



Kent Academic Repository

Melkonyan, Armen, Oyugi, Boniface, Conovali, Eugeniu, Storozhenko, Oleg, Gijs, Geert, Paronyan, Lusine, Relan, Pryanka and Salio, Flavio (2025) *A review of the response and the emergency medical teams (EMTs) deployment in Armenia following an explosion at a fuel depot near Stepanakert (Nagorno-Karabakh)/ in Armenia*. Conflict and Health, 19 (1). ISSN 1752-1505.

Downloaded from

<https://kar.kent.ac.uk/108789/> The University of Kent's Academic Repository KAR

The version of record is available from

<https://doi.org/10.1186/s13031-025-00649-1>

This document version

Publisher pdf

DOI for this version

Licence for this version

CC BY-NC-ND (Attribution-NonCommercial-NoDerivatives)

Additional information

Versions of research works

Versions of Record

If this version is the version of record, it is the same as the published version available on the publisher's web site. Cite as the published version.

Author Accepted Manuscripts

If this document is identified as the Author Accepted Manuscript it is the version after peer review but before type setting, copy editing or publisher branding. Cite as Surname, Initial. (Year) 'Title of article'. To be published in **Title of Journal**, Volume and issue numbers [peer-reviewed accepted version]. Available at: DOI or URL (Accessed: date).

Enquiries

If you have questions about this document contact ResearchSupport@kent.ac.uk. Please include the URL of the record in KAR. If you believe that your, or a third party's rights have been compromised through this document please see our [Take Down policy](https://www.kent.ac.uk/guides/kar-the-kent-academic-repository#policies) (available from <https://www.kent.ac.uk/guides/kar-the-kent-academic-repository#policies>).

RESEARCH

Open Access



A review of the response and the emergency medical teams (EMTs) deployment in Armenia following an explosion at a fuel depot near Stepanakert (Nagorno-Karabakh)/ in Armenia

Armen Melkonyan¹, Boniface Oyugi^{2,3} , Eugeniu Conovali⁴, Oleg Storozhenko⁴, Geert Gijss⁴, Lusine Paronyan⁵, Pryanka Relan^{2*} and Flavio Salio²

Abstract

Introduction An explosion at a fuel depot in the region of Berkadzor, around 6 km near Stepanakert in Nagorno-Karabakh, happened on September 25, 2023 resulting in more than 220 lost lives and around 300 injuries. The Ministry of Health of the Republic of Armenia (MoH), collaborating with the WHO, requested assistance for burn specialised care teams and medical evacuation.

Study objectives To describe the emergency response learnings by reflecting on Armenia's experience managing the incident and the international EMTs' role in responding to it.

Methods This was an observational study whose data was compiled through a triangulation of data obtained from the EMT teams using information management tools, including an EMT Minimum Data Set (MDS) specifically designed for coordinating burns responses in a daily reporting format and others from the MoH and medical evacuation (Medevac) teams, together with the information and analysis from field coordination meetings and deliberation with MoH.

Results Four international EMTs (I-EMTs) were deployed to Armenia in coordination with the MoH and WHO. They were well-prepared and self-sufficient, but the response highlighted the need for standardized protocols for Medevac and burns care. Nearly half of the patients were critical on the first day, with 58% in non-ICU centers and 42% in ICU, with 20 patients medically evacuated using draft Medevac guidelines. Severely burned patients in non-ICU units received 24-hour care from intensive care specialists. However, the shortage of ICU and specialized burns beds in Armenian hospitals was evident. The Emergency Medical Teams Coordination Cell (EMTCC) team effectively used information management tools to collect, process, analyze, and disseminate data to the MoH and response teams, facilitating rapid deployment and decision-making. The EMTs collaborated with local hospital staff, ensuring coordination with MoH and hospital management for follow-up and supply delivery. This integrated approach built local capacity, developed essential rehabilitation modules for burned patients, and delivered burn kits and surgical

*Correspondence:
Pryanka Relan
relanp@who.int

Full list of author information is available at the end of the article



© The Author(s) 2025. **Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

equipment. Early international assistance, coordinated by WHO and MoH, facilitated a rapid response, early EMT CC installation, and improved communication, ensuring the delivery of essential burn kits.

Conclusion There is a need to set standards for elements such as Medevac and burns care through the WHO EMT Standards and recommendations. In addition, these settings should be integrated into the information management tools under development. The findings and lessons learnt on the specialised care teams have been essential and aligned with the 2030 EMT strategy. Major investments are needed to ensure that more specialised care teams are efficient and effective even in future responses, especially for healthcare facilities that are inadequately capacitated, which would eventually allow local workforce growth and strengthen technical skills through their collaborations in training and collaborative responses. Further, they would guide future fast delivery of surgical equipment and burns treatment kits.

Keywords Armenia, Medical evacuation, Burns care, Emergency response, Emergency medical teams

Background

The large-scale military offensive of Azerbaijan against Nagorno-Karabakh on 19 September 2023 led to forced displacement of its entire indigenous population. It was preceded by 10 months-long blockade, humanitarian crisis with exacerbating impact on the most vulnerable [1]. As of September 20 2023, it was shown that more than 100,632 people were forcibly displaced who had entered Armenia from Nagorno-Karabakh, accounting for approximately 3.6% of Armenia's existing population [1].

To compound this already existing humanitarian impact of the population movement, an explosion at a fuel depot in the region of Berkadzor, around 6 km near Stepanakert in Nagorno-Karabakh happened on September 25, 2023 [2]. It resulted in more than 220 people losing lives and more than 300 injuries [2]. Many of the victims of the explosion were transferred to several hospitals within the township, with a majority of those injured being male patients (including young children) and having severe burns [3]. This led to a high demand for advanced and specialised medical care.

The National Center for Burns and Dermatology, with its 80 beds, was fully occupied. With the increase in the number of patients to receive burn care, there was an additional need to increase the number of beds in the hospital using the area of accounting department. Eight other hospitals in Yerevan also provided medical and surgical care. Patients were triaged, treated, or admitted as suggested by the hospital's burns case management team (plastic surgeons, general surgeons, anaesthesiologists, physicians, nutritionists and nurses). On September 29, the EU Civil Protection Mechanism (UCPM) was activated following a request for assistance from the Embassy of Armenia in Brussels. On October 1, 2023, the Armenian Ministry of Health (MoH) provided a Request for Assistance (RFA) specifically for Burn Specialised Care Teams and safe and rapid patient transfer and medical evacuation (medevac) Specialised Care Teams. The RFA was received by the World Health

Organization (WHO) and published on the same day for support in the mobilisation of the Emergency Medical Teams (EMTs) in response to this emergency (Fig. 1). The request aimed to assist the MoH in treating the over 229 burn cases that had been evacuated to medical centres in Yerevan. This assistance involved providing elements of specialised management such as skin graft operations, rehabilitation, and others [4]. Additionally, it included providing medical supplies, equipment, and pharmaceuticals (analgesics) for the care and treatment of burn patients and training and capacity building for local healthcare professionals to enhance their skills in burn care and treatment, and rehabilitation [4].

Due to the 10 months-long blockade of Nagorno-Karabakh, which had caused a critical shortage of food, medicine, sanitation and other essential goods with exacerbating impact on the most vulnerable, including children, elderly, people with disabilities and pregnant women, which in turn caused additional complications during the treatment of patients. During the entire period of treatment of malnourished patients, there was a strong need for temporary skin substitutes, parenteral nutrition and feedings, in particular Albumin.

This study aims to describe the emergency response learnings by reflecting on Armenia's and WHO's experience managing and coordinating the incident and the international EMT's role in responding to it. It builds on a growing literature of EMT responses that provide insights into responding to different emergencies and whose experiences are imperative in improving future responses.

Method

This is an observational study whose data was compiled from September 25, 2023, to October 28, 2023. No personal or individual patient medical data have been included as most of the information presented here has been collected from open online sources or reports from the EMTs to the Emergency Medical Team Coordination Cell (EMT CC) in line with the EMT initiative's ambition

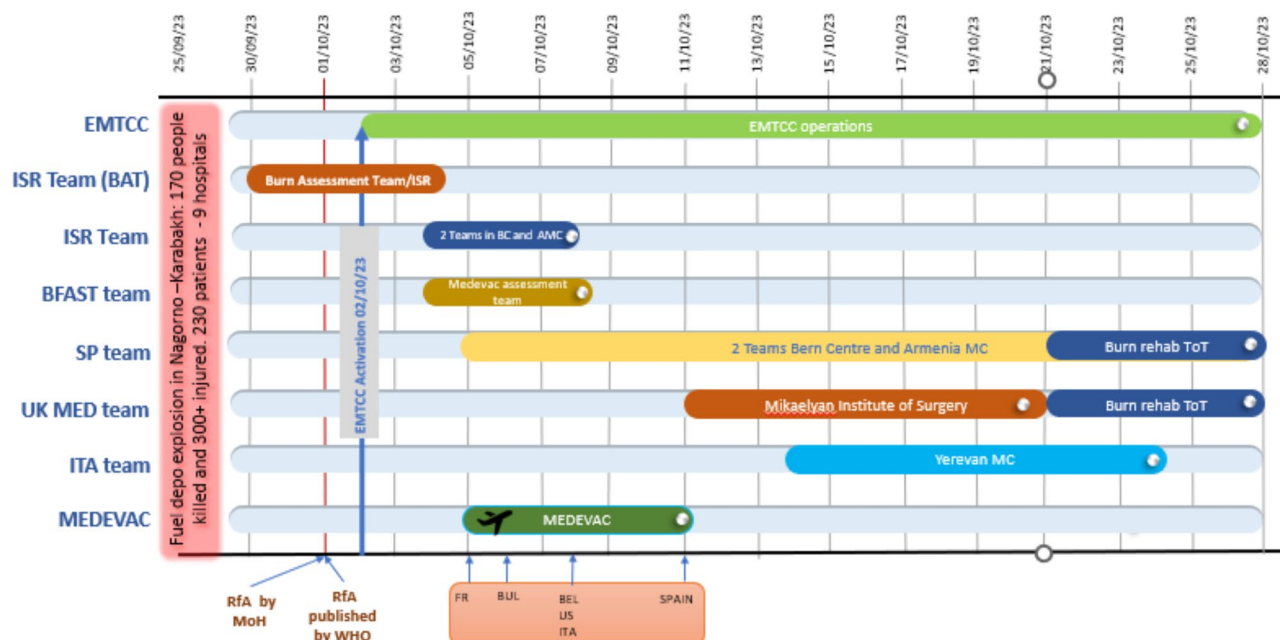


Fig. 1 Response operation timelines

of fostering accountability and transparency. As such, no ethical concerns were identified that would outweigh the study's objectives, and permission from an ethical review board was not deemed necessary.

The study used documents or studies that were focused on the international EMT response in Armenia in September and October 2023. The secondary data sources were provided to the EMT CC run by the Armenian MoH with the support of the WHO. The EMT CC used information management tools, including an EMT Minimum Data Set (MDS) specifically designed for burns responses and medical evacuation in a daily reporting format [5]. This included a WHO-defined package of key data items for reporting to the EMT CC. The Burns MDS daily reporting form comprised a total of 27 items that could broadly be categorised into three main sections/ areas: team information (8 items from organisation name, teams and contact persons, dates and the longitudes/ latitudes (mainly locations); areas of deployment (captured six items, including the region, city and facility name); daily summary statistics (such as number of consultations, admissions, discharges, procedures and outcomes and other necessary comments). Additionally, we gathered further information using a data form to capture the list of people for evacuation and their characteristics, including accompanying persons. We also included additional information and analysis from field coordination meetings and deliberation with MoH.

Each EMT aggregated daily reports at the end of each day using Microsoft Excel (Microsoft Corp.), which the

EMT CC provided. The information was then shared either online or physically with the information manager of EMT CC at the end of each day. The EMTs also provided information on the number of their specialist (workforce and their categorisations by speciality), which was only done once at the onset of the response and corrected whenever there were changes during the response processes. Additionally, more data from the MoH on the number of patients in different hospitals was also shared with the information manager at the end of each day (categorised as those in ICU and non-ICU— although it did not reflect the need for specialised beds but the shortage of ICU and specialised burns-management beds in Armenian hospitals) in addition to the Medevac MDS data on the patients that had been transferred and evacuated for medical intervention that the MoH provided. The EMT CC team set up an Ad-hoc surveillance system (i.e., the dashboard with all pieces of information combined) for the EMTs on 03/10/2023, and the use of the burns MDS daily reporting tool and all the other sources (aforementioned) commenced on 04/10/2023. The information manager aggregated the daily report using an online dashboard, which was used to create and generate the daily statistics [6]. During the overall reporting time, 49 daily reports were sent to the information manager. A descriptive analysis of the frequency statistics was conducted directly on the dashboard.

Additional searches from both PubMed and Google using search words: 'foreign medical teams' OR 'Emergency medical teams' OR 'field hospital' OR

'Armenia explosion' and websites of the deployed I-EMTs, MoH, Relief Web, and WHO were done to validate the finding data. Further, to ascertain the validity, the results and the documentation were verified and discussed with the designated focal point for coordinating the data management of the Armenia response. This critical review was imperative in reflecting on the lessons learnt.

Results

Formation of the EMT CC

Following the request from the MoH and in coordination with the WHO, the EMT CC was activated in Yerevan on October 2 (Fig. 1) to ensure the smooth coordination of incoming EMTs and Medevac. The daily response coordination was done collaboratively under EMT CC with the representatives of MoH Armenia, the WHO Regional Office for Europe and the WHO Country Office (WCO), and the mobilised teams. The EMT CC ensured reliable information exchange with the present and incoming EMTs, the Embassy of Belgium in Armenia and European Civil Protection (EUCP) Mechanism and the European Response– Emergency Response Coordination Centre (ERCC) for Medevac through the signed standard operating procedures (SOPs) between WHO and ERCC on response capacities. An operational Sitrep was regularly shared with stakeholders to enhance information flow. During the response, the WHO Regional Office for Europe (EURO) deployed 3 EMT CC Coordinators (in rotation) and one permanent dedicated Information Management (IM) officer.

Type/organisation of I-EMTs

Four international EMTs (I-EMTs) and specialised care teams for burns management were deployed to Armenia: Israel Defence Force EMT (Israel), Samaritan's Purse (United States of America), UK-MED (United Kingdom), and Protezione Civile Nazionale EMT (Italy). Each was deployed in coordination with the MoH Armenia based on capacity available at the EMT level and the cross-matching of needs at the four different Armenian hospitals. Two were categorised as a non-governmental organisation (UK-MED and Samaritan's Purse), one as mixed military and government (Israel Defence Force EMT), and one as government (Protezione Civile Nazionale EMT) deployed under the UCPM. At the time, the Samaritan's Purse and Protezione Civile Nazionale were undergoing the classification process at the time of the response and were under mentorship. The UK-MED team had just had their reclassification while preparing for the deployment, and they arrived a day after the reclassification. All the teams were mainly categorised as specialised care teams in burns (WHO provided a temporary description of the required capacities to standardise assistance and services offered). Two teams,

Samaritan's Purse and Israel Defence Force EMTs, were successfully deployed to two different hospitals, effectively expanding the available operating theaters to serve more patients.

Timelines, composition of teams

Each team arrived at a different time following clearance. The Israel Defence Force EMTs had two teams arriving at different times. The Burns Assessment Team (BAT) was the first to arrive in Armenia on September 30, five days after the incident, followed by their second team, the Burns Specialised Care (BSC) Teams, which arrived on October 2. All two teams of the Samaritan's Purse team arrived on October 5, 10 days after the incident (with additional incoming staff and equipment coming days later); UK-Med followed up 15 days after the incident (on October 11); and Protezione Civile Nazionale EMT was the last to arrive nearly 20 days after the incident (October 14). The composition of the teams is shown in Fig. 2.

The response required a multidisciplinary team composed of surgeons, anesthetists, intensive care specialists, nurses, nutritionists, rehabilitation specialists, and mental health professionals. The most needed specialists were burn surgeons, critical care anesthetists, and physiotherapists, given the high number of severe burns requiring surgical intervention, respiratory support, and post-burn rehabilitation. Specialized burn nurses and nutritionists were part of the team, and collaboration between local and international teams significantly enhanced capacity building.

The Israel Defence Force EMTs had the highest number of 12 specialists (one team lead, six surgeons, two nurses and three anaesthetists), followed by Samaritan's Purse EMT, which had 11 specialists (one team lead, four surgeons, four nurses, three anaesthetists, and two physiotherapists, then UK-MED that had had 6 specialists (one team lead, one surgeon, two nurses, one anaesthetist, and one physiotherapist) and the Protezione Civile Nazionale EMT had three specialists (one surgeon, one anaesthetist, and one nurse).

Activities and workload

Regarding workload and activities, the teams were deployed to the four major Armenian facilities (National Center for Burn and Dermatology, "Armenia" Republican Medical Centre, Mikaelyan Institute of Surgery, and Yerevan Scientific Medical Centre), and their deployment was based on need as identified by MoH. All the other five hospitals also referred patients who needed specialist care to the four major facilities. 85% of all the patients were non-ICU, with the 15% in ICU having a medical plan or requiring evacuation. A trend in the hospital situation is in Fig. 3.

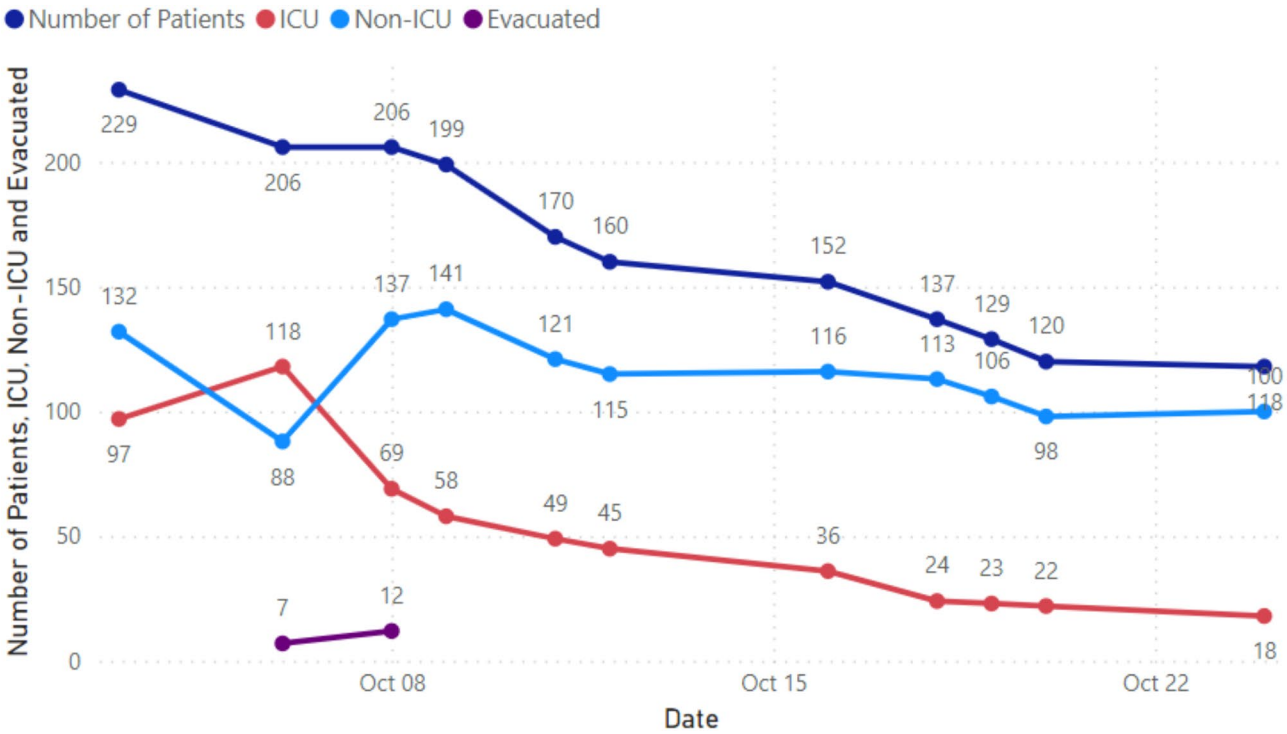


Fig. 2 Trends in the hospital situation

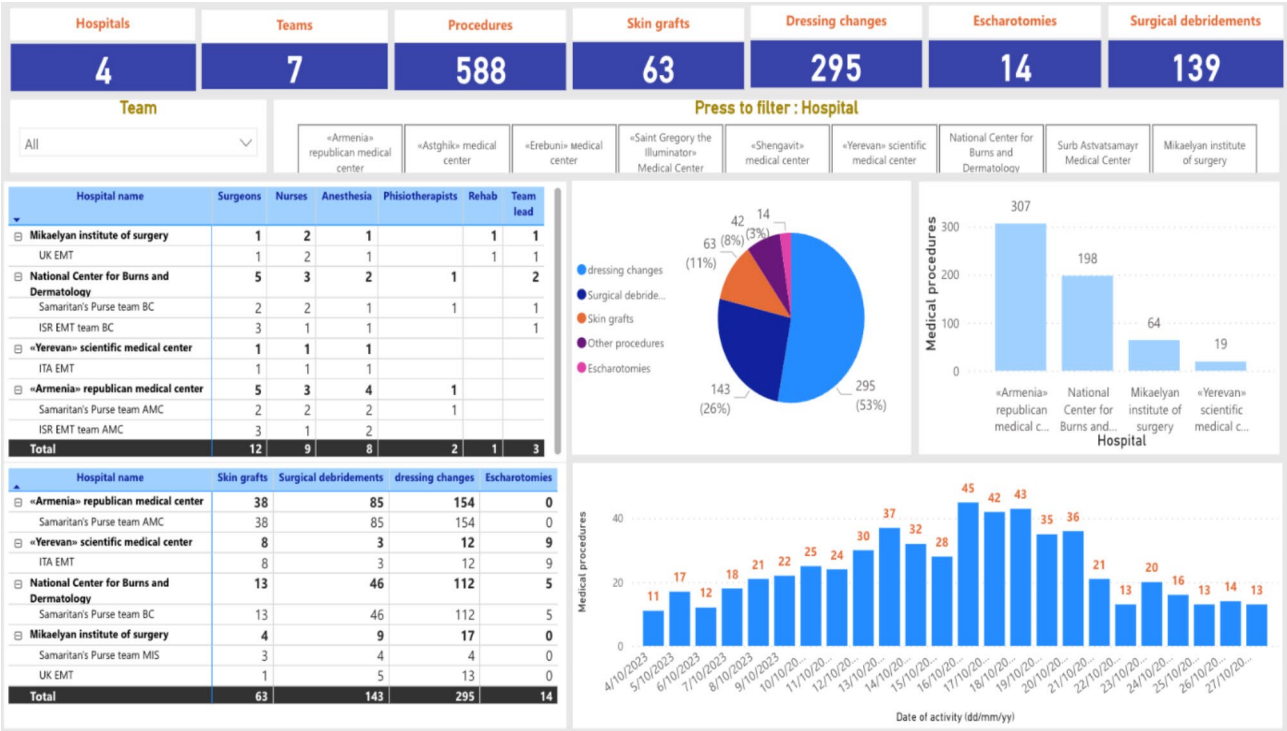


Fig. 3 Summary of activities, staff, and workload

Dressing changes were the most frequently performed procedure ($n=295$, 53%), followed by surgical debridement ($n=143$, 26%) and skin grafts ($n=63$, 11%). Escharotomies were the least common ($n=14$, 3%). The workload distribution per team is detailed in Fig. 2. Among the healthcare facilities, the “Armenia” Republican Medical Center conducted the highest number of procedures ($n=307$), followed by the National Center for Burns and Dermatology ($n=198$), Mikaelyan Medical Center ($n=64$), and “Yerevan” Scientific Medical Center ($n=19$). These figures were reported by the EMTs, who worked in coordination with national health professionals.

The Samaritan’s Purse EMTs conducted the most procedures spread across three health facilities (54 skin grafts, 135 surgical debridements, 270 dressing changes, 5 Escharotomies, and 474 other procedures). The team took 23 days in the whole deployment translating to approximately 41 procedures per day. They commenced their work at Mikaelyan Medical Center, and after four extra staff members joined the team, they were divided into two teams, covering the National Center for Burns and Dermatology and the “Armenia” Republican Medical Center. The Israel Defence Force EMTs were deployed in two main hospitals (The National Center for Burns and Dermatology and the “Armenia” Republican Medical Center). In overall they conducted 42 procedures and took 4 days in deployment translating to approximately 11 procedures per day. Further, the team worked simultaneously in four operation theatres alongside the local medical staff and conducted the initial burns assessment, whose finding was that there were 200 severely burned patients, with 80 of them in critical condition, surging capacity for specialised care teams (burn experts) to support existing medical centres and the provision of medical supplies and equipment. The team identified the scope of needed medical support along with a list of equipment and medicines required for Medevac. Their mission did not last the planned three weeks as they had to return to Israel to attend to the country’s deteriorating context.

Beyond surgical interventions, the medical management of burn patients was centered on fluid resuscitation using the Parkland formula, multimodal pain management with opioid and non-opioid analgesics, and stringent infection control measures to prevent sepsis—one of the leading causes of burn-related morbidity. In ICUs, advanced wound care, including early debridement and the use of temporary skin substitutes, played a crucial role in patient recovery. Patients suffering from inhalation injuries and respiratory distress were managed with specialized respiratory therapy and ventilatory support. Nurses played a vital role in burn care, particularly in wound dressing, infection

prevention, pain management, and continuous patient monitoring. They were responsible for implementing strict aseptic techniques, ensuring optimal wound healing through frequent dressing changes, and providing essential nutritional support for burn recovery. Additionally, nurses offered psychological support to both patients and their families, addressing the emotional trauma associated with burn injuries. The deployment of EMTs further strengthened the local nursing workforce through hands-on training in advanced burn care protocols, enhancing their ability to manage complex burn cases effectively.

Following the recommendation for Medevac from the BFAST assessment, medical evacuation operations were initiated to transfer critically injured patients to specialized burn centers abroad. On October 2, the Armenian MoH submitted a request to the ERCC for the medical evacuation of burn patients. Medevac operations commenced on October 3, with a total of 20 patients successfully evacuated. A small BAT, in collaboration with the MoH and WHO, conducted feasibility assessments using standardized evaluation criteria. The selection for Medevac was based on factors such as burn severity (percentage of total body surface area affected), the presence of inhalation injuries requiring ventilatory support, and the availability of specialized burn care in the receiving country. The first group of patients was evacuated within 7–10 days post-incident, with destinations including the USA, France, Belgium, Italy, Bulgaria, Romania, and Spain.

The Romanian Air Force operated the Medevac flights. Belgium provided treatment for three patients, while Bulgaria offered both transportation and treatment for another three. France facilitated the evacuation and treatment of four patients, Spain accepted two patients for specialized burn care, and Italy received five evacuees. Additionally, three patients were transferred to the United States through a bilateral agreement with the Armenian MoH. The timeline for Medevac varied due to logistical challenges and international coordination efforts. This operation highlighted the importance of standardized protocols to streamline medical evacuations in future emergencies. A summary of the Medevac is shown in Table 1.

The UK-MED team commenced operations at Mikaelyan Medical Center, where they conducted 1 skin grafts, 5 surgical debridements, 13 dressing changes, and 53 other procedures in their 10 days of deployment translating to approximately 7 procedures per day. The Protezione Civile Nazionale EMT worked at the Yerevan Scientific Medical Center, where they conducted 8 skin grafts, 3 surgical debridements, 12 dressing changes, 9 escharotomies, and 19 other procedures in their 10 days of deployment translating to approximately 5 procedures

Table 1 Summary of medevac

Country evacuated to	Number of patients	Date of evacuation
USA	3	08/10/2023
Belgium	3	08/10/2023
France	4	05/10/2023
Italy	5	08/10/2023
Spain	2	10–11/10/2023
Bulgaria	3	06/10/2023
Total	20	

(Source: Ministry of Health)

per day. Figure 2 shows a summary of the procedures per team.

Lessons and opportunities

Only some teams were adequately prepared and self-sufficient

One of the main challenges with the initial response time was the lack of equipment, specifically dermatomes and EMT personnel. Not all teams arrived self-sufficient as required, which meant that the EMT CC had to find creative solutions. One such solution was combining I-EMTs to pool resources in order to meet the needs at the hospital level. However, when the team was divided in two for different hospitals, there was insufficient equipment to operate effectively at both locations. There was a challenge to provide in a concise time frame (<12 h) highly specialised medical supplies (such as impregnated gauze for burn treatment and dermatome for skin grafting) in a relatively high volume setting. These pointed out the need for specific guidelines on providing these elements for BSC as a standard and having them available in the shortest possible way before deployment. These guidelines should consider a short and efficient supply chain before departure. Future responses should ensure pre-established stockpiles of burn treatment supplies and develop rapid supply chain mechanisms to address equipment shortages efficiently.

The teams demonstrated considerable expertise in managing the patients despite their deployment for varying lengths of time, with challenges in donating materials after the response

For instance, the Israel Defence Force ET continued after the initial assessment and was equipped with all necessary instruments and technologies (including dermatomes), focusing on providing essential care to burn patients, providing crucial support in medical surgical procedures, and providing over 42 specialised procedures performed. The Samaritan's Purse EMT had several staff rotations by the organisation. It even used its plane to import additional supplies, equipment, and instruments that were urgently needed and later donated to the MoH. The Samaritan Purse teams in the two

facilities actively provided medical services throughout this critical period, demonstrating their dedication and expertise. The exceptional number of complex surgical interventions they conducted underscored their remarkable skill and commitment to patient care. However, while the teams were deployed for varying lengths, some were unwilling to leave their equipment behind or donate it to hospitals upon completing their response in Armenia.

Early activation of the international assistance mechanism, such as through WHO and EUCP involvement, facilitated rapid coordination and communication among stakeholders

For instance, the support from member states and the strong buy-in from the Armenia MoH for EMT CC coordination were game-changers and improved the quality of the response coordination. The active involvement of the Embassy of Belgium facilitated the prompt activation of the ERCC and strengthened coordination with the EMT CC. This brought about a streamlined response and urgency in the operations. This timely response framework allowed for the efficient deployment of all resources between the national and international teams and the hospitals. Further, they enhanced the coordination of Medevac through the signed standard operating procedures (SOPs) between WHO/EMT and ERCC regarding response capacities. However, the bilateral deployment of teams that had not completed the EMT classification process affected coordination on the ground.

The EMT CC data was a key driver of the flexible response through strengthened coordination

This flexible response to the evolving challenges of the hospitals was based on outstanding and daily changing needs. Using the available data and regular field coordination meetings initiated and shared by EMT CC, the MoH, in consultation with the teams, enhanced the timely deployment of specialised teams by informing the response teams which hospitals needed urgent responses. This was also based/determined by the number of specialists the teams had with the MoH using the available information and data to determine where to put the teams. This included adapting and tailoring efforts to the needs on the ground to maximise the emergency's effectiveness. The teams were able to adapt very quickly and move from one hospital to the other without struggles, and they had flexible deployment strategies. However, there were some challenges with data sharing between EMT CC and ERCC, as well as a lack of a modular approach to the MDS application.

Both the hospitals and the decision-makers effectively utilised EMT CC data for decision-making

The standardised information management implemented by EMT CC and data sharing enhanced situation awareness through continuous monitoring, evaluation, validation, and verification of data sources and facilitated the real-time monitoring and analysis of the data through interactive maps, real-time dashboards of MDS and key performance indicators. This data was then used to make quick, informed decisions regarding prioritising actions and interventions, resource allocation, and coordination based on defined means.

Standardised protocols and guidelines were key to facilitating uniformity in service provision

The EMT CC data sharing enhanced situation awareness through continuous monitoring, deliberation, evaluation, validation, and verification of data sources. They facilitated the real-time monitoring and analysis of the data through the dashboards and key performance indicators. These were used in making quick decisions in terms of prioritisations of actions. For example, at the onset of the response, WHO EMT standards and recommendations on burns and Medevac (which both had been ongoing development) were utilised early in the response. They were provided early to WCO and EMT CC to support the uniformity of the care provided by the different teams in the response. It further encouraged the interactions between EMT CC and the WCO and formed part of the cluster at the WHO regional office. However, developing the burns module took significant time during the response operation.

Working together to achieve response objectives

Over four weeks, the collaborative work between the EMTs, the MoH, and partners helped see a decrease in the number of patients from 229 at the onset of EMTs' response to 118 as of their departure and the number of severe cases in the ICU also decreased from approximately 100 to 18. EMTs performed about 500 procedures, including escharotomies, skin grafts, and surgical debridement's. It is worth noting that rehabilitation interventions were critical part of the entire medical procedures starting from the first day of the hospitalization of the patients. The local medical staff together with EMTs were heavily involved not only in the process of escharotomies, skin grafts, and surgical debridements but also in daily rehabilitation services to maintain patients' health conditions and promote early functional recovery. The rehabilitation therapy was carried out simultaneously through the rehab team together with the participation of a burn specialist, a kinesiotherapist and a psychologist, if needed. Depending

on the patient's condition, other team members could also join other team members including psychiatrists etc.

The EMTs effectively integrated with local hospital staff, including surgeons and nurses, fostering capacity building and strengthening the overall response

This collaboration highlighted the need for future responses to prioritize the development of a well-structured, multidisciplinary burn care team with clearly defined roles. For example, the Israel Defence Force EMT worked closely with local experts early in the response, jointly conducting early rehabilitation for burn patients. Their seamless integration with local medical professionals played a crucial role in the mission's success. Similarly, the Protezione Civile Nazionale EMT forged a strong partnership with local doctors, working together to provide comprehensive care and support to over 20 burn patients. These efforts demonstrated the power of collaboration, enhancing the impact and effectiveness of burn care delivery.

Enhanced development of essential capacity-building modules

In addition to their medical duties, three rehabilitation specialists from the UK-MED and Samaritan's Purse teams played a significant role in developing the content for the EMT Essentials Burn Rehabilitation Training of Trainers (ToT) training. This EMT ToT initiative was developed as part of a collaborative effort involving Armenian MoH, WHO (EMT and WCO), UK-MED, and Samaritan's Purse to enhance the national health system capacity in burn rehabilitation post-EMT response. The ToT took place on 25–27 October 2023, with 26 participants, including rehabilitation physicians, physical therapists, occupational therapists) from the capital and 5 provinces (locally known as Marz) from the different Armenian hospitals. This was the first time the EMT Initiative had coordinated capacity-building training as part of the exit plan for EMTs to be delivered collaboratively rather than individually. Drawing on the collective expertise of the existing EMTs provided the possibility to deliver a high level of training (ToT), resulting in a wider reach to strengthen health systems over the coming months.

As a logical continuation of the ToT, enhancing the national capacity for burn care and rehabilitation, the WCO, together with the MoH Armenia and Samaritan's Purse EMT, organized a four-day accredited "Burn Care and Rehabilitation" training course involving 4 international and 3 national experts. This training was for 30 new specialists, including 4 doctors of physical medicine and rehabilitation, 5 burn surgeons, 5 rehabilitation nurses, 11 physical therapists and 5 occupational therapists from 9 healthcare facilities all

over Armenia. As a result, capacity-building activities strengthened 56 national specialists in provision of healthcare services for burn care and rehabilitation and promoted a multidisciplinary team approach.

Discussion

This response study has highlighted the significant need to set standards for elements (such as EMT CC Information Management and Medevac, which has been ongoing within the EMT Initiative, and the need to standardise capacities around burns care through the WHO EMT Standards and recommendations on Burns care in mass casualty incidents [7, 8]). The draft standards were provided early in the response and effectively enhanced coordination. MoH and all the responders (EMTs, WCO and EMT CC) used them as a key reference and aligned the coordinated responses.

Further, the findings and lessons learnt on the specialised care teams have been essential and aligned with the 2030 EMT strategy [9, 10]. It shows that major investments are needed to ensure that more specialised care teams are efficient and effective even in future responses, especially for healthcare facilities that are inadequately capacitated. There is a need to capacitate and set up specialised teams which would eventually allow local workforce growth and strengthen technical skills through their collaborations in training and collaborative responses, which benefit the daily workforce. With the training on EMTs' work, they can support the strengthening of health systems through resilience of health systems aligning with the WHO goal of strengthening the global architecture for health emergency preparedness, response and resilience [11].

Further, the EMTs provided a wide range of services, from emergency care to public health and rehabilitation, upon their arrival, which was essential in enhancing livelihood and returning them to normalcy. Other studies have shown that the services provided by medical teams following events are not limited to the surgical treatment of trauma but include public health and disease control, routine emergency care, rehabilitation and primary health care (PHC), mental health, nursing, and other specialised services [12]. Essentially, many EMTs have adapted the service provided to align with the emergency's context, scenarios and nature and, consequently, a rapid assessment of the gaps, needs, capacities, and vulnerabilities critical to an appropriate and customised response, including team profiles and kits [13]. From the lessons learnt in the responses, some, such as in the case of Armenia, have ended up changing the type of service delivery to meet the healthcare needs of the local population (for instance, from rehabilitation services, water and sanitation hygiene, and clinical care to public health) [12].

The WHO set up the EMT CC in collaboration with the MoH Armenia, where they stationed an EMT CC coordinator and information manager. This collaboration was done early in the response, enhancing the flow of communication and coordination of the teams' roles. It managed to fulfil the coordination role based on the information gathered from EMTs. The coordinating body formulated a dashboard and instituted the data from the EMT MDS, which helped to provide an overall picture of the Armenian emergency and to guide the management of the operational resources required [6]. The ease of using the burns MDS and the sturdy logistical capacity of the deployed EMTs were the main elements that permitted data to be collected even during the acute phase. This shows a need to continuously work with the EMTs on the MDS tool and improve it in areas where gaps were identified. Through it, it was easy to prioritise and channel the most needed resources. This was done through greater access to data that emerged from all the deployed EMTs and strengthened a proper detailed analysis through the dashboard, improving coordination with all the stakeholders.

Besides, it became easy to work on as there was good leadership and willingness of the government of Armenia to see through the success of using the data towards the response and supported information sharing. EMT services, such as information from their deployment, are key for effective response and timely decision-making [14]. The EMT CC are often critical in coordinating EMTs during a response, as shown in the Armenian response. This finding was akin to those that emerged from the case study of the Response to Tropical Cyclone Idai in Mozambique [14–16].

Given the specialised nature of the EMT deployment, other areas were discussed between EMT CC and EMTs to explore further collaborative work, including the possibility of developing research papers on Burn Rehabilitation and conducting a lessons-learned workshop [17]. Research has shown that individual education and training options are available to help prepare professionals engaged in disaster response, and such a training approach is essential to help learn lessons from their experiences [18].

Limitations

This study has some limitations. For instance, some findings are based on data from the EMT CC Information Management system and the burn MDS daily reporting system, which may lack completeness for a thorough analysis. However, to triangulate the results and gain additional information, we had a validation exercise with the teams from the ground, strengthening the work. The work would have been stronger with the availability of data on patients' outcomes. For instance, it would have been easy to show which cadre/ gender or age group of

patients was more susceptible to different treatments. This would be an area future teams involved in the response could consider.

Implication for research and policy

The response work in Armenia highlights key lessons, gaps, and the urgent need to improve future responses in Armenia and other countries. It has identified the following EMT policy implications:

Strengthening the EMT CC information management tools Improve systematic approaches for collecting, analysing, visualising, storing, and sharing data. This enhancement will help coordinate efforts in the field and raise awareness among EMTs, key partners, and Member States about data sharing and protection requirements and existing tools like the MDS.

Strengthening the guidelines and the SOP tools Recognizing the need for guidelines and standard operating procedures, the MoH Armenia, with WCO support, has initiated the development of clinical practice guidelines and SOPs on burn care and rehabilitation establishing a national multidisciplinary working group coordinated by the National Institute of Health, MoH Armenia.

Need for a modular approach in MDS application The EMT response in Armenia revealed the necessity for developing a modular approach to MDS use tailored to the specific needs of different crises, such as natural disasters, outbreaks of infectious diseases, and burns management.

Development of a digital information management tool The EMT response in Armenia highlighted the need to develop a digital Information Management tool ("EMT CC in a box") that can be activated at the onset of an emergency. This tool would ensure proper coordination among key partners from the early stages of the response operation.

Pre-established highly specialised equipment and a short supply chain for specific treatment consumables before departure for BSC. The specific nature of the emergency showed the importance of specialised care teams and the need for highly specialised preparation and readiness, not only for staff but also for specific equipment, medication, and consumables. These strong and specific challenges should be dealt with in developing guidelines and setting the standards for WHO classification for these teams.

Coordination strengthening through operational platform and liaison officers. Whilst strong and reliable information sharing is crucial, certainly, when medevac operations are involved, it was experienced that operational ties with EMT CC can be enhanced. Whilst the information flow

in the country for the burn patients and data sharing was straightforward, the complex and changing environment for Medevac information on arriving flights and destinations needed to be searched as they came into the EMT CC with delays or had missing links. The organisation of bilateral initiatives made the EMT CC unable to show the whole picture, or at least in a delayed manner.

The absence of a permanent representative from other regional organisations and a direct link with the operational coordination centre was damntory for fluid work in the field and the role of EMT CC.

The existing SOPs between the ECHO and WHO should be operationalised in direct and automatic contact with the field through the EMT CC, access to an automatic data-sharing platform should be considered, and a dedicated operational liaison officer should be on both sides of the spectrum. The existing SOPs could benefit from a well-developed and explained training topic in the future.

Conclusion

This study provides a comprehensive analysis of Armenia's emergency response to a mass casualty incident, detailing key lessons learned and the crucial role of international and national EMTs in coordinating and delivering lifesaving care. The findings underscore the importance of rapid mobilization, effective coordination, and structured protocols in managing complex health emergencies. The Armenian MoH, in collaboration with WHO, successfully led a multi-agency response that ensured the swift deployment of specialized medical teams to treat severely burned patients and stabilize casualties across regional hospitals. A key highlight of this response was the effective integration of the EMT CC, which optimized information management, resource allocation, and clinical standardization, significantly improving the efficiency of care delivery. The study reinforces the necessity of pre-established, standardized medical evacuation and burn care protocols, which would enhance preparedness, reduce delays, and improve patient outcomes in future crises. The early incorporation of rehabilitation services into emergency burn care was another critical lesson, as it facilitated better long-term recovery and functional outcomes for patients with severe injuries. Moreover, the response showcased the importance of capacity-building initiatives, particularly training local healthcare providers in burn management, critical care, and emergency coordination. Strengthening Armenia's healthcare resilience through such targeted training ensures that national systems are better equipped to handle similar emergencies in the future. Additionally, the study highlights the significance of consistent data collection, documentation, and analysis in guiding real-time decision-making and post-crisis evaluation. Ultimately, this experience reinforces the global need for structured

response frameworks, rapid deployment of specialized medical teams, and enhanced coordination mechanisms, all of which align with the 2030 EMT Strategy's vision for a globally synchronized approach to health emergencies. Investing in preparedness, standardized protocols, and healthcare system strengthening is essential to building more resilient and responsive emergency medical systems worldwide.

Abbreviations

BAT	Burns Assessment
BSC	Burns Specialised Care
EMT	Emergency Medical Team
EMT CC	Emergency Medical Team Coordination Cell
I-EMT	International Emergency Medical Team
Medevac	Medical evacuation
MDS	Minimum Data Set
MoH	Ministry of Health
RFA	Request for Assistance
UCPM	EU Civil Protection Mechanism
WHO	World Health Organization

Acknowledgements

The team appreciates the support of all the partners involved in the response, both in terms of funding and data provision.

Author contributions

BO collected the data, conducted the analysis, and drafted the initial manuscript, which was subsequently revised by all authors for important intellectual content. All authors read and approved the final manuscript.

Funding

This study was funded by the WHO EMT team at the Global Office in Geneva, Switzerland. The WHO Regional Office for Europe and the Armenia MoH also supported the reported activities. The funders had no role in study design, data collection and analysis, publication decisions, or manuscript preparation.

Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethical approval and consent to participate

Not applicable.

Patient consent for publication

None required.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

¹Ministry of Health, Yerevan, Armenia

²World Health Organization, Emergency Medical Teams Initiative, Headquarters, Geneva, Switzerland

³Centre for Health Services Studies (CHSS), University of Kent, George Allen Wing, Canterbury CT2 7NF, UK

⁴Emergency Preparedness and Response Programme, World Health Organization, Regional Office for Europe, Copenhagen, Denmark

⁵World Health Organization, Country Office, Yerevan, Armenia

Received: 4 November 2024 / Accepted: 7 February 2025

Published online: 18 February 2025

References

1. Armenia refugee response: Situation report No. 1, 5. October 2023 [<https://iris.who.int/bitstream/handle/10665/373241/WHO-EURO-2023-8251-48023-71133-eng.pdf?sequence=1>]
2. Dozens Reported Dead During Karabakh Exodus. [<https://www.azatutyun.am/a/32660106.html>]
3. Refugee response in Armenia: public health situation analysis, 5. October 2023 [<https://www.who.int/europe/publications/i/item/WHO-EURO-2023-8252-48024-71134>]
4. EMT request for assistance- Armenia. Burns Specialized Care Teams [https://extranet.who.int/emt/news_detail/717]
5. World Health Organisation: EMT Burns Response Daily Data Form -. October 2023. In. Geneva: World Health Organisation - Emergency Medical Teams; 2023.
6. Ministry of Health of the Republic of Armenia, World Health organisation Regional Office for Europe, World Health organisation Emergency Medical Team: Armenia situation. In., vol. 2024: World Health Organisation; 2023.
7. World Health Organisation. Standards and recommendations for burns care in mass casualty incidents. In. Edited by Initiative WEMT. Geneva: World Health Organisation; 2024.
8. World Health Organisation. Medical evacuation (medevac) in emergencies: a guidance document for medical teams and specialised care treatment. In. Edited by Initiative WEMT. Geneva: World Health Organisation; 2024.
9. World Health Organization. Actioning the Emergency Medical Teams' initiative in the WHO African Region: strategic paper. In.; 2023.
10. Emergency medical. teams 2030 strategy [<https://iris.who.int/bitstream/handle/10665/372867/9789240076945-eng.pdf?sequence=1>]
11. Strengthening WHO preparedness for and response to health emergencies. Strengthening the global architecture for health emergency preparedness, response and resilience. Ten proposals to build a safer world together: Report by the Director-General [https://apps.who.int/gb/ebwha/pdf_files/EB152/B152_12-en.pdf]
12. Bartolucci A, Mackway-Jones K, Redmond AD. Decision support framework for deployment of emergency medical teams after earthquakes. *Disaster Med Pub Health Prep.* 2021;15(6):727–34.
13. Canadian RedCross: The future of field hospitals in disaster response. In: A Blue-Sky Workshop: 2014. 2014: 10.
14. Kubo T, Chimed-Ochir O, Cossa M, Ussene I, Toyokuni Y, Yumiya Y, Kayano R, Salio F. First activation of the WHO Emergency Medical Team Minimum Data Set in the 2019 response to Tropical Cyclone Idai in Mozambique. *Prehosp Disaster Med.* 2022;37(6):727–34.
15. Sacchetto D, Raviolo M, Lovesio S, Salio F, Hubloue I, Ragazzoni L. Italian Field Hospital experience in Mozambique: report of ordinary activities in an extraordinary context. *Prehosp Disaster Med.* 2022;37(4):553–7.
16. Ladeira LM, Cardoso I, Ribeiro H, Lourenço J, Ramos R, Barros F, Rato F. PT EMT - Portuguese Emergency Medical Team Type 1 relief mission in Mozambique. *Prehosp Disaster Med.* 2021;36(5):651–3.
17. Ministry of Health of the Republic of Armenia, World Health Organisation Regional Office for Europe: Emergency Medical Team Coordination Cell. Final report. In. Yerevan: World Health Organisation Regional Office for Europe; 2023.
18. Camacho NA, Hughes A, Burkle FM Jr, Ingrassia PL, Ragazzoni L, Redmond A, Norton I, von Schreeb J. Education and training of emergency medical teams: recommendations for a global operational learning framework. *PLoS Curr* 2016, 8.

Publisher's note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.