

# Characteristics of Medical Teams in Disaster

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## Abbreviations:

DART: Disaster Assistance Response/Relief Team  
DMAT: Disaster Medical Assistance Team  
LMIC: low-middle income country

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## Abstract

Disasters present unique challenges for teams providing medical assistance to those populations impacted by the event. This scoping review focused on the characteristics of medical teams in disaster and how these characteristics are developed. The scoping review methods of Arksey and O'Malley were followed. An inductive thematic analysis of selected articles was used to identify recurrent themes. A total of 6,521 articles were reviewed from eight databases, yielding 33 articles. Four recurrent theme groups were identified: (1) adaptability, flexibility, and improvisation; (2) creativity and innovation; (3) experience and training; and (4) leadership and command structure. The study highlighted key characteristics identified by responders for effective team functioning and interdependence between the characteristics. It also identified the paucity of literature on the subject. Results from the study can help to guide future research and training development for medical teams in disaster.

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## Introduction

Today, it is common to hear reports of disasters occurring across the globe. Immediately following a disaster, there is a critical period to triage initial casualties and address the most critically injured in a systematic and effective manner.<sup>1,2</sup> Medical teams responding to disasters must function quickly and effectively in circumstances that can be dynamic and volatile. Teams also may be faced with limited resources and significant need.<sup>1</sup> To better support medical teams in the field and improve the outcomes for casualties, it is important to identify the characteristics that facilitate medical team function and the training required to develop them. This study examined the key characteristics and training that enable medical teams to function effectively, with a specific focus on low-resource settings because these areas are disproportionately impacted by disaster.

## Methods

A scoping review mapping the current state of the literature regarding medical teams in the context of disaster response was conducted.<sup>3</sup> In addition to consulting previously published scoping review articles, the recognized methodological framework of Arksey and O'Malley was used, along with more recent critiques of the scoping review methodology.<sup>3-6</sup> The methodological framework was comprised of five sequential steps: (1) identifying the research question; (2) identifying relevant studies; (3) study selection; (4) charting the data; and (5) collating, summarizing, and reporting the results.<sup>4</sup> According to these authors, a scoping review provides a synopsis of the literature without prescribing a specific weight to any individual article.<sup>4</sup> To facilitate the final steps of charting and collating, the methods of Braune and Clarke<sup>7</sup> were used for a thematic analysis of the selected articles. The research questions were as follows: What are the characteristics of medical teams responding to disaster in low-resource settings? What training do medical teams go through to develop these characteristics?

A combination of keywords and subject headings were selected: *medical team*; *characteristics*; *disaster*; and *response*. *Low-resource settings* and *low- and middle-income countries (LMICs)* were added to focus on the context of low-resource settings in the first question. The keyword *training* was added to answer the second question.

The initial literature search was conducted between December 2014 and January 2015 using three online databases: Google Scholar (Google Inc.; Mountain View, California USA); PubMed (National Center for Biotechnology Information, National Institutes of Health; Bethesda, Maryland USA); and Web of Science (Thomson Reuters; New York,

New York USA). To be included, articles had to be available in full text through the university's access rights, available in English, and published since 2010 (Figure 1). Articles were excluded for not having a focus on teams in the disaster setting or for not providing a description of team activities and experiences. Articles referring to the training of teams were kept as a sub-group to examine how characteristics developed.

Results of the first search demonstrated the need to revise the search strategy to widen the scope and find additional relevant articles. New terms were added (*emergency; humanitarian; relief; Disaster Medical Assistance Team or DMAT; Disaster Assistance Response/Relief Team or DART; traits; and attributes*), while *low-resource settings* and *LMICs* were removed. Five additional databases were searched: CINAHL (EBSCO Information Services; Ipswich, Massachusetts USA); Global Health (EBSCO Information Services; Ipswich, Massachusetts USA); JSTOR (ITHAKA; New York, New York USA); ProQuest (Ann Arbor, Michigan USA); and PsychInfo (American Psychological Association; Washington DC, USA), and articles published since 2005 were included. This revised search was conducted between February 2015 and May 2015.

Article selection began with a title review followed by an abstract review. A review of the reference lists of key articles was conducted. This led to a hand search of three relevant journals (*Annals of Emergency Medicine, Disaster Management & Response, and Inter-Professional Care*). General article data were reported followed by a description of recurrent themes. All selected articles were uploaded to the qualitative analysis software ATLAS.ti Version 7 (ATLAS.ti Scientific Software Development GmbH; Berlin, Germany) and an inductive thematic analysis was used for coding and summarizing the data. Selected articles were read in full and then re-read. This was followed by making notes and coding passages from articles on characteristics that were explicitly identified or implicitly described through first-hand experiences.<sup>7</sup> The software program was used for dictating notes and coding the articles for retrieval and analysis. Two authors reviewed the coded data, discussed the characteristics, and grouped them into thematic areas. Two systematic reviews investigating the literature on medical team training and development for the disaster context were selected in the review.<sup>8,9</sup> Both systematic reviews were analyzed separately and each contained only one article found in the literature search.

## Report

The search yielded over 100,000 hits (CINAHL: 3,579; Global Health: 24; Google Scholar: 17,400; JSTOR: 26,500; ProQuest: 81,237; PsychInfo: 227; PubMed: 3,255; and Web of Science: 1,495). A title review was conducted of the first 1,000 results from each database (sorted by relevance). A combined 6,251 articles were included in the title review, yielding 138 articles. Of these, another 93 were excluded for either not addressing the research questions ( $n = 77$ ) or being duplicates ( $n = 16$ ). The reference-list review provided 24 additional articles, while the hand search provided five new articles. From the first reading, general information was collected and recorded, and another 41 articles were excluded.

## Summary of Articles

A final 33 articles were selected. Fourteen were research articles and included 10 qualitative studies, two systematic reviews, and two descriptive studies. The remaining 19 articles were descriptive

and focused on the experiences of providing medical care in the disaster setting. Eleven were from low-resource settings. Nine focused on the training of medical teams for disaster. Three key points emerged from the literature. First, few formal studies existed on medical teams in disaster. Second, one-half of the current disaster literature was based on experiences in the United States. Third, of the 11 articles from LMICs, the majority were concentrated on the 2004 tsunami in Asia ( $n = 2$ ) and the 2010 earthquake in Haiti ( $n = 6$ ).

## Characteristics

An inductive thematic analysis was completed by reading the selected articles in full and developing a coding process of recurrent themes selected through explicit identification in research and implicit identification through narratives of descriptive articles.<sup>7</sup> Abstracted themes that occurred concurrently or were described similarly in the literature were grouped together for further discussion. The following theme groups were formed: (1) adaptability, flexibility, and improvisation; (2) creativity and innovation; (3) experience and training; and (4) leadership and command structure. Table 1 provides a definition of each of the recurrent themes.

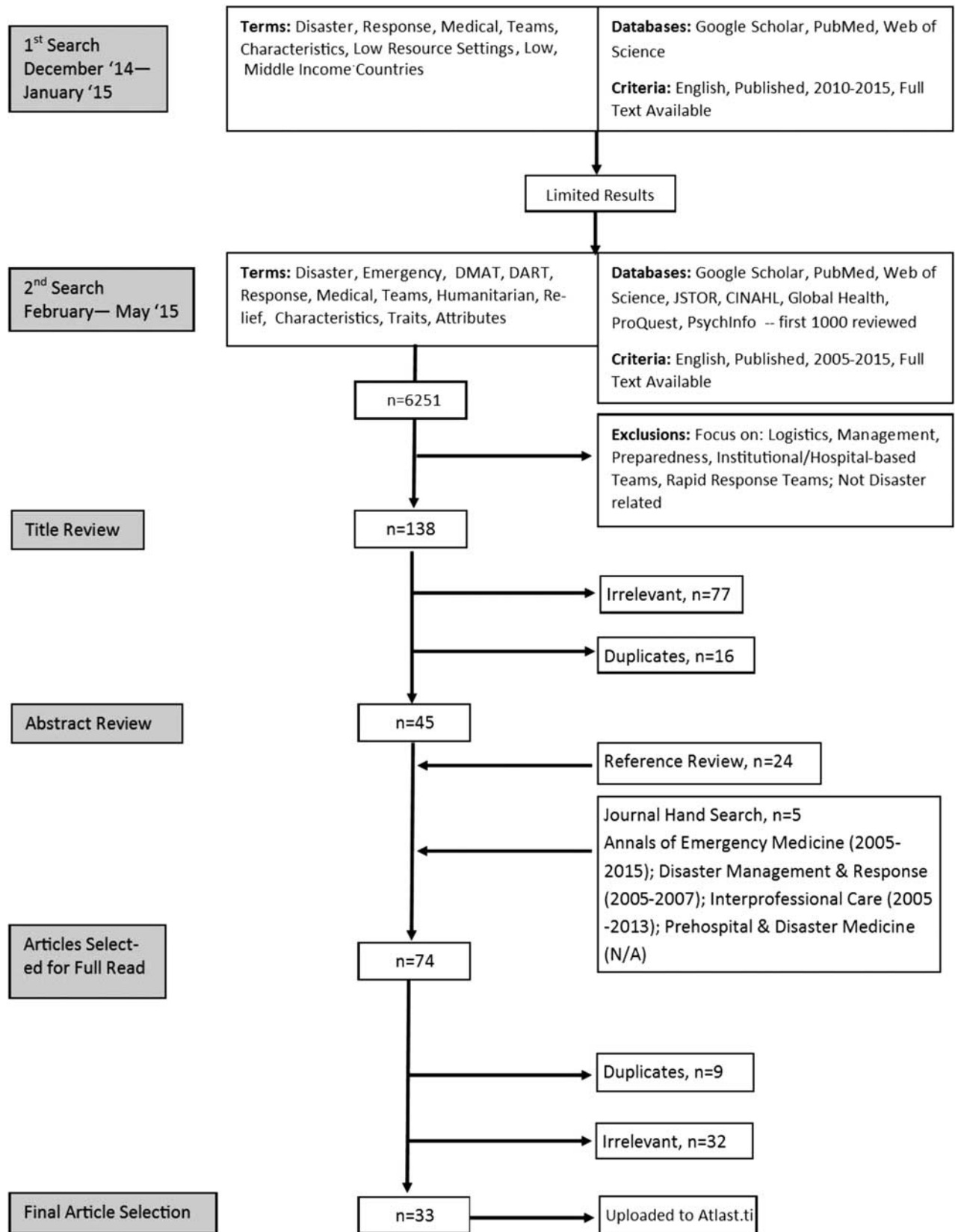
*Adaptability, Flexibility, and Improvisation*—The most common characteristics cited in the literature were adaptability ( $n = 18$ ), flexibility ( $n = 12$ ), and improvisation ( $n = 14$ ), with some articles expressing a combination of these three characteristics. They are described separately; however, it should be noted that these characteristics frequently were identified in the coding process as inter-related and interchangeable.

In relation to team members' roles, a nurse in Haiti explained adaptability as "adapt[ing] to your environment and be[ing] willing to change your role to achieve your goals."<sup>10(p21)</sup> In their study of medical response to the 2004 tsunami, Robertson et al. noted the critical need for team members "being able to improvise and adapt to constantly changing circumstances."<sup>11(p342)</sup> Adaptability, as described in the literature, is similar to the dictionary definition: "able to change or be changed in order to fit or work better in some situation or for some purpose."<sup>12</sup> It highlights the importance of making changes based on new challenges.

Contextually, flexibility is defined by a team's ability to address new challenges, but adaptability and flexibility are described in the literature as interdependent rather than discrete characteristics. One article found that team members "adapted their skills accordingly,"<sup>13(p544)</sup> while another reported that "while the teams initially had been organized to provide front-line medical assistance, they actually functioned as hospital reinforcement."<sup>14(p619)</sup> Flexibility was also seen in organizational changes precipitated by patient needs:

[Transition] from an improvised medical disaster response to a well-organized health clinic occurred much more easily than anticipated. Very important to the success of this transition were . . . these providers [who] easily switched from "emergency response" mode into "a day at the clinic" mode."<sup>15(p521)</sup>

Studies focusing on improvisation cited examples of teams improving air quality by covering vents with plastic and substituting prehospital medications for surgical procedures.<sup>14,16</sup> Responders indicated they modified their roles to address



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Figure 1. Search Strategy.

Abbreviations: DART, Disaster Assistance Response/Relief Team; DMAT, Disaster Medical Assistance Team.

Adaptability	Able to change/be changed in order to fit/work better in some situation or for some purpose.
Command Structure	[Command] to have authority and control over (a group of people, such as soldiers); [structure] the way that a group of people are organized.
Coping <sup>a</sup>	To deal with and attempt to overcome problems and difficulties.
Creativity	The ability to make new things or think of new ideas.
Experience	Skill or knowledge that you get by doing something; the length of time that you have spent doing something (such as a particular job).
Flexibility	Characterized by a ready capability to adapt to new, different, or changing requirements.
Improvise	To make or create (something) by using whatever is available.
Innovation	The introduction of something new; a new idea, method, or device.
Leadership	A position as a leader of a group, organization, etc; the time when a person holds the position of leader; the power or ability to lead other people.
Stress <sup>a</sup>	A state of mental tension and worry caused by problems in your life, work, etc; something that causes strong feelings of worry or anxiety.
Training	A process by which someone is taught the skills that are needed for an art, profession, or job.

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**Table 1.** Definitions of Recurrent Theme GroupsNote: Definitions were retrieved from <http://www.merriam-webster.com/>.<sup>a</sup> Although the themes stress and coping were not one of the main thematic groups identified, they were identified within the sub-group of the literature.

challenges and find creative solutions. In situations where resources were limited, responders had to improvise and use materials not associated with the task.<sup>17</sup> For example, transporting critical patients while manually ventilating them with a bag-valve mask because mechanical ventilation was unavailable.<sup>18</sup> It was recognized in the literature that adaptability is a necessary, non-technical skill for surgeons in disaster situations.<sup>19</sup> Rehabilitation therapists who responded to the 2010 earthquake in Haiti commented, “You really gotta think, ‘Ok. I don’t have any tools here, so what can I do to really help these patients?’”<sup>20(p334)</sup>

Consequences associated with adapting to challenges also were discussed in the literature. One article reported that “medical teams had to adapt and downgrade some procedures.”<sup>14(p619)</sup> Practice that is below normal medical standards, such as manual versus mechanical ventilation,<sup>18</sup> transfer of patients without monitoring equipment, and intravenous drips held by hand,<sup>8</sup> create a moral dilemma. However, while improvisation may not be optimal for patients, teams must be willing to adapt in order to carry out the key tenet of triage: the greatest good of the greatest number.<sup>21</sup>

*Creativity and Innovation*—Eleven articles provided examples of teams demonstrating characteristics of creativity and innovation. These characteristics normally were described through the use of physical resources when resources were limited, or appropriate equipment was not available. A nurse in Haiti commented, “We would face new situations that [required] us to think outside the box to devise new solutions to problems.”<sup>22(p493)</sup> Surgical procedures required “the ability to think outside the box”<sup>13(p546)</sup> and “inventing new solutions, or adapting old solutions to new situations.”<sup>19(p383)</sup> A nurse stated, “We had to be creative . . . we constructed [splints and slings] from bandages and string.”<sup>10(p20)</sup> A responder remarked, “Sometimes we didn’t have the right

equipment . . . but we made it work the best that we could.”<sup>20(p334)</sup> In one study, the lack of resources necessitated the use of glove fingers or intravenous lines for drainage.<sup>14</sup> The literature demonstrates that creativity and innovation cannot be divorced from adaptability, flexibility, and improvisation. Kendra and Watchendorf found that creativity was vital for addressing the needs of the World Trade Center (New York, USA) disaster, particularly creativity based on prior knowledge.<sup>23</sup>

*Experience and Training*—Experience (n = 9) and training (n = 10) generally were perceived as supporting the characteristics previously cited.<sup>11,24,25</sup> Responders emphasized that experience was the foundation for adaptability, including adaptation of a triage system where none previously existed<sup>26</sup> and using resources not typically associated with a task.<sup>14</sup> Experience was also a critical element for team leadership. Team members with previous disaster experience or training understood each member’s role and the overall purpose of the team, which allowed them to easily transition to a leadership position.<sup>26</sup>

*Leadership and Command Structure*—Leadership (n = 12) and command structure (n = 14) were discussed frequently in relation to team functioning.<sup>27</sup> They could be developed on an ad hoc basis or through prior training or experience.<sup>16,24,28-30</sup> However, experience from an earthquake response highlighted the challenges of teams formed on an ad hoc basis. In this disaster, patients were arbitrarily evacuated from the area without proper triage.<sup>31</sup>

Yet there are significant differences between structured clinical environments and disaster situations wherein team leaders working in volatile conditions must assess the needs of patients, clinicians, and external stakeholders.<sup>18,27,29</sup> Team leaders were likewise responsible for facilitating teamwork by “effectively directing and delegating to others and refraining from micromanagement.”<sup>27(p335)</sup>

Connelly described the need for “an unambiguous chain of command with clear standards of patient care and accountability.”<sup>29(p6)</sup> Aitken et al. noted the importance of a clear command structure, defined leader, and autocratic leadership style.<sup>32</sup> However, organizational research findings contend that successful team management and coordination require the combination of agility and discipline, describing agility as adaptability, creativity, and flexibility and discipline as a system of leadership and organizational and command structure.<sup>33</sup>

#### *Influence of Settings*

Medical teams in low-resource settings had to adapt to compensate for the lack of supplies and materials compared to the normal health care setting.<sup>10</sup> Responders in Haiti emphasized the need for knowledge and skills: “We had more equipment back at the hotel but nothing of the kind found in UK emergency departments, and it soon became clear that our biggest assets were our basic clinical assessment skills.”<sup>10(p19)</sup> Prior experience in disaster humanitarian settings, or the military, also was perceived as useful.<sup>10,13,24,28</sup>

*Stress and Coping*—Increased stress (n = 12) and coping (n = 5) were seen as unique to the low-resource setting and often were related to the disaster exasperating previous socio-economic challenges in the area (eg, poverty and lack of adequate health services). In addition to limited resources and having to adapt to difficulties, team members experienced significant intrapersonal challenges. Responders noted, “Working in a disaster zone is inherently physically and mentally stressful,”<sup>28(p7)</sup> and the overwhelming destruction “[left] even the most seasoned responder speechless.”<sup>22(p493)</sup> They also felt guilty leaving when so much need still existed and questioned whether they had done enough.<sup>20</sup> Australian responders observed that medical team leadership involves maintaining the welfare of team members because of the stress they endure.<sup>32</sup> Other articles shed light on mechanisms to deal with stress and reduce its effects such as humor and sleep.<sup>18,19,29</sup>

#### *Development and Training of Teams*

Nine articles provided information on the development of teams and team characteristics as reflected in the recurrent themes.

Four articles focused on the competencies of health care providers in the disaster setting and emphasized competency development through formal education.<sup>8,25,27,30</sup> One pilot study surveyed 200 experienced disaster responders from different health backgrounds to identify competencies they saw as most important.<sup>25</sup> Another was a combined systematic review and expert working group consensus that identified a comprehensive list of competencies for disaster responders in health care.<sup>8</sup>

King et al. conducted focus groups with Emergency Medical Service leaders and compiled a list of attributes needed for disaster responders<sup>27</sup> that parallels themes identified in the analysis. For example, training and experience with the command structure to understand team member roles and the context of disaster response. Based on responder survey results, responders had to be creative to adapt to the dynamic environment of the disaster setting.<sup>25</sup> In relation to role improvisation, one leader said, “When you get there you have to change from being a paramedic to being the scene manager”<sup>27(p335)</sup> and “[when a] plan goes out the window... you are going to have to adapt.”<sup>27(p336)</sup> Furthermore, responders “have to be flexible enough to recognize

when a protocol isn’t working and they need something else.”<sup>27(p336)</sup>

One article identified the need to be creative and flexible, to apply skills and knowledge, to understand one’s role and function as part of the overall response, and to identify potential contingencies.<sup>30</sup> Expert opinion surveys cited a lack of coordination among teams formed on an ad hoc basis. Respondents indicated that for teams to be better prepared and understand their capabilities prior to deployment, they should be formed as a team and train as such.<sup>31</sup>

Three articles focused on team training.<sup>9,34,35</sup> One qualitative study researched the effectiveness of an online disaster management and preparedness course and demonstrated education helped improve the participants’ understanding of their roles and overall team functioning during a disaster.<sup>34</sup> A descriptive study investigated the effectiveness of virtual reality training for mass-casualty events; however, the study focused on individual and not team performance.<sup>35</sup> A systematic review of health provider disaster training assessed the quality of study design and likelihood for bias and found that the majority of articles were of fair to poor quality with limited experiential learning. It concluded that “the available evidence is insufficient to determine whether a given training intervention in disaster preparedness for health care providers is effective in improving knowledge and skills in disaster response.”<sup>9(p221)</sup>

#### **Discussion**

Disasters occur unexpectedly and the need of the population affected necessitates assistance from functioning medical teams. There has been significant research on the functioning of teams in the clinical context and the development of effective training methods. However, there is limited research on medical teams operating in the disaster context. The unpredictability of disasters is a barrier to investigative study. Researchers cannot plan for a specific time or location in which a disaster might occur, and the volatile nature of disasters presents additional risks which may limit the ability to collect adequate data. This was evident in most of the descriptive literature found in the review.

Findings from the current study can be used to guide future research and development of effective team training. For example, existing evidence on medical teams in the institutional context could be reviewed to determine if there are similar recurrent themes. Although the context is different, it may provide a starting point for evaluating team functioning and development of effective training.

#### **Limitations**

The primary limitation of this review is the paucity of literature. Most articles were first person perspectives or retrospective analyses. Furthermore, the scoping review does not evaluate the quality of evidence or weight the evidence; these limitations may not provide an objective analysis of team functioning and performance. The scope of the review also was limited to full text articles available with the university’s access rights, and the first 1,000 articles sorted by relevance; however, articles beyond the first 1,000 were found to be highly irrelevant. The context of the literature was concentrated on specific disasters and locations such as the United States and Haiti. This concentration may limit the generalizability of the identified characteristics.

## Conclusion

In summary, this scoping review was conducted to determine the characteristics of medical teams responding to disaster in low-resource countries and the training required to develop these characteristics. One of the important findings is that commonalities exist across disaster settings regardless of area, type of disaster, or who is involved. Concerning the development of characteristics, studies conducted to date identify some key competencies and

experts in the field have provided some insight, but more information is required. Gaps in the literature highlight the need for further research.

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