning program or a standard (paper-based) bioterrorism learning program improved post-test scores and there was no significant difference between groups.<sup>8</sup> A second study evaluated participants who completed two 15-minute online modules on disaster triage. Physicians and EMTs significantly improved post-test knowledge and correct triage of patients in a scenario following the online modules.<sup>26</sup>

Studies like these highlight that using computerized simulation disaster exercises or online educational modules can be an effective way to both educate and evaluate the performance of health professionals for disasters. Once programs have been set up, they can provide a practical way for health professionals to learn, practice, and evaluate disaster management knowledge.<sup>14</sup>

#### *Tools and Methods Test Knowledge/Preparedness*

While most studies measured knowledge, attitudes, or performance of health professionals, six studies in the review used validated tools. Three studies used the EPIQ. This tool is designed to comprehensively assess a nurse's perceived knowledge of emergency preparedness and identify education and training needs. The tool has been used to measure perceived RN competence for disasters in Wisconsin (USA), Texas (USA), South Carolina (USA), and the United Kingdom.<sup>3,15,28</sup>

Three additional studies within the literature review used the START system to teach and then assess competence for clinicians (physicians, nurses, and EMTs) in disaster triage.<sup>14,22,26</sup> This tool is an algorithm designed to detect patients that have conditions that will cause them to die within one hour if not treated.<sup>14,22,26</sup>

It is important to have tools which can be used to evaluate disaster preparedness in order to ensure health professionals and support staff are prepared for disasters, and using tools improves reliability and transferability of results. Tools have their limitations, however, as the EPIQ was designed to measure perceived competence in RNs and the START system only measures triage performance.<sup>3,14,22,26,28</sup> It is important to have a tool suited to measuring the disaster preparedness of all health professionals and support staff and a wider range of actual skills and knowledge required to facilitate quality preparedness and disaster care.

#### *Willingness to Participate in Disasters*

During disasters, health professionals and support staff may be even more important than in normal operational periods. A significant percentage of health professionals and support staff may not be willing nor able to participate in disaster care should they be required. Some studies have estimated that between 30% to 80% of health care workers will not wish to attend work during disasters.<sup>3-5,10,20,23,27,29,30</sup>

While some factors that influence willingness to attend work cannot be changed (such as the type of disaster), preparation strategies, including providing training and promoting organizational and personal planning, can promote health professionals and support staff to attend work. Health professionals or support staff who have attended education, training, or exercises in disaster management are more likely to attend work. This education

includes disaster training in higher education programs or education in the workplace. If universities, education providers, or health services provide compulsory disaster education, health professionals and support staff may be more willing to attend work during disasters.<sup>3,5,10,20,23,27,29,32</sup>

When staff feel that their organization has a plan and can provide adequate support and protection, this promotes health professionals to attend work. This support and protection included providing adequate PPE, vaccination, antiviral prophylaxis, and access to information.<sup>10,27,30</sup> An additional factor related to planning that can influence willingness to attend work is when individuals have a plan for transportation to get to and from work and a plan for care of family members. Promoting health facilities, health professionals, and support staff to have plans in place can enhance willingness to attend work during disasters.<sup>5,27,30,32</sup>

There is some understanding of the preparation factors that will promote health professionals and support staff to attend work, including education, protection from harm, and having an organizational or personal plan for transport and care of family members.<sup>3,5,10,20,23,27,29,35</sup> It is important these factors are incorporated into disasters preparedness to help prepare health care workers for disasters.

#### **Limitations**

Of the 36 studies included in the review, only five were rated at 100% using the MMAT. The majority of quantitative studies used convenience samples of health professionals and a pre- and post-test or survey to evaluate preparedness or the effectiveness of educational strategies to prepare health professionals. All research of this nature demonstrated improvements in preparation of the health professionals following implementation of a training program; however, due to research design, this improvement is hard to validate and generalize. Eight qualitative studies were included in the review which did produce rich data; however, only two were rated at 100% using the MMAT. It is important that future research evaluating disaster preparedness uses quality research design appropriate for the research to better inform preparedness.

The majority of studies were evaluating nurses, physicians, public health workers, or paramedics/EMTs. There are not much data regarding support staff or allied health professionals, such as physiotherapists, pharmacists, dieticians, laboratory scientists, radiographers, or dentists, who all have important roles to play in various disasters.

All of the research included in the review focused on preparation for or evaluation of external disasters such as pandemics or other mass-casualty incidents. No studies which met the inclusion criteria focused on preparation for or evaluation of internal disasters such as internal fire, floods, or utility failures affecting health services. How to best identify how health professionals and support staff can prepare for or share learnings from these internal disasters is an important area for future research.

The measurement of effective disaster preparation is also important. The tools identified in the review either focused on evaluating only one profession (ie, nursing) or focused on only one area of knowledge (ie, triage). Validated tools that measure a wide range of disaster competencies for a wide range of health professionals and support staff may be beneficial in measuring effectiveness of disaster preparation. Actual performance in disasters is also an important measurement. While the unpredictable nature of disasters can make this difficult to measure, efforts could be made

to assess the usefulness of preparation for health professionals and support staff with reference to their performance in disasters.

The literature certainly suggests there may be areas for improvement, as despite an increased focus on disaster preparedness in recent years, many health professionals or support staff are not prepared for or able to attend work during disasters.

### Conclusion

It is evident that disaster medicine, nursing, and health care are relatively new disciplines which have gained traction since the terrorist attacks in New York on September 11, 2001. The search strategy of this literature review dated back to January 1, 1980; however, the oldest research article in this review was published in 2003. Disasters are not new phenomena, although it appears within the health disciplines, publishing research to improve preparation may be new.

All methods and content included in disaster preparation appear to lead to improvements in the preparation of health professionals and support staff. Given the issues with research design, it is difficult to determine what content or methods of delivery are most effective. Important questions for future research will need to include what content should be delivered and how this should be provided. It will be equally important to identify differences in the needs of health professionals and support staff, and also differences in preparation required for different types of disasters, including internal disasters affecting health services. Additionally, it is important to include the whole interdependent health care team as participants in future research and disaster preparedness.

There is room for more research identifying best practice disaster preparedness for health professionals and support staff.

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