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The role of paramedics in emergency medical teams responding to natural disasters: a scoping review

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ABSTRACT

INTRODUCTION: Climate-related disasters have increased by over 80% in the last four decades. It is often the responsibility of Emergency Medical Teams (EMTs) to respond to the aftermath of disasters, delivering medical care and aid. Post-event evaluations have revealed flaws in the productivity and functionality of EMTs. This scoping review maps the existing literature regarding EMTs' experiences in natural disaster response, highlighting areas of limitation in which paramedics may be able to contribute their knowledge and skills to improve the response.

MATERIALS AND METHODS: A scoping review was conducted using the JBI method. The databases CINAHL, MEDLINE, Cochrane Library, and Scopus were searched with the following terms: ("paramedics" OR "paramedic" OR "emergency medical service" OR "EMT" OR "EMS") AND ("perceptions" OR "attitudes" OR "experience" OR "disaster response") AND ("humanitarian disaster" OR "natural disasters") NOT ("simulation"). 340 papers were screened; 8 studies met the inclusion criteria.

RESULTS: Analysis of the selected studies revealed four prominent themes: operational and access challenges, healthcare delivery and infrastructure, communication and data management, and resource utilisation and team management.

CONCLUSIONS: EMT limitations range from logistical to systemic issues; there is a need to fill the public health gap currently found in EMTs. Enhancement of paramedic training on urgent and primary care around disease outbreak, and everyday healthcare provision after a disaster, would prove invaluable. Paramedics have the potential to offer a resolution to lack of basic healthcare provision after a natural disaster.

KEY WORDS: Delivery of healthcare, health workforce, natural disasters, paramedics.

Abbreviations

CINHAL - Cumulative Index to Nursing and Allied Health Literature

EMS - Emergency Medical Services

EMT - Emergency Medical Team

HCP - Health Care Professional

JBI - Joanna Briggs Institute

MEDLINE - Medical Literature Analysis and Retrieval System Online

PRISMA - Preferred Reporting Items for Systematic Reviews and Meta-Analyses

UK - United Kingdom

WHO - World Health Organisation

INTRODUCTION

A natural disaster is a calamitous event, primarily driven by natural phenomena, which results in destruction and loss of property, infrastructure, environment, or life. [1] The frequency of natural disasters is increasing at an alarming rate [2] with climate-related disasters increasing by more than 80% over the last four decades [3,4]. Despite the rise in frequency, the global death toll is at least five times lower than during its peak in the 1900s [5]. This reduction in deaths may be partially attributed to improved emergency preparedness and response [5].

Emergency Medical Teams (EMTs), composed of diverse healthcare professionals (HCPs) from various backgrounds, play a crucial role in disaster response by providing vital medical care [6-8]. The term EMT is used, as the 'EMT Initiative' is a globally recognised World Health Organization (WHO) programme that encompasses a wide range of organisations, institutions, stakeholders and partners across the humanitarian and global health emergency sectors [9]. These teams are now recognised as a critical part of the global health workforce. Post-event reviews are essential for EMTs to adapt and improve their effectiveness [9,10]. However, despite their importance in reducing mortality and morbidity after disasters, concerns have arisen regarding EMT functionality and productivity [11]. Many EMTs lack sufficient preparedness and competency, highlighting the global need for EMT improvement [12,9]. To address this, the "Classification and minimum standards for foreign medical teams in sudden onset disasters" was established as a benchmark for EMT performance [9]. Subsequent literature has documented disaster responses, such as the 2016 Kumamoto earthquake [13] and the 2020 Samos earthquake, [14] and a literature review has identified ongoing areas for improvement in EMT disaster response [15].

Despite paramedics being globally recognised members of EMTs and having active involvement in disaster response [16], there is a lack of research focusing on their specific role. Existing opinions suggest that the need for paramedic-specific skills in disaster settings quickly shifts towards clinical care and triage, with EMTs prioritising trauma and surgical interventions [17,18]. Key characteristics of EMT members, including adaptability, flexibility, and improvisation, are often found in paramedics [19]. The dynamic and unpredictable nature of prehospital care fosters versatility in paramedics, enabling them to make critical decisions in diverse situations [20,21]. Their adaptability allows them to collaborate effectively with various professionals within EMTs [22]. Recent research has highlighted the undervalued contribution of professions like physiotherapy in disaster response, demonstrating their unique skills within EMTs [23-26]. However, similar research on the paramedic profession is lacking, potentially leading to underutilisation of their diverse skillset in disaster settings. This scoping review has two main focus areas: the results focus on the experiences of EMTs in natural disaster response, highlighting areas of success and limitation based on past responses. The discussion aims to develop the conversation surrounding specific EMT limitations, in which paramedics may be able to play a more prominent role. The relevant competencies and skills of paramedics are explored in relation to the areas in which EMTs are lacking.

MATERIALS AND METHODS

A scoping review was chosen to map the breadth of literature on EMT experiences in natural disaster response, allowing for the inclusion of both peer-reviewed and grey literature. The Joanna Briggs Institute (JBI) method was utilised due to its comprehensive guidance and established framework for conducting and reporting scoping reviews [27-29].

Identifying the research question

The research question used for this scoping review was, “*The role of paramedics in emergency medical teams responding to natural disasters: a scoping review*”.

Table 1. Inclusion and exclusion criteria.

Inclusion Criteria	Exclusion Criteria
Participants worked as part of an emergency medical team.	The disaster occurred before 2013.
The experiences/thoughts/opinions of a professional, or professionals working in response to a disaster were documented.	The disaster was unnatural or man-made.
A natural disaster, or natural disasters as an entirety were discussed.	Papers solely discussing professionals working within a hospital setting.
Published or translated in English.	Full texts not available.

Identifying relevant studies

Relevant studies were selected from databases and grey literature searches. The search term; (“paramedics” OR “paramedic” OR “emergency medical service” OR “EMT” OR “EMS”) AND (“perceptions” OR “attitudes” OR “opinion” OR “experience” OR “view” OR “reflection” OR “beliefs”) AND (“humanitarian response” OR “humanitarian disaster” OR “disaster management” OR “disaster relief”) AND (“natural disasters”) NOT (“simulation”) was input into four databases: CINHAL; Medline; Cochrane Library and Scopus. A search of reference lists from relevant articles was completed, as well as a search of relevant organisations and websites involved in humanitarian disaster response: World Health Organisation; UKMED; British Red Cross and United Nations.

Selecting studies to be included in the review

The study selection process followed predefined inclusion and exclusion criteria (Table 1) and is summarised in the PRISMA flowchart (Figure 1). A total of 318 records were identified from databases and 45 from other sources including websites, organisations and citation searching. After removing 23 duplicate and non-relevant records, 340 were screened. Of these, 269 were excluded based on their title and abstract. Full-text review was conducted for the remaining 71 reports (48 reports from databases and 23 reports from other sources). This resulted in the exclusion of 63 studies due to non-compliance with the inclusion criteria or meeting the exclusion criteria. In total, 8 studies met the criteria and were incorporated into the final review (Table 2).

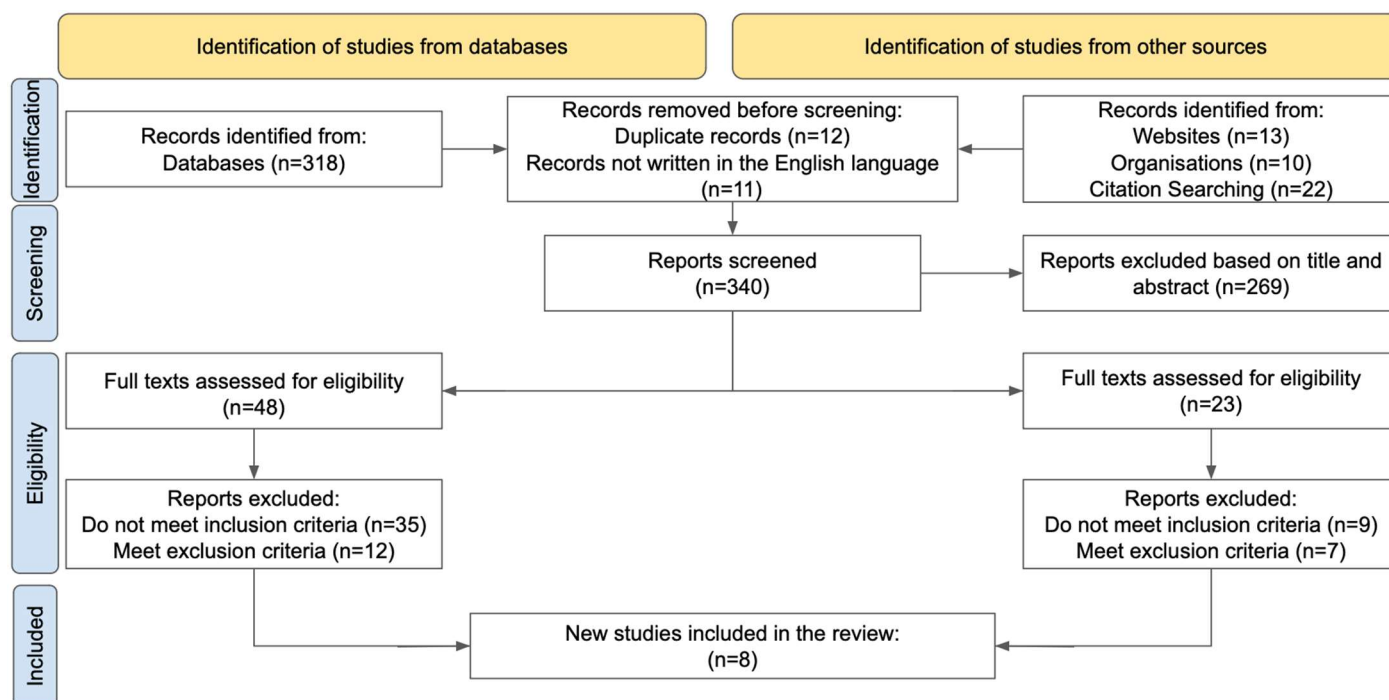


Figure 1. PRISMA flowchart.

Charting the data

Data was charted by study characteristics (Table 2) and key findings (Table 3).

Table 2. Study characteristics.

Study	Study Design	Location of Disaster	Type of Disaster	Participant(s)	Aims, Objectives and Questions
Anderson, 2019	Personal account	Mozambique	Cyclone	Humanitarian doctor	To describe a personal account of the experience of acting as clinical lead during Cyclone Idai.
Brolin et al, 2015	Retrospective descriptive study	Philippines	Typhoon	Emergency medical teams	To study the timings, capacities, and activities of emergency medical teams during Typhoon Haiyan.
Hugelius et al, 2017	Explorative qualitative interview study	Philippines	Typhoon	Local medical teams	To explore healthcare professionals' experiences of working during and immediately after Typhoon Haiyan.
Kim et al, 2015	Report	Philippines	Typhoon	Emergency medical teams	To describe the experiences of an emergency medical team in the initial phases of a disaster response, focusing on local collaboration.
Leonard et al, 2016	Report	Nepal	Earthquake	Armed forces medical teams	Reporting patient demographics and disease patterns as well as discussing the challenges and key observations from the team.
Lin et al, 2017	Report	Nepal	Earthquake	Emergency medical teams	A descriptive report of the mission phases and recommendations for future international medical rescue.
Sorani et al, 2018	Qualitative interview study	Iran	N/A	Local medical teams	To explore the challenges faced by prehospital local emergency medical services during disaster response.
Watts & Byrom, 2014	Personal accounts	Philippines	Typhoon	Paramedics in an emergency medical team	Personal descriptions of the UK-Med response to Typhoon Haiyan.

Collating, summarising and reporting the results

Numerical, descriptive statistics were used to report on the study characteristics, detailing frequency counts of the concepts in 'charting the data', to provide an overall summary of the content and aim of the articles [29]. A more in-depth, descriptive, qualitative content analysis was completed [28,29]. This involved examining the texts, identifying sections of information relevant to the research question and grouping these into themes and sub-themes (Table 3), which were then used to organise and direct the results and discussion.

Table 3. Data extraction table.

	Main Results	Operational and access challenges:	Healthcare delivery and infrastructure:	Communication and data management:	Resources utilisation and team management:
Anderson, 2019	<p>Reaching remote populations was difficult due to road and infrastructure damage, affecting transport.</p> <p>Basic health provision was not being met due to malaria and other diseases.</p> <p>Clinics could only run during daylight hours due to the lack of power or running water.</p> <p>The initial setup of clinics was difficult and took too much time due to landowners not giving consent and difficulties establishing an uncontaminated water supply.</p> <p>Statistics were likely under-reported due to the rural environment and communication breakdown.</p>	<p><u>Access difficulties:</u></p> <p>-Road and infrastructure damage,</p> <p><u>Time delays:</u></p> <p>-Time delays setting up clinics</p>	<p><u>Lack of basic healthcare provision:</u></p> <p>-Disease outbreak,</p> <p><u>Lack of basic necessities:</u></p> <p>-Lack of water,</p> <p>-Electricity shortages</p>	<p><u>Challenges with record keeping:</u></p> <p>-Under-reporting of statistics</p>	
Brolin et al., 2015	<p>Time taken between arriving on site and becoming operational took too long (on average 3 days).</p> <p>Lack of transportation to, and information about, areas that needed help.</p> <p>Misleading media images led rescuers to prioritise areas that were not as affected as others.</p> <p>Language barriers with locals.</p> <p>Lack of logistical support and appropriate training.</p> <p>The level of self-reliance needed by healthcare professionals (HCPs) was often not considered.</p> <p>Short missions (under 3 days) are not cost effective, and their medical value should be questioned.</p> <p>Sending type 1 medics (who care for "normal conditions") was effective as local HCPs were able to cover inpatient trauma sufficiently.</p> <p>A clear format for reporting the actions of EMTs is required to keep teams accountable and monitor adherence to standards.</p> <p>Research is needed to increase the evidence-base of disaster response and improve future responses.</p>	<p><u>Access difficulties:</u></p> <p>-Lack of transport and misleading information,</p> <p><u>Time delays:</u></p> <p>-Delay in team members becoming operational,</p> <p><u>Lack of preparation:</u></p> <p>-Lack of logistical support and training</p>		<p><u>Challenges with record keeping:</u></p> <p>-Production of a standard reporting template for EMTs,</p> <p><u>Communication:</u></p> <p>-Language barriers</p>	<p><u>Use of resources:</u></p> <p>-HCPs time on scene,</p> <p>-The roles allocated to the EMTs,</p> <p><u>Self-care:</u></p> <p>-HCPs failed to consider their own self-care needs</p>
Hugelius et al., 2017	<p>HCPs felt separated from the rest of the community due to the contained medical setting, meaning they felt as if they did not have sufficient information to help and reassure patients.</p> <p>Feelings of shame and guilt due to being separated from their families.</p> <p>Support from authorities and EMTs was lacking.</p> <p>HCPs had mistrust in their own coping abilities which led to doubt in their own medical skills.</p> <p>HCPs felt as though there was not enough acknowledgement for their work, leading to demotivation.</p> <p>Isolation from outside society is difficult, yet it does help to suppress negative emotions and thoughts.</p> <p>Accepting that "working by the book" is no longer possible leads to a feeling of calm and acceptance.</p>			<p><u>Communication:</u></p> <p>-EMTs and authorities failed to communicate and support local HCPs</p>	

Understanding the complexity and meaning of being a HCP is required to adequately prepare for the post-disaster setting.

Disaster training and planning should focus on the personal and psychological impacts of being a HCP during a disaster.

The context in which aid is delivered by EMTs should be understood to maximise the benefits to recipients and avoid ambiguous feelings towards them.

Kim et al., 2015	<p>The archipelagic nature of the Philippines meant that some affected areas could not be reached quickly, due to transport problems.</p> <p>Teams became overwhelmed by large patient loads.</p> <p>Shortage of electricity and equipment.</p> <p>EMTs that arrived were underprepared, acting freely and unmonitored.</p> <p>Poor cooperation with local authorities resulted in duplicate aid in certain places and none in others.</p> <p>Effective collaboration between local and foreign teams leads to successful results.</p>	<p><u>Access difficulties:</u> -Geographical difficulties,</p> <p><u>Lack of preparation:</u> -EMTs were underprepared to function efficiently</p>	<p><u>Lack of basic necessities:</u> -Electricity shortage</p>	<p><u>Communication:</u> -Lack of communication with local authorities</p>	<p><u>Multi-nationality cooperation:</u> -Combination of EMTs and local HCPs is effective</p>
Leonard et al., 2016	<p>Medical subgroups were deployed at slightly different timings.</p> <p>Some affected areas were mountainous and had difficult terrain, the team did not have sufficient transport or equipment to navigate the terrain meaning victims here received no treatment.</p> <p>The nature and outcome of injuries encountered by the medical teams correlate with the time taken to reach the victims.</p> <p>Combining EMTs of different nationalities and skill sets leads to greater capacity to manage more casualties.</p> <p>To facilitate planning for future deployments, teams should have equipment to treat musculoskeletal, respiratory and gastrointestinal problems as these are the most commonly affected after an earthquake.</p> <p>HCPs should be prepared to treat paediatric and common obstetric problems, especially births.</p> <p>All team members should familiarise themselves with the logistics and processes so that patient management is as seamless as possible.</p> <p>Any study and data collection/analysis methods should be formulated and assigned prior to deployment to ensure that it is thorough and accurate.</p>	<p><u>Access difficulties:</u> -Difficult terrain and inadequate equipment</p>	<p><u>Challenges with record keeping:</u> -Formulation and assignment of data collection prior to deployment</p>	<p><u>Multi-nationality cooperation:</u> -Combination of EMTs from different regions is effective</p>	
Lin et al., 2017	<p>The earthquake aftershock resulted in safety hazards for the team and for locals, increasing the number of patients.</p> <p>Multidisciplinary and multinational communication and cooperation is necessary to ensure optimal and careful treatment.</p> <p>Research into the development of lighter, more portable medical equipment is necessary as current equipment is cumbersome and heavy to transport around the field.</p> <p>Research into the optimal combination of medical professionals is needed.</p>				<p><u>Multi-nationality cooperation:</u> -Combination of EMTs and local HCPs with different professions is effective</p>

Sorani et al., 2018	<p>Damage to roads and infrastructure meant that victims could only be reached by air transport, which was extremely limited.</p> <p>The involvement of lay-people, with insufficient first aid training, exacerbated and caused further injuries.</p> <p>Overcrowding at disaster scenes slows progress.</p> <p>Communication within the affected area, as well as the outside region, was disrupted or jammed.</p> <p>Local hospitals were damaged and unable to continue normal daily functions.</p> <p>Local HCPs had insufficient knowledge and skills in the disaster field.</p> <p>Safety considerations for emergency services were not a priority.</p> <p>The initial response is often chaotic as there is no defined management plan for local, national, or international rescuers.</p> <p>HCP misconception about the expected patients: there is no preparedness to react to non-traumatic emergencies.</p> <p>During the response phase, scarce resources are wasted due to poor allocation of human and financial resources.</p> <p>Community infrastructure should be more resilient and able to withstand and function in extreme hazardous conditions.</p>	<p><u>Access difficulties:</u></p> <p>-Road and infrastructure damage,</p> <p>-Lack of air transport,</p> <p><u>Lack of preparation:</u></p> <p>-Lack of disaster knowledge and skills</p>	<p><u>Lack of basic healthcare provision:</u></p> <p>-Damage to hospitals</p>	<p><u>Communication:</u></p> <p>-Damage to electronic communication</p>	<p><u>Use of resources:</u></p> <p>-Allocation of human and financial resources</p>
Watts & Byrom, 2014	<p>The geographical location of some of the islands posed logistical problems for accessing them, leading to delayed response times.</p> <p>Poor sanitation due to stagnant typhoon water led to re-infection of wounds which required further treatment.</p> <p>There was no standard medical record keeping for EMTs, meaning the team had to improvise.</p> <p>The self-care requirements of the EMT were under-anticipated, especially concerning hydration.</p> <p>Effective communication with local HCPs is essential so as not to undermine local healthcare structures, fostering unrealistic expectations from the locals.</p>	<p><u>Access difficulties:</u></p> <p>-Geographical difficulties</p>	<p><u>Lack of basic healthcare provision:</u></p> <p>-Poor sanitation, leading infection of wounds</p>	<p><u>Challenges with record keeping:</u></p> <p>-No standard template for record keeping</p>	<p><u>Self-care:</u></p> <p>-Under-anticipated self-care needs of EMTs,</p> <p><u>Multi-nationality cooperation:</u></p> <p>-Cooperation with local HCPs to deliver suitable healthcare</p>

RESULTS

Study Characteristics

All studies were retrospective in nature and published from 2014 to 2019. Two were personal accounts detailing the experiences of a doctor and two paramedics during the response to a cyclone and a typhoon [31,32]. Two studies conducted qualitative interviews; questioning local medical teams who had worked alongside international EMTs about their experiences and challenges during a typhoon, and about natural disasters as a whole [33,34]. There were three descriptive reports, focusing on foreign and armed forces medical teams' experience in disaster response to typhoons and earthquakes [35-37]. There was one descriptive study which detailed the timings, capacities, and activities of EMTs during the response to a typhoon [38]. Characteristics of each of the eight references can be found in Table 2.

Data Extraction

Key results were extracted from the selected references through a methodical full-text analysis. The following common themes emerged: operational and access challenges; healthcare delivery and infrastructure; communication and data management; and resource utilisation and team management. Further refinement led to the development of sub-themes: access difficulties; time delays; lack of preparation; lack of basic healthcare provision; lack of basic necessities; challenges with record keeping; communication; use of resources; self-care; and multi-national cooperation (Table 3).

Operational and access challenges

Access difficulties - Disaster responders face several challenges, even before reaching patients. Due to the destructive nature of natural disasters, roads and infrastructure are often damaged to such extent that areas cannot be accessed, limiting access to patients [31,34,36]. This is exacerbated by a lack of suitable road vehicles and lack of alternative transport options, such as helicopters [34,36,38]. Often, there is an increase in traffic on unaffected roads further slowing down the relief effort [34]. Teams are faced with geographical challenges, such as the archipelagic nature of the Philippines and the mountainous terrain of Nepal [32,35,36]. Geographical difficulties require more time, logistical planning and specialised equipment to navigate, leading to delayed or no treatment for victims of the disaster [32,36]. Much of the current equipment is too heavy to transport into hard-to-reach locations [37]. Transportation assets such as four-wheel-drive vehicles allow HCPs to commute to remote areas with difficult terrain and are an asset to disaster response [36]. Media can also have a negative impact on accessing patients, due to misleading reports and images, resulting in rescuers prioritising areas less affected than others [38].

Time delays - During natural disasters, the nature of injuries encountered by an EMT can correlate to the timing of the team's deployment and operational status [36]. Timeliness of a team's response is crucial yet has been found to be delayed by a range of factors. In Mozambique, establishing a medical clinic was difficult due to landowners' reluctance to consent to land use [31]. Natural disasters often cause a shortage of running or decontaminated water [31,32]. In some areas, this also posed problems in establishing an efficient, functioning clinic [31]. Local and foreign teams have been found to take too long to become operational upon arrival [35,38], with no members in the Philippines becoming operational before day three, some not until day six [35,38].

Lack of preparation - Though EMTs frequently deploy "fast and light" in the disaster setting, they often face logistical challenges, such as lack of appropriate training and support [38]. Local and foreign teams have been found to be underprepared in their training [34,35], leading to further damage to the victims of the disaster [35]. Local and foreign medical staff have insufficient knowledge and skills in disaster response, leading to inappropriate and sometimes harmful results, not acceptable in the local context [34]. To ensure that patient management is as seamless as possible, team members and HCPs should familiarise themselves with the relevant logistics and processes, prior to deployment [36]. Medical teams have been found to be able to quickly adapt and work around these difficulties to deliver quality care [36].

Healthcare delivery and infrastructure

Lack of basic healthcare provision - A natural disaster creates serious disruption in the functioning of a community and increases demand on pre-established healthcare structures. During a disaster, pre-existing healthcare conditions persist alongside trauma [32]. EMTs should be equipped to manage these needs, as their most valuable role in some disaster settings has been to compensate for collapsed infrastructure and maintain 'normal conditions' [38]. Natural disasters appear to increase the prevalence of pre-existing barriers to health. In Mozambique, the prevalence of diseases such as malaria was increased, and in the Philippines, due to stagnant typhoon water, sanitation was poor, leading to infection and re-infection of wounds [31,32]. These problems cause difficulties in the provision of everyday, basic healthcare needs. Health facilities such as hospitals are often vulnerable to disasters, becoming so severely damaged that they are unable to continue normal daily functions [31,34]. It is recommended that community infrastructure should be planned for durability and be able to withstand extreme conditions [34].

Lack of basic necessities - The lives of victims and the functioning of medical teams can be significantly impacted by the lack of basic necessities. Some clinics could only function in daylight hours due to lack of power, which in some cases proved to be the greatest barrier to productive activity [31,35]. The provision of power generators from EMTs helped to return health facilities back to normal operation [35]. Access to de-contaminated, running water also posed a barrier to health. Fresh water supplies for local people and EMTs were often contaminated with sea water or debris [32] and in some locations, there was no access to running water at all [31].

Communication and data management

Challenges with record keeping - Adequate documentation of EMT activities in disaster settings is often lacking, hindering accurate performance assessment [32,38]. This data deficiency, highlighted by one study in this review that could not answer its research question due to insufficient data [38], is partly attributed to the absence of a standardised data collection format [32,36,38]. Lack of data impacts not only the understanding of EMT activities but also crucial information about patient location and condition, essential for improving future disaster response [32]. Furthermore, even with a clear methodology, reporting statistics is often not prioritised by EMT members, who may exhibit poor adherence to standards [38]. EMTs face multiple challenges throughout their mission with limited capacity, making research a secondary concern [36]. Obstacles like rural environments and language barriers further compound the issue, leading to underreporting due to communication breakdowns [31,36]. To address this, a pre-defined data collection method with assigned roles for suitable individuals should be established before deployment [36,38].

Communication - Effective communication among HCPs and disaster response services is essential, yet numerous challenges exist. Language barriers frequently hinder communication in international EMTs

deployed to disaster-stricken areas; this affects interactions with both local HCPs and patients, ultimately impacting care quality [33,38].

Local HCPs have reported inadequate communication with EMTs, leading to ambiguity and unrealistic expectations [33]. To improve communication and optimise aid delivery, EMTs must understand the context of their assistance [33]. Furthermore, poor inter-EMT communication can negatively impact victims, causing aid duplication in some areas and gaps in others [35]. Finally, natural disasters often disrupt communication infrastructure due to physical damage or increased call volume, hindering information gathering and decision-making regarding response levels [34,38].

Resource utilisation and team management

Use of resources - During the response phase of a disaster, financial and human resources have been found to be wasted [34,38]. The processes and requirements for deploying and utilising EMTs have been criticised. In the Philippines, almost half of the EMTs left scene within the first month of the incident, with some teams being on site for less than five days [38]. Local HCPs were disappointed when help from EMTs was not as expected, or did not arrive [33]. These brief rescue missions cast doubt on the medical value and cost effectiveness of EMTs [38].

Despite this, the allocation of roles within EMTs has been found to be suitable and well balanced, meeting requirements [38]. The initial response to a disaster can be chaotic and unorganised with no defined process for mobilisation and utilisation of resources at a local, regional, or national level [34]. There are often far too many responders to a disaster, resulting in disordered scenes [34]. Conversely, EMTs have been found to become overwhelmed by large patient loads [35].

Multi-national cooperation - Effective multi-national cooperation is essential to reliable performance in response to a natural disaster, producing overall positive results [32,35-37]. Every team presents with varying assets and flaws. When combining teams, these have been found to complement each other; results achieved from the amalgamation of teams are greater than when working separately [35,36]. Members of different teams have been found to be able to cooperate well together at short notice, a credit to HCPs globally [36].

The sharing of knowledge and information between multi-national teams can aid in individual HCP progression, leading to better understanding of different countries' cultures and ways of working [36]. Discussion with local HCPs is useful due to their knowledge of the area and available pathways [32,37]. Due to the less-developed economy of many natural disaster settings, it is important not to undermine existing healthcare structures or foster unrealistic expectations from patients; integration and communication with local HCPs is essential to ensure this [32]. Multi-disciplinary work and consultation is also essential in a natural disaster setting due to the common presentations of patients. Afflictions such as multiple trauma and complicated diseases require effective multi-disciplinary teamwork [37].

DISCUSSION

EMTs face numerous challenges in delivering healthcare during disaster response, ranging from logistical issues [31,32,34,35,38], to systemic problems [32-35,38]. A key finding is the lack of basic healthcare provision in disaster settings [31,32,34]. Given their broad knowledge base, including public health and urgent care competencies, paramedics could be an asset to EMTs, which currently lack these crucial skills. Disaster response encompasses 'The Five Phases of Emergency Management': prevention, preparation, response, recovery and mitigation [48]. The crucial response phase occurs immediately after a disaster and is primarily aimed at reducing further loss of life and property [39]. The recovery phase takes place after short-term needs have been addressed and includes; rebuilding physical and non-physical infrastructure such as schools, hospitals and healthcare systems [49]. The division of responders and response actions between the response and recovery phase is not distinct, yet the response stage predominantly involves local authorities, services and search and rescue teams, while the recovery phase utilises EMTs and other organisations [41,50,51].

The clearest impact on the health of a population affected by disasters is injuries and deaths attributed directly to the disaster [52]. Less obvious impacts, such as disruption to every-day medical care contribute significantly to the death toll caused by natural disasters [40]. Disasters can render health facilities unable to provide essential medical care [31,32,34]. This may be due to damage to infrastructure, a loss of critical utilities such as water and power, or services becoming overwhelmed by disease outbreak [31,32,34,53]. The WHO suggests that during the early recovery phase, access to essential care packages and public health programs may reduce vulnerabilities and save lives [54]. It is particularly important to ensure primary healthcare services are available and accessible [53].

While the most beneficial role for EMTs in sudden-onset disasters is maintaining normalised healthcare conditions and addressing primary care needs [38,55], they often prioritise trauma care over urgent medical needs [42,43]. This focus on acute surgical and orthopaedic care can hinder their ability to effectively respond to disaster-related complications such as disease outbreaks, infections, premature deliveries, mental health crises, and cardiovascular events [55-57]. This lack of adaptability can limit EMTs' ability to reach target populations and provide sustainable solutions [15,58]. EMTs are involved throughout the entire disaster response cycle, from initial response to final recovery [41]. Therefore, EMTs should be equipped to handle a wide range of emergencies with both clinical and public health expertise [59]. This is an area in which paramedics may be able to contribute their skills. Despite paramedics being recognised members of EMTs and active in disaster response [16], research on their specific contributions is lacking. While paramedics are often associated with immediate critical care [60], their role encompasses healthcare, public health, and social care, spanning various settings including emergency, primary, and urgent care [61].

Disasters increase the prevalence of communicable and non-communicable diseases, leading to unpredictable outbreaks [62]. Existing chronic conditions are often exacerbated by disruptions to routine healthcare [40,63]. However, the paramedic role has evolved to meet these challenges. With the emergence of paramedic specialists in primary and urgent care, paramedics are now adept at managing acute-on-chronic conditions [64,65]. Furthermore, in the UK, the Health and Care Professions Council standards ensure paramedics understand the impact of environment on health and empower individuals to manage their own health [66]. Specialised and non-specialised paramedics can provide continuity of care for patients with chronic conditions [67,68]. These pre-existing and newly acquired competencies in public health and primary care make paramedics an asset to EMTs, which currently lack such skills. Considering that not all disasters necessitate a robust prehospital response, paramedics can serve as a crucial surge workforce addressing urgent and primary care needs in natural disasters [46].

Paramedics can take steps to improve their functionality in disaster settings. Primarily, understanding the potential risk of disease outbreaks and how to manage them. Factors that may precipitate disease outbreak following disasters include after-effects, environmental changes and public knowledge and awareness of health risks [69,70]. It is the responsibility of not only government and non-government organisations to tackle these challenges but also public health and humanitarian professionals, such as paramedics [69]. The unique skill set of urgent and primary care paramedics place them in an advantageous position to develop knowledge regarding disease outbreak and successive health complications following a natural disaster.

Study Limitations

This scoping review has several limitations. Firstly, the search was restricted to English language studies, introducing a potential bias by excluding relevant research available in other languages. Given that disaster response is a global issue, insights from non-English language sources, particularly those from regions frequently affected by natural disasters, may have been overlooked. Secondly, database limitations may have resulted in the omission of relevant studies. While multiple major databases (CINAHL, MEDLINE, Cochrane Library, and Scopus) were searched, studies indexed in other databases or published in non-indexed sources, such as government reports and regional grey literature, may not have been captured. This could lead to an incomplete representation of the evidence base. Thirdly, the scoping review methodology prioritises breadth over individual study quality.

The studies included varied in design, methodology, and reporting standards, limiting the ability to assess their relative strength and reliability. Additionally, given that only eight studies met the inclusion criteria, the findings may not be fully generalisable to all EMT responses in natural disasters. The small sample size may not reflect the full scope of paramedic involvement across different disaster contexts, healthcare systems, and geographical regions. Future research should incorporate a broader range of

sources, consider multilingual studies, and employ systematic review methodologies to provide a more comprehensive analysis of paramedics' role in disaster response.

CONCLUSIONS

This scoping review highlights the need to investigate the under-researched role of paramedics in EMTs. Despite well-defined limitations in EMTs globally, paramedics have not been considered as a potential solution. EMT limitations range from logistical to systemic issues, with a lack of basic healthcare provision being a domain in which paramedics may offer a solution. The emergency skills, for which paramedics are often recognised, quickly become less useful as health requirements move to critical care and surgical focus. A paramedic's capability in urgent and primary healthcare may prove more beneficial to EMTs. This is due to the high likelihood of disease outbreak after natural disasters and the risk this poses of exacerbating chronic conditions. Enhancing the knowledge of urgent and primary care paramedics in disease outbreak and everyday healthcare provision after a disaster, may prove invaluable to filling the public health gap currently found in EMTs.

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