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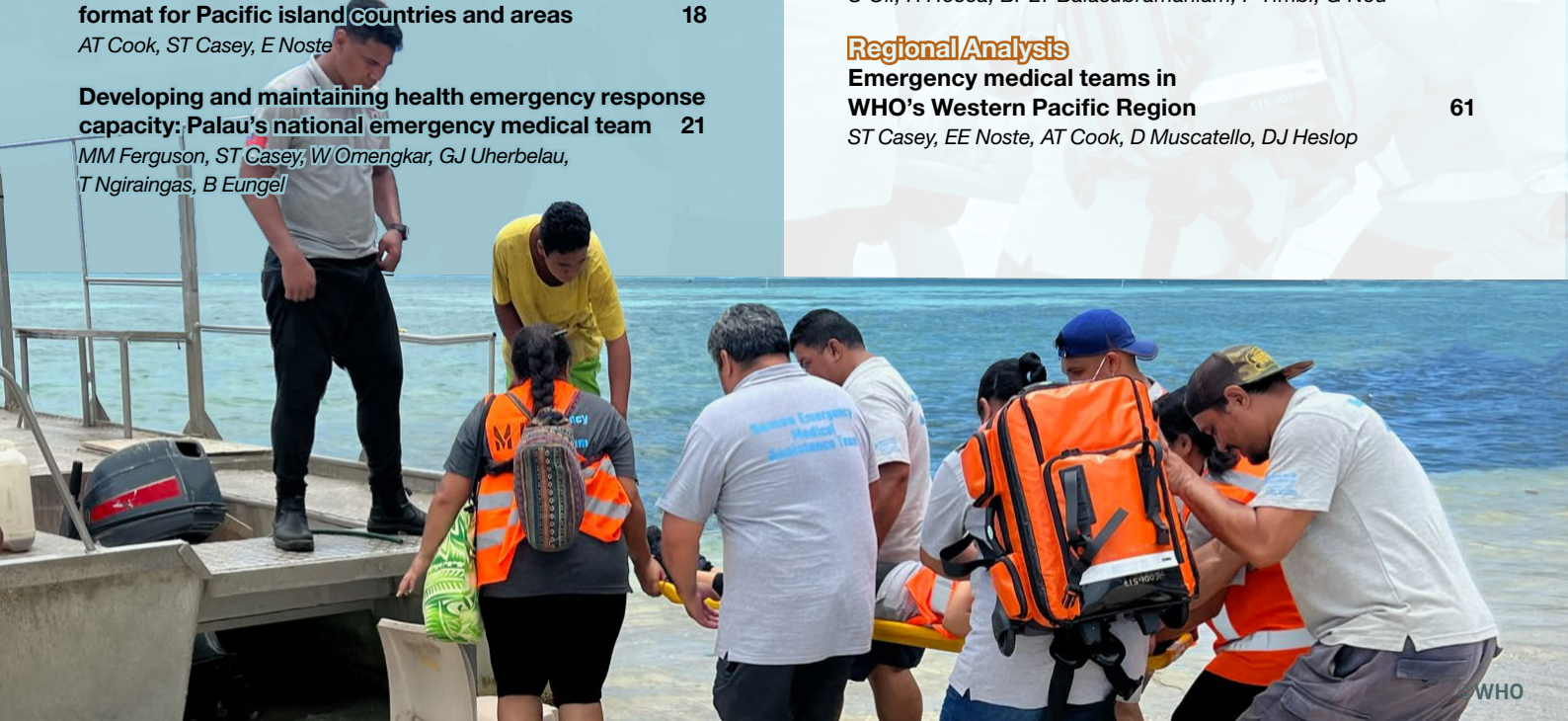
IN THIS ISSUE



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The Emergency Medical Team Initiative in the Western Pacific Region

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Emergency medical teams (EMTs) are often among the first responders when disease outbreaks or disasters strike. As self-sufficient, deployable field hospitals and clinics staffed by trained team members and equipped with pre-positioned clinical and non-clinical supplies (known as "EMT cache"), EMTs are primed to deliver high-quality clinical care and public health response to affected populations in the most remote locations and austere conditions. Based on WHO's *Classification and minimum standards for emergency medical teams* (2021),[1] EMTs are committed to excellence in clinical care and apply a principled approach to health emergency response, which includes working under national leadership in the affected country or area and not adding any burden to local responders. EMTs' clinical scope ranges from routine outpatient care to highly specialized surgery and intensive care, and they respond to a wide range of emergencies, including infectious disease outbreaks, disasters, conflicts and other human-induced events.

This Special Edition of WHO's *Western Pacific Surveillance and Response* (WPSAR) journal provides a range of insights into how EMTs are developed and maintained, how team members are trained, how EMTs provide care in response to a wide range of emergencies, and some of the challenges they face in these efforts. It includes articles written by emergency responders from a range of country contexts, as well as by WHO experts supporting EMT development and coordination in emergencies. It was developed with the explicit goal of expanding research and documentation related to the work of EMTs, as articulated in WHO's EMT 2030 strategy.[2]

In 2022, during the fifth EMT Global Meeting hosted in Armenia, a new Western Pacific Regional EMT Chair Group was appointed for the calendar year 2023. The 2023 Chair Group membership – composed of representatives of health ministries and departments from Malaysia, the Commonwealth of the Northern Mariana Islands (United States of America), Palau and Samoa, as well as the nongovernmental organization (NGO) MERCY Malaysia – was appointed to reflect the Region's extensive and diverse network of national and international EMTs. The Region's EMTs, which range from very small mobile teams in several Pacific island countries and areas (PICs) to much larger field hospitals, as well as specialized care teams that can deploy to existing health facilities,[3,4] mirror the demographic diversity of the Region itself, with some of the smallest and largest countries in the world, both in terms of landmass and population.

By the end of 2023, nearly every country in the Region had established at least one EMT or had become engaged with the EMT Initiative. The Region hosts 12 of the world's 40 classified international EMTs (as of late 2023), which are teams that have undergone mentorship and an external quality assurance process to ensure quality and predictability when they deploy internationally in response to emergencies. Teams based in larger, higher-income countries such as Australia, China and Japan are well established with highly advanced capabilities and have responded to health emergencies around the world while

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also serving as mentors to emerging EMTs. At the same time, 13 PICs have developed or are in the process of establishing EMTs, including one internationally classified team in Fiji.[3] Other countries in the Region, including Mongolia, the Philippines, Singapore and countries in the Greater Mekong Subregion, are also establishing EMTs, with some working to achieve international EMT classification in the near future. The Region's EMT network is also enriched by multiple teams managed by NGOs in Australia, Japan, Malaysia and New Zealand, which are actively engaged in health emergency response within the Region and around the world.

Western Pacific EMTs are largely managed by ministries of health, but many involve other government agencies, such as the armed forces, civil defence forces, fire and rescue services and national disaster management offices. Western Pacific EMT rosters include thousands of individual team members, with an enormous range of clinical and non-clinical expertise and extensive experience in complex health emergency settings.

EMTs are routinely called upon to care for affected communities in their greatest moments of need.[3–6] Based upon the requirements of the International Health Regulations (IHR 2005) and recommendations from the Asia Pacific Health Security Action Framework (APHSAF), significant work on EMT development has been carried out across the Region, which has improved country preparedness and operational readiness and strengthened regional surge response capacities.[7,8] Recent EMT successes include the deployment of the Tonga Emergency Medical Assistance Team (TEMAT) to the Ha'apai island group following the January 2022 volcanic eruption and tsunami,[4] multiple deployments of the Philippines Emergency Medical Assistance Team (PEMAT) in response to domestic disasters,[9] as well as many larger national and international EMT deployments in response to the COVID-19 pandemic across the Region.

While many EMTs in the Region have been working towards strengthening their readiness for deployment at home, others have also actively engaged in health emergency response beyond their borders. In 2023, the Japan Disaster Relief (JDR) EMT and PEMAT responded to earthquakes in Türkiye and Syrian Arab Republic, while the Fiji Emergency Medical Assistance Team (FEMAT) deployed to Vanuatu in response to Tropical Cyclone Lola. In 2020–2022, the Australia Medical Assistance Team (AUSMAT) and the New Zealand Medical Assistance Team (NZMAT) supported COVID-19 response efforts in multiple PICs.

To support EMT development in the Region, WHO's Regional Office for the Western Pacific procured and delivered EMT cache to national EMTs across the Pacific, as well as to teams in Cambodia, the Lao People's Democratic Republic, Mongolia and the Philippines throughout 2022 and 2023.[3,10] WHO and its donor partners also supported national team members' training in 14 countries across the Region in 2023 alone.[3,11]

In the years ahead, further growth and development of EMTs in the Region is planned. More than 10 Western Pacific EMTs are currently working towards WHO EMT classification, with several teams aiming to achieve this in 2024. Meanwhile, several existing EMTs are working towards reclassification in 2024, which is required every 5 years following initial classification. National EMT development will continue through activities such as team member trainings and simulation exercises and faculty/mentor exchanges, all of which contribute to the sharing of experiences and lessons across countries, areas and teams. The common cache procured by WHO for Pacific EMTs and the implementation of a consistent training approach will serve to strengthen EMT interoperability going forward, in line with the EMT 2030 strategy.[2,10]

Working towards EMT 2030

The 2023 Western Pacific Region EMT Chair Group has endorsed the goals outlined in the Global EMT Network's EMT 2030 strategy, which states, "[I]n times of crisis, national EMTs are in the best position to provide immediate assistance. Strengthening both national and international EMTs and increasing interoperability with other rapid response capacities are essential components of a country's emergency preparedness and response to save lives, improve health and serve the most vulnerable and in need."[2] The Western Pacific Region is already making significant progress in achieving the targets outlined in the EMT 2030 strategy, which align with World Health Assembly document WHA75/20 (Strengthening the global architecture for health emergency preparedness, response and resilience), WHO's Triple Billion targets, and the United Nation's Sustainable Development Goals.[12–15]

In the years ahead, EMTs across the Region will continue to expand partnerships, strengthen local leadership, support national EMT focal points, and further refine the regional EMT governance structure. The Western Pacific Regional EMT Chair Group will continue to provide guidance to EMTs and to the WHO Secretariat, and will advocate for sustainable, institutionally grounded rapid response capabilities and financial investments in EMT development and operations. The Western Pacific Region has a long history of partnership and knowledge sharing and will continue to build on this tradition to enhance capacities to respond to emergencies nationally, regionally and globally.

EMTs contributing to regional health security in the Western Pacific

The newly published APHSAF identified several priorities for the Region, including "to protect the health and well-being of communities in the Asia-Pacific region by strengthening, maintaining and enhancing multisectoral health security capacities and systems to prevent, prepare, respond and increase resilience to multi-hazard public health emergencies".[8] The previous, current and planned EMT work across the Region is aligned with this vision, aiming to create "an Asia-Pacific region that is prepared for and resilient to public health emergencies through collective action and that contributes to global health security".

The Western Pacific EMT Chair Group is committed to supporting and strengthening health emergency response capabilities in the WHO Western Pacific Region to ensure a more secure health future for peoples of the Region and beyond.

Acknowledgements

The authors acknowledge the extensive work undertaken by ministries of health, NGOs and the thousands of EMT members who have contributed to the development of a network of highly capable self-sufficient teams across the Western Pacific Region. We acknowledge the personal sacrifice of individual team members and their families in responding to the most challenging health emergencies in the Region and beyond. We are proud of the EMTs of the Western Pacific Region, and of every person from our Region who has served as part of a national or international EMT – demonstrating their commitment to saving lives and relieving suffering, and to ensuring that those in need receive the highest quality of care, even in the most challenging circumstances.

Conflicts of interest

The authors have no conflicts of interest to declare.

Ethics statement

Ethical clearance was not required. No personal identifiable information was collected or reported.

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Strengthening health emergency response capacity in Kiribati: establishing the Kiribati Medical Assistance Team (KIRIMAT)

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The Republic of Kiribati is a small-island, large-ocean nation in the Pacific with a population of approximately 110 000. Kiribati is comprised of 32 low-lying coral atolls and one raised island, straddling the equator across an ocean territory of over 3.5 million km^2 (**Fig. 1**). Given its low-lying land mass, high population density, high levels of poverty, and chronic food and water insecurity, Kiribati is particularly vulnerable to the impacts of climate change and rising sea levels. A State of Disaster was declared in June 2022 due to a severe drought.[1,2]

Health services are provided by Kiribati's Ministry of Health & Medical Services (MHMS). Across its three main archipelagos, the country's inhabited islands are served by 115 health facilities, one national referral hospital, and a health workforce of 59 doctors and 385 nurses.[3] Most of Kiribati's outer-island health facilities lack power and have limited means of communications. Many are staffed by a single nurse.

While Kiribati's MHMS ensures continuity of essential services on all of the country's populated islands, its capacity to mobilize surge support to outer islands when emergencies occur has in the past been hampered by a combination of transport challenges (many of Kiribati's islands are served by infrequent passenger ships or flights), human resource constraints, and the lack of an established deployment mechanism.[3] Recognizing both the hazards and limitations the country faces, Kiribati's MHMS National Health Strategic Plan for 2020–2023 sets out its intention to make health security a priority, stating that it aims to "strengthen health protection and improve community empowerment to address environmental health issues and health security including climate change, disaster risk management and outbreak control".[3,4]

Historically, responses to outer-island emergencies in Kiribati have been mounted by ad hoc teams. In 2018, for example, an ad hoc national Emergency Medical Team (EMT) was deployed in response to a maritime disaster which left 95 dead.[5] Several other ad hoc clinical teams have deployed for outbreak investigations and response efforts in Kiribati's outer islands, including most recently for the country's COVID-19 response in 2022. However, these teams have never been formalized, and typically have lacked formal standard operating procedures (SOPs) and adequate equipment to support their deployment. To formalize this capability, the Kiribati Medical Assistance Team (KIRIMAT) was launched in November 2022 to serve as Kiribati's deployable, self-sufficient clinical capacity for health emergency response.

Establishing KIRIMAT

In 2019, Kiribati's MHMS committed to establishing a national EMT capable of deploying clinical teams to all parts of the country in response to outbreaks, disasters and other emergencies with health consequences. Kiribati's EMT was conceived with technical assistance from the World Health Organization (WHO) and with funding support from the United States Agency for International Development's Bureau for Humanitarian

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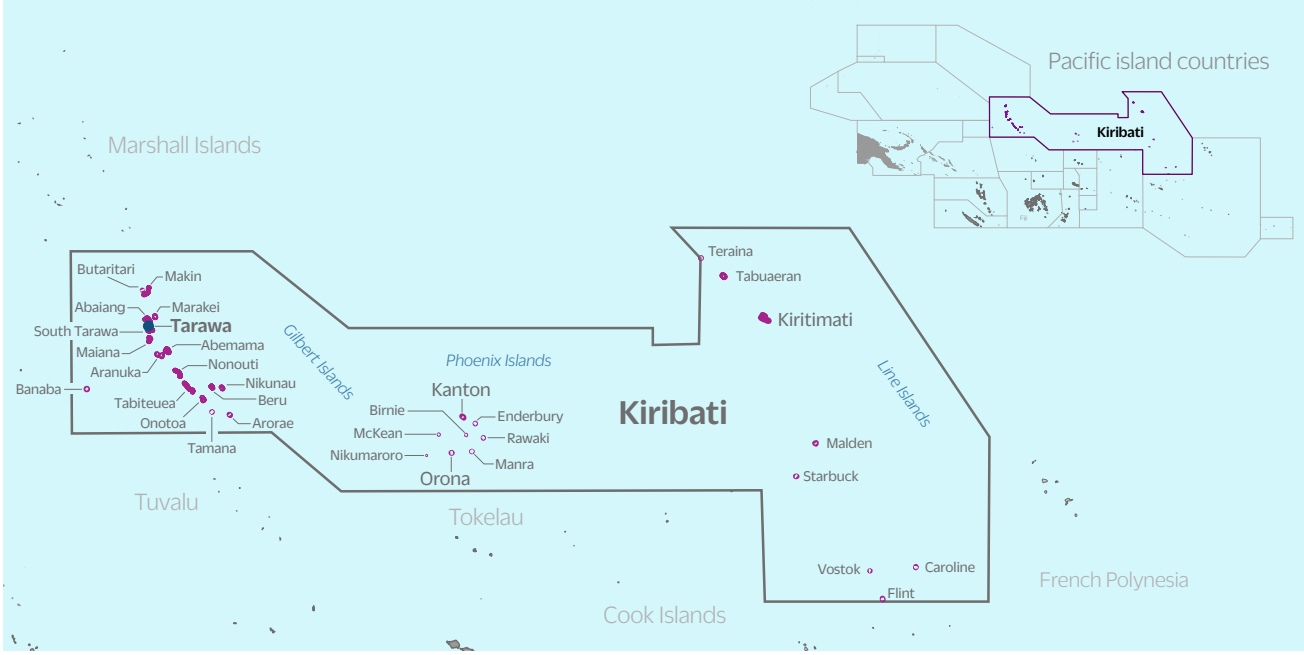
Fig. 1. **Map of Kiribati**



Assistance (USAID/BHA). The aim of national EMT development was to enable rapid response to emergencies within Kiribati's borders, maintaining high standards of clinical care while also ensuring the safety of both personnel and patients, in accordance with the guidance provided by WHO's EMT handbook, "Classification and minimum standards for emergency medical teams".[6] The COVID-19 pandemic and protracted border closures delayed the full development of Kiribati's EMT for several years, but progress was made despite this challenge.

In 2021, participants from Kiribati joined a WHO-led Pacific EMT webinar series, which over a period of 11 weeks covered the core principles of EMT development and coordination.[7] In 2021/2022, a dedicated national EMT coordinator was hired by WHO and Kiribati's MHMS. This role was created to support the establishment of a national EMT Technical Working Group (TWG) in Kiribati and to coordinate efforts to form the EMT, mobilizing the required resources including personnel from across the MHMS. With support from WHO and the national EMT coordinator, Kiribati's EMT TWG drafted SOPs for KIRIMAT, based on a template designed by WHO specifically for Pacific EMTs.

Leveraging funding from USAID/BHA, WHO was able to procure equipment and supplies for KIRIMAT. This EMT "cache" comprises the equipment required by clinical and public health teams to deploy to Kiribati's most remote outer islands,[8] such as generators, tents, water treatment equipment, camping gear and satellite communication equipment, as well as clinical supplies to provide emergency and outpatient care. This kit is designed to be durable and to last for at least several years and through multiple deployments. KIRIMAT and other Pacific EMTs are developing inventory management plans to ensure that caches are well-maintained and in a state of readiness for rapid deployment.

KIRIMAT team members were formally inducted in November 2022, with a 5-day training session held on the island of South Tarawa involving 32 doctors, nurses, environmental health specialists, logisticians and health information specialists. The training was delivered by Kiribati's MHMS and WHO, using a curriculum designed specifically for Pacific EMTs, with modules on clinical operations, logistics and coordination.[9] The training workshop culminated in a 1-day disaster response simulation exercise, which included elements of team mobilization and

deployment, mass casualty triage and patient care; the simulation exercise used volunteer actors as patients and required the team to travel with their cache using a small boat.

DISCUSSION

With the launch of KIRIMAT in 2022, Kiribati now has in place a national EMT capable of mounting a self-sufficient national clinical and public health response to a wide range of hazards, including disease outbreaks and disasters. Low-lying and dispersed Pacific island countries and areas (PICs) such as Kiribati require this type of deployable clinical capacity to reach their most vulnerable communities in their greatest moments of need. The formal establishment of KIRIMAT, with its cohort of trained team members and a deployment-ready EMT cache tailored to Pacific contexts, means that the Kiribati MHMS will be able to reach all corners of Kiribati within hours or days of an emergency with high-quality clinical services. Kiribati is also now part of the global EMT network, a step which will continue to strengthen national response capacities and improve the coordination of international EMT support should this be required to supplement national capabilities. With the launch of KIRIMAT, Kiribati joins 12 other PICs that have established or are in the process of establishing national and international EMT capacity.[10] This represents a significant shift in PICs' ability to respond to the range of hazards that they face, with increased self-reliance and capacity to serve their populations without requiring deployment of international EMTs.

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Conflicts of interest

The authors have no conflicts of interest to declare.

Ethics statement

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Localizing health emergency preparedness and response: emergency medical team development and operations in Pacific island countries and areas

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Since 2010, the World Health Organization (WHO) has worked with Member States and nongovernmental organizations around the world through its Emergency Medical Team (EMT) Initiative to build a network of deployable clinical rapid response teams. Capable of national and/or international response, EMTs apply common principles and minimum standards as detailed in WHO's *Classification and Minimum Standards for Emergency Medical Teams* (2021), also known as the "Blue Book" (originally published in 2013 as *Classification and Minimum Standards for Foreign Medical Teams in Sudden Onset Disasters*).[1]

In the Pacific, island nations face threats from emerging infectious diseases, natural hazards and the long-term impacts of climate change. Recognition of these threats has led to increased investments and focus on health emergency preparedness, readiness, response, recovery and resilience. In response to the impacts of many tropical cyclones and typhoons, recent volcanic eruptions and tsunamis, measles outbreaks in 2019, and the lingering effects of the coronavirus disease (COVID-19) pandemic across the region, Pacific governments have increased investment in national response capacities, including by establishing and activating deployable, self-sufficient national EMTs (**Map 1**).[2–8]

EMERGENCY MEDICAL TEAM DEVELOPMENT IN THE PACIFIC

In the first years of EMT development in the Pacific, national teams were established in four countries: Fiji, Solomon Islands, Tonga and Vanuatu. Support was provided by WHO with funding and technical support from the governments of Australia and New Zealand to: (a) train Pacific EMT members; (b) provide a "cache" of EMT equipment and supplies for self-sufficient deployment; (c) develop national EMT standard operating procedures (SOPs) in each country; and (d) formalize and ensure national ownership of each EMT.[2] Pacific EMT development support and training is based on WHO's Blue Book, with necessary adaptations for small Pacific island contexts, which have smaller human resource pools, infrastructure and storage limitations, financial constraints and extremely challenging logistics.[9–11]

Between 2017 and 2019, prior to the COVID-19 pandemic and extensive border closures across the Pacific region, 5-day in-person training workshops with full-scale simulation exercises were held in Fiji, Solomon Islands, Tonga and Vanuatu. EMT mentors with extensive experience in developing EMTs and deploying as team members provided both remote and on-site support while Pacific teams formalized their structures and developed their national SOPs. At the same time, Pacific EMTs recruited team members from within Pacific ministries of health and other government agencies (including police and fire services) to form national EMT member rosters.

Through procurements, donations and leveraging existing in-country clinical and non-clinical equipment and supplies, Pacific EMTs became self-sufficient and equipped to deploy to outbreaks and disasters in remote and austere conditions without burdening local resources.

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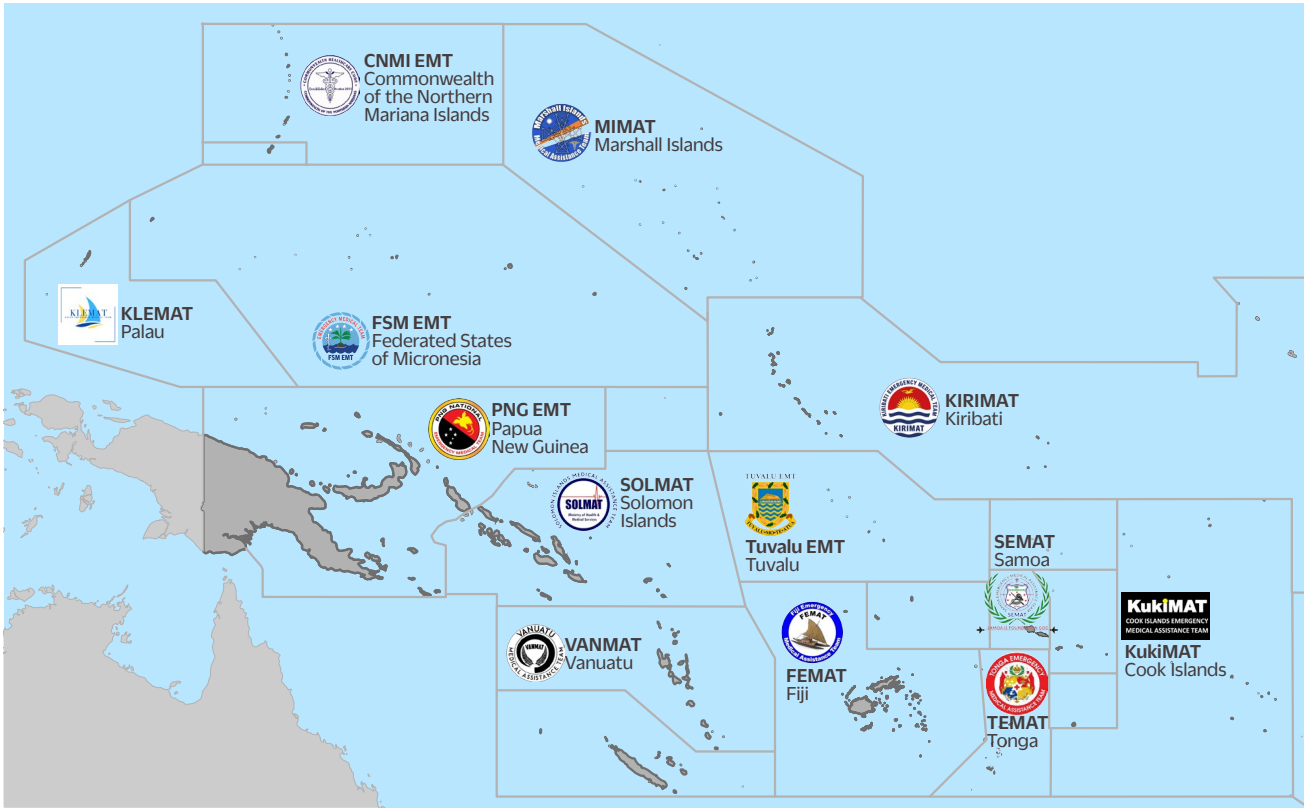
Map 1. **Pacific emergency medical teams established and in development**



CNMI: Commonwealth of the Northern Mariana Islands; EMT: emergency medical team; FEMAT: Fiji Emergency Medical Assistance Team; FSM: Federated States of Micronesia; KIRIMAT: Kiribati Medical Assistance Team; MIMAT: Marshall Islands Medical Assistance Team; PNG: Papua New Guinea; SEMAT: Samoa Emergency Medical Assistance Team; SOLMAT: Solomon Islands Medical Assistance Team; TEMAT: Tonga Emergency Medical Assistance Team; VANMAT: Vanuatu Medical Assistance Team.

EMTs established standalone field operations, ensured safe food and water for patients and staff, and provided clinical care according to national standards in response to emergencies within their own borders.[6–8]

Subsequently, building on the success of national EMT development in several countries in the South Pacific, additional Pacific island countries and areas (PICs) committed to establishing their own national EMTs. Following the same model, teams were established in the Cook Islands and in the Commonwealth of the Northern Mariana Islands in 2019.[3]

With additional investment from the United States Agency for International Development, the European Union and the Government of Japan, WHO was able to expand national EMT development support to additional PICs beginning in 2019, including Kiribati, the Marshall Islands, the Federated States of Micronesia (FSM), Palau, Papua New Guinea, Samoa and Tuvalu.[4,5,9] While national borders remained closed in multiple PICs during 2020–2022 due to the COVID-19 pandemic, online training was provided to Pacific EMTs through an 11-week webinar series in 2021, hosted by WHO and with faculty and participants from across the Pacific.[9]

In-person EMT training workshops and simulation exercises based on the WHO Blue Book recommenced in mid-2022, with team member trainings held in Fiji, Kiribati, the Marshall Islands, Palau and Samoa using the tailored Pacific EMT training package.[10] These trainings marked the formal launch of several EMTs, including the Kiribati Medical Assistance Team (KIRIMAT), the Marshall Islands Medical Assistance Team (MIMAT), Palau's KLEMAT, and the Samoa Emergency Medical Assistance Team (SEMAT).[4,5] At the same time, with support from multiple donor partners, WHO undertook large-scale international procurement of curated cache kits designed specifically for lightweight, mobile Pacific EMTs to ensure that all teams are fully equipped and prepared for self-sufficient deployments.[11]

Pacific EMTs are considered "Type 1" according to standards set out in the WHO Blue Book. They are either fixed or mobile and are capable of providing emergency and outpatient care during daylight hours. The Fiji Emergency Medical Assistance Team (FEMAT) has also developed deployable surgical capacity. Pacific EMTs vary in size and composition, primarily based on human resource limitations in their countries. In Fiji, FEMAT now has a roster of over 500 potential members, of whom approximately 70 are trained, while teams in smaller PICs may have only 30 team members trained, with the capability to deploy 6–10 members at a time without undermining routine health services. Pacific EMT members include physicians, nurses, allied health professionals, public health experts, environmental health specialists, logisticians, firefighters, police and military, depending on national arrangements in each country.

ACCOMPLISHMENTS OF PACIFIC EMTs

Pacific EMTs have made substantial progress since they started developing in 2017.

- In 2019, FEMAT became the first Pacific EMT to achieve international classification. FEMAT was activated and deployed for seven national emergencies between 2019 and 2021, including multiple tropical cyclones and outbreaks, and was heavily involved in the country's COVID-19 response.[6,7] FEMAT undertook its first international deployment to Tuvalu in 2022 to support its neighbour's COVID-19 response, and deployed to Vanuatu in 2023 to support the response to back-to-back Tropical Cyclones Judy and Kevin.
- The Solomon Islands Medical Assistance Team (SOLMAT) deployed alongside 17 other international EMTs to Samoa in 2019 in response to a massive measles outbreak. The team also supported national COVID-19 response efforts in 2022, among other national deployments.
- In 2022, the Tonga Emergency Medical Assistance Team (TEMAT) responded independently to the Hunga-Tonga Hunga-Ha'apai volcanic eruption and subsequent tsunami while the country's borders were closed.[8] TEMAT deployed to the Ha'apai islands for over 6 weeks, caring for nearly 400 patients affected by the eruption and tsunami.
- The Vanuatu Medical Assistance Team (VANMAT) responded independently to the category 5 Tropical Cyclone Harold in 2020, when COVID-19 travel restrictions prevented deployment of international responders, and was activated in response to Tropical Cyclones Judy and Kevin in 2023.

DISCUSSION

Pacific EMTs have become critical resources for emergencies, and are supporting national responses to outbreaks and disasters, often without reliance on international EMTs for the provision of clinical services. The progress made since 2017 has demonstrated that even small and developing countries can develop and mobilize professional EMTs capable of timely, self-sufficient and high-quality responses to a wide range of emergencies, highlighting the importance of this capability for rapid response, and the significant return on investment when emergencies strike.

Looking forward, there are opportunities for Pacific EMTs to continue to improve and develop. Training for Pacific EMTs continues to evolve, based on the Blue Book standards and practical lessons from deployments. As expertise grows within PICs, national EMT leaders and team members can become faculty for peer EMT training, both in their own countries and internationally. Documented evidence on EMT operations and their effectiveness remains limited, presenting opportunities for Pacific EMTs to conduct operational research and evaluations of their deployments, and to measure and report on their impact in emergency settings.

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of establishing their own teams; mentors and technical advisers who have supported Pacific EMTs for several years; the many Pacific EMT members who have enthusiastically participated in EMT trainings; those who have served as faculty for team members' training workshops; the donor partners that have supported EMT development in the Pacific, including the Government of Australia, the European Union, the Government of Japan, the Government of New Zealand and the Government of the United States of America through the United States Agency for International Development's Bureau for Humanitarian Assistance; and those who have deployed with EMTs in support of populations in need.

Conflicts of interest

STC and JEL are associate editors of the Western Pacific Surveillance and Response journal. They were not involved in the editorial decision to publish this article. The other authors have no conflicts of interest to declare.

Ethics statement

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Tailoring a national emergency medical team training package for Pacific island countries and areas

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BACKGROUND

Pacific island countries and areas (PICs) comprise thousands of populated islands spread across vast ocean territory, with some of the most challenging logistics in the world. Pacific populations are particularly vulnerable to disasters and the intersecting impacts of climate change. Recent sudden-onset disasters in the Pacific, such as Tropical Cyclone Yasa in Fiji in 2020 and the Hunga–Tonga Hunga–Ha'apai (HTHH) volcanic eruption and tsunami in the Kingdom of Tonga in 2022, have highlighted the need for national emergency medical teams (EMTs). These are clinical teams trained and equipped to deploy to and operate in remote island contexts, with the capability to respond independently to disasters within their borders and care for affected populations.[1,2] EMTs are groups of health professionals that treat patients impacted by emergencies and disasters, based on established global principles and standards of self-sufficiency, quality of care and coordination.[3]

Since 2017, Pacific ministries of health have been developing national EMTs to support health emergency responses within their borders and have trained team members to be ready for deployments.[4–9] Pacific EMTs are considered "Type 1" according to the standards in the World Health Organization (WHO) *Classification and Minimum Standards for Emergency Medical Teams* (2021), also known as the "Blue Book".[3] Pacific EMTs vary in size and composition, with the smallest teams deploying only 6–10 team members at a time – adapting global EMT standards for the realities of small Pacific contexts.

With financial and technical support from partners, WHO's Regional Office for the Western Pacific has facilitated EMT development and training across the Pacific since 2017.[4] This brief report describes how WHO has leveraged global and regional EMT training content and approaches, and adapted these for unique Pacific contexts.

Training foundations

Curricula for EMT member training courses have traditionally been based on the minimum standards described in the Blue Book, with individual teams leading the design and delivery of training for their own team members.[3,10] The Pacific EMT training package applies Blue Book principles and standards, but training content has been specifically tailored to the unique small Pacific island contexts. Training materials developed by WHO and peer EMTs have been used as the foundation of the Pacific EMT member training package. Group activities, practical exercises and *talanoa* or storytelling discussions have been added, in addition to content on readiness for deployments to remote and difficult-to-reach islands to care for populations with limited on-site resources and referral options.[11] Hands-on activities and logistics sessions are based on the EMT cache (equipment) procured by WHO for Pacific EMTs.[12] Training content

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and approaches emphasize readiness for the deployment of light, mobile clinical response teams to disasters and outbreaks in PICs.

Training content

The 5-day Pacific EMT member training programme comprises a mix of didactic and practical sessions, plus a 1–2-day simulation exercise (**Table 1**), with each session underpinned by learning objectives (**Table 2**). The training package is designed to provide information and develop skills in three EMT knowledge areas: (1) overview, administration and coordination; (2) clinical care; and (3) operational logistics and water, sanitation and hygiene or WASH. Training participants include clinicians, logisticians and administrators.

The overview, administration and coordination sessions introduce the EMT initiative with a specific emphasis on how the initiative was developed and how EMT principles and approaches have been applied in the Pacific to improve health emergency response.

Clinical sessions present the types of medical care provided in lightweight, mobile outpatient EMT clinics. Sessions incorporate team activities to discuss ethical issues during the care of patients in an emergency, as well as some of the clinical decisions to be made based on the logistical limitations of mobile medical care in remote island settings.

Logistics and WASH sessions provide hands-on activities using EMT equipment to prepare Pacific EMT members to operate with self-sufficiency. These sessions cover EMT camp planning and clinic set-up, day-to-day operations, clinic handover and responsible EMT exit. Specific concepts are underscored throughout the 5-day training, such as safety, reporting and radio/satellite communication protocols.

Table 1. **Illustrative schedule for 5-day Pacific EMT member training course**

<table>
<tr><th>Day 1</th><th>Day 2</th><th>Day 3</th><th>Day 4</th><th>Day 5</th></tr>
<tr><td>National EMT / WHO training official opening (45 minutes)</td><td>Morning review</td><td>Morning review</td><td>Morning review</td><td>Travel for SIMEX</td></tr>
<tr><td rowspan="2">EMT initiative introduction (45 minutes)</td><td rowspan="2">How is national EMT activated? (75 minutes)</td><td>EMTs in outbreak response (60 minutes)</td><td rowspan="2">Resilience on deployment (90 minutes)</td><td rowspan="4">SIMEX (4 hours minimum)</td></tr>
<tr><td>EMT coordination (45 minutes)</td></tr>
<tr><td>Coffee break (15–30 minutes)</td><td>Coffee break (15–30 minutes)</td><td>Coffee break (15–30 minutes)</td><td>Coffee break (15–30 minutes)</td></tr>
<tr><td>Introduction to the Blue Book and national EMTs (75 minutes)</td><td>Clinical overview (90 minutes)</td><td>Logistics and WASH overview (90 minutes)</td><td>Triage and mass casualty management (60 minutes)</td></tr>
<tr><td>Lunch (30–60 minutes)</td><td>Lunch (30–60 minutes)</td><td>Lunch (30–60 minutes)</td><td>Lunch (30–60 minutes)</td><td>Lunch (30–60 minutes)</td></tr>
<tr><td>Health standards, principles and ethics (90 minutes)</td><td>Conditions of service and standard operating procedures (90 minutes)</td><td>Site layout and camp planning (90 minutes)</td><td>Triage and mass casualty incident activity (90 minutes)</td><td rowspan="3">SIMEX debrief: self and peer feedback, review of key learning points</td></tr>
<tr><td>Coffee break (15–30 minutes)</td><td>Coffee break (15–30 minutes)</td><td>Coffee break (15–30 minutes)</td><td>Coffee break (15–30 minutes)</td></tr>
<tr><td rowspan="2">Deployment cycle and national EMT structure (90 minutes)</td><td>Safety and security on deployment (45 minutes)</td><td rowspan="2">Feeding the team (60 minutes)</td><td rowspan="2">SIMEX briefing and preparation (60 minutes)</td></tr>
<tr><td>Team communication and radio procedures (45 minutes)</td></tr>
</table>

EMT: emergency medical team; SIMEX: simulation exercise; WASH: water, sanitation and hygiene; WHO: World Health Organization.

Table 2. **Pacific EMT member training course, learning objectives**

Session title	Learning objectives
Introduction to the Global EMT Initiative	Explain the EMT core principles and minimum standards for self-sufficiency and quality care in emergency response
	Review the goals of the Global EMT Initiative and the importance of national, regional and international emergency response capacity
	Review team roles and responsibilities, including logistics, WASH and clinical roles
	Review the role of the EMT within the context of other health emergency responders
	Introduce experiences in the Pacific with national EMT deployments in response to emergencies
EMT life cycle	Introduce the concept of the EMT life cycle and the EMT's role in a national response to a disaster
	Explain the activation and mobilization process of EMTs
	Discuss the planning, coordination and collaboration required for planning the EMT's demobilization and exit
EMT coordination	Describe the different models for the EMT Coordination Cell (EMT-CC) and how the ministry of health or other government ministries play a role in the coordination of EMTs
	Introduce the process for requesting and coordinating international EMTs
	Discuss the importance of EMT reporting
	Discuss when national response capacity may need to be supplemented with international EMTs
Health standards, principles and ethics	Understand the EMT guiding principles and how they are applied to real-life examples
Clinical overview	Explain the importance of achieving minimum health standards of care during EMT operations
	Describe the existing standards of health care and health infrastructure both locally and regionally, including the relationship with EMT principles and standards
	Locate desired information within the national EMT standard operating procedures (SOPs) and the EMT Blue Book
	Describe how emergencies can increase medical risks for vulnerable people
	Outline the different deployment modalities a national EMT can be requested to perform (mobile clinic, surge support, community checks, evacuation centre staffing)
EMTs in outbreak response	Describe the roles of EMTs in outbreak response
	Use prior outbreak responses in the Pacific to highlight the important role EMTs play in outbreak response
	Describe the importance of reporting patient encounters and the use of the Minimum Data Set (MDS) in all EMT activities
	Demonstrate ability to use the MDS during an EMT deployment
Triage and MCIs	Recognize the approach in the management of multiple casualties within the EMT context
	Review the challenges of managing multiple casualties within the EMT
	Demonstrate how to effectively manage overwhelming numbers of patients encountered
	Describe what patients will need to be transferred from an EMT to national health facilities and other care centres
Resilience on deployment	Discuss previous experience with stress management
	Share what strategies for stress management worked well
	Using the deployment cycle, review predicted stressors and discuss individual and group mitigation strategies
EMT cache familiarization	Identify the core components of individual (non-clinical) field kits necessary for national EMT deployments
	Provide hands-on training on EMT deployment gear

Session title	Learning objectives
Logistics overview	Describe how team members and the logistics focal point must plan for team self-sufficiency while in the field
	Explain EMT field logistics and logistics operations in an emergency response
	Review team members' roles in EMT logistics
WASH overview	Review how WASH will be approached in a mobile medical response
	Describe how water will be stored, tested and treated on EMT deployment
	Describe how medical and non-medical waste will be managed on a deployment
	List ways of vector control
Safety and security	Provide an overview of team member safety on a deployment
	Review safety measures when team is being transported by boat, road or air
	Describe safety rules for fire and fuel
	Understand the importance of water safety when deploying in the Pacific
Mobile medical care layout and camp planning	Provide an overview of how to choose an appropriate location to establish the EMT camp and how to set up gear
	Describe camp layout considerations
	Plan for mobile medical-care layout
Communication	Operate basic functions of emergency communications equipment that will be used in a deployment, including radios and satellite communication devices
	Understand the importance of effective radio communications and how to use correct radio terminology, including the phonetic alphabet
	State the purpose of a situation report (SITREP) and understand how to effectively write a SITREP for sharing with relevant authorities and coordination bodies
	Understand how to run daily briefing sessions with team members and utilize techniques to ensure their effectiveness

EMT: emergency medical team; MCI: mass casualty incident; WASH: water, sanitation and hygiene.

A simulation exercise is held on the final day of the training for a minimum of 4 hours, although this can be expanded to an overnight simulation exercise at a remote island location, where available. Given that most EMTs in the Pacific may encounter a disaster response with the need to utilize small boats, the simulation exercise often includes a practical session in which the teams load their EMT cache onto small boats and set up their camp and clinic in a remote location. Recent EMT training courses in Samoa and Vanuatu have used nearby uninhabited islands for these exercises.

Training delivery

Following initial team member training in 2018–2019, in-person EMT training in the Pacific was paused due to the COVID-19 pandemic and extended border closures. In 2022, national EMT training courses recommenced and were held in Fiji, Kiribati, the Marshall Islands, Palau, Samoa and Vanuatu using the updated training package. Participants included physicians, nurses, public health experts, environmental health specialists, paramedics, firefighters, pharmacists, logisticians, and police and military personnel, depending on the national composition of each EMT. There were 20–30 participants at each training. In Fiji and Samoa, the participants stayed in *bures* or *fales* (thatched huts) in remote locations so that they were removed from their usual daily clinical tasks, which increased opportunities for team-building activities.

Feedback was obtained from the participants through anonymous online surveys after training sessions. Generally, the results of the survey were highly positive, particularly regarding interactive sessions on cache/equipment familiarization, group discussions on the logistics of response in a remote island setting, and full-scale simulation exercises, including the use of actors and real-world deployment modalities (for example, small seacraft).

DISCUSSION

Recent national EMT deployments in the Pacific, such as during the HTHH volcanic eruption and tsunami, highlighted the successful deployment of national EMTs and underscored the need for recurring national training tailored to Pacific contexts. In Tonga, the last EMT training before the HTHH deployment had been prior to the COVID-19 pandemic, and many of the deployed team members had not attended a formal training course.[13]

Tailoring training materials and approaches to specific country contexts is essential for knowledge and skills acquisition, and the application of those skills during deployments. In the Pacific, an emphasis on practical activities based on previous deployments in remote islands stimulates increased participant engagement, and training is viewed by participants as useful in preparing them for real-world deployments.

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The authors acknowledge the contributions of EMTs around the world in support of effective, accountable and high-quality clinical care in the most challenging of circumstances, including EMTs in the Pacific. We are grateful to those who provided input during the design and delivery of the Pacific EMT training package, as well as to the many Pacific EMT members who have enthusiastically participated in the training courses, served as faculty, and provided feedback on content and delivery approaches. The authors also thank the donor partners that have supported EMT training and development in the Pacific, including the Government of Australia, the European Union, the Government of Japan, the Government of New Zealand and the Government of the United States of America through the United States Agency for International Development's Bureau for Humanitarian Assistance.

Conflicts of interest

JEL and STC are associate editors of the Western Pacific Surveillance and Response journal. They were not involved in the editorial decision to publish this article. The other authors have no conflicts of interest to declare.

Ethics statement

Formal ethical approval was not sought as research was not undertaken.

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Modifying routine emergency medical team introductory training to a virtual storytelling (*talanoa*) format for Pacific island countries and areas

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Many governments of Pacific island countries and areas (PICs) have committed to establishing rapidly deployable, fully self-sufficient national emergency medical teams (EMTs). The momentum for EMT development has expanded following recent health emergencies, such as tropical cyclones, measles outbreaks and the coronavirus disease (COVID-19) pandemic, among others.[1,2] However, for the first two and a half years of the COVID-19 pandemic, all PICs instituted some form of border restrictions, including extended border closures in some countries and areas that limited the ability to hold in-person EMT member training, which had been a core element of EMT development in the Pacific since the start of the initiative in the Pacific in 2017.

Despite border restrictions, Pacific EMTs continued to request support for team development and training as outbreaks and climate-related events in the disaster-prone Pacific continued to affect vulnerable populations.[3] During the first year of the COVID-19 pandemic, Category 5 cyclones Harold and Yasa hit both Fiji[4,5] and Vanuatu.[6] Given travel restrictions enforced in each country, these cyclones required national responses without the assistance of international EMTs. Prior to the COVID-19 pandemic, the Fiji Emergency Medical Assistance Team (FEMAT) and Vanuatu Medical Assistance Team (VANMAT) had been established with trained and equipped team members, following multiple in-person training workshops.

The need for local and national response capabilities, and the limited availability of international assistance during the first year of the COVID-19 pandemic, emphasized the need for ongoing national EMT development and training in the Pacific. To meet this need, the World Health Organization (WHO) proposed a series of remote, interactive, online EMT member training sessions to engage existing and future Pacific EMT members during the COVID-19 pandemic.

METHODS

From July to September 2021, WHO facilitated and hosted a weekly webinar series to familiarize existing and potential EMT members across the Pacific with the essential concepts, principles and standards of the EMT initiative. These online sessions were 60–90 minutes long, with 45–60 minutes of presentation on specific topics (**Table 1**) and up to 30 minutes of open dialogue based on the Pacific tradition of storytelling or *talanoa*. In many Pacific languages, *talanoa* means to tell a story or have a conversation.[7] The webinar series content followed the principles of the *Classification and minimum standards for emergency medical teams* (2021), known as the "Blue Book",[8] with specific themes from and for Pacific contexts.

Webinar sessions were divided into the following three themes: overview of the EMT initiative and coordination; EMT operational logistics and water,

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Table 1. **Pacific emergency medical team (EMT) webinar schedule, 2021**

Date	Topic
6 July	How the EMT initiative can improve disaster and outbreak response in the Pacific
13 July	EMT logistics – how to plan and outfit teams to deploy on small boats or aircraft
20 July	EMT clinical operations in the Pacific
27 July	The EMT life cycle
3 August	EMT coordination
10 August	Light-weight mobile medical care – pharmaceutical cache planning
17 August	Safety, security and communication in the field
24 August	EMT water, sanitation and hygiene (WASH)
31 August	A guide to EMT camp planning and setup
7 September	EMT physical and mental health during deployments
14 September	The role of EMTs in outbreak response

sanitation and hygiene (WASH); and EMT clinical care. The overview sessions included discussions on how the EMT standards and principles could be implemented in the Pacific in response to disasters and outbreaks, as well as on the EMT life cycle and how Pacific EMTs have operated in past emergencies. The first session under this theme stressed the importance of nationally-led coordination of both national and international EMTs.[9]

The webinar series included four EMT operational logistics and WASH sessions. The first provided an overview of EMT logistics focusing on how to deploy teams on small boats or aircraft that are most likely to be used in the Pacific. The next session outlined safety, security and communication in the field. The last operational logistics session provided a guide to EMT camp planning and setup, with a focus on deploying mobile EMTs to Pacific communities, villages and islands.

The remainder of the webinar sessions focused on EMT clinical service delivery, which included four separate sessions. The first provided an overview of clinical operations that an EMT in the Pacific is expected to perform, with experiences shared by EMT colleagues from Australia and Tonga. The second session provided details on how to plan an EMT's pharmaceutical cache to deliver mobile medical care in remote or disaster-affected islands or areas. The third session covered team members' physical and mental health, and the final session highlighted the role of EMTs in outbreak response based on many experiences in the Pacific, including COVID-19 response efforts in Fiji and the 2019 measles response in Samoa. The 11-week webinar series was designed to deliver a broad-based overview of EMT action in the Pacific.

RESULTS

Over 300 participants from 23 countries and areas across the Pacific and other countries across the world participated in the 11 online webinar sessions. The average number of participants per session was 85. Individuals who could not attend a specific session were able to view the recorded presentations on a shared server or a dedicated YouTube link.[10] All presentations and resources were shared with the participants after the session through a Google Drive link.

Feedback was sought after every session via a questionnaire designed to inform changes for future sessions. The questionnaire addressed such questions as whether the session had covered all of its objectives, whether the images and text used during the session were clear and visible, whether the webinar had increased the participants' understanding of the topics, whether participants would recommend this webinar to their colleagues, and if they had any suggestions on how to improve the sessions. Much of the feedback was positive, with a few suggestions on increasing the time dedicated to the Pacific tradition of *talanoa* and asking participants to share their experiences.

The most significant adaptation of the sessions based on the feedback was the incorporation of the Pacific tradition of *talanoa*. This was included following feedback from the first session, with 30 minutes in each

subsequent session dedicated to *talanoa*. These *talanoa* sessions enabled experienced faculty from EMTs in Australia, Cook Islands, Fiji, New Zealand, Papua New Guinea, Solomon Islands, Tonga and Vanuatu to share their Pacific deployment experiences through storytelling.

DISCUSSION

Adapting the webinar session plans and content to incorporate the *talanoa* style of communication in the Pacific facilitated an environment of learning from peers and colleagues. This sharing of stories increased attendee engagement in the online virtual setting. The Pacific EMT webinar series provided knowledge on the core standards, principles and modes of EMT operations, and increased engagement in the establishment and continued growth of the EMT initiative in the Pacific.

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Ethics statement

The preparation of this article was conducted in accordance with ethical principles. The authors have made every effort to ensure its integrity and transparency. No original research on human subjects was undertaken.

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Developing and maintaining health emergency response capacity: Palau's national emergency medical team

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The Republic of Palau is a small island–large ocean nation in the western Pacific ocean. A national census conducted in 2020 determined the population to be 17 614.[1] The nation is extremely susceptible to the impacts of climate change and natural hazards.[2] In June 2022, Palau established a national emergency medical team (EMT), making it the smallest country by population to achieve this. The team was given the name KLEMAT, a word that refers to the rope that holds the sails of Palau's traditional canoes and also describes leadership, authority and good governance.[3]

KLEMAT was developed through a multistep process with support from technical and funding partners. As part of the Global Emergency Medical Team Initiative,[4] Palau was introduced to EMTs in 2019 through orientation webinars and virtual meetings led by the World Health Organization (WHO). These sessions were attended by key personnel from the Palau Ministry of Health and Human Services from 2019 to 2021. In 2022, WHO and the Ministry jointly hired a national EMT coordinator, and in April 2022, a Technical Working Group was formed comprising stakeholders with key roles in developing national responses to disasters (**Fig. 1**).

The main goal of the Technical Working Group was to facilitate the establishment of a national EMT capable of being self-sufficient and providing high-quality clinical responses to emergencies or disasters. The Technical Working Group is now working towards integrating KLEMAT into the National Risk Disaster Management Framework,[2] the Belau National Hospital Emergency Plan and the national budget.

Team development

As a result of the initial meetings of the Technical Working Group, KLEMAT's standard operating procedures (SOPs) were drafted, by adapting WHO's *Classification and minimum standards for emergency medical teams* to a small island context.[5] KLEMAT's first EMT member training and full-scale simulation exercise were conducted in Palau by WHO-led faculty in June 2022.[6] In 2023, the 18 fully trained KLEMAT members include physicians, nurses, environmental health officers and logisticians. The number of KLEMAT personnel will continue to increase, as a result of additional WHO-led EMT member training. This expansion of KLEMAT's roster will ensure that it has a full complement of personnel for any major deployment (**Table 1**).

To enable KLEMAT's activation and a fully self-sufficient response to emergencies or disasters, even in remote or austere contexts, a specifically designed EMT cache (i.e. equipment) was procured for all Pacific EMTs, including KLEMAT.[7] This includes personal deployment, clinical and communication equipment, among others.

Because KLEMAT has developed SOPs, been trained and has a deployment-ready cache, the team is now a deployable clinical resource, ready to respond locally, nationally and potentially regionally in the event of an

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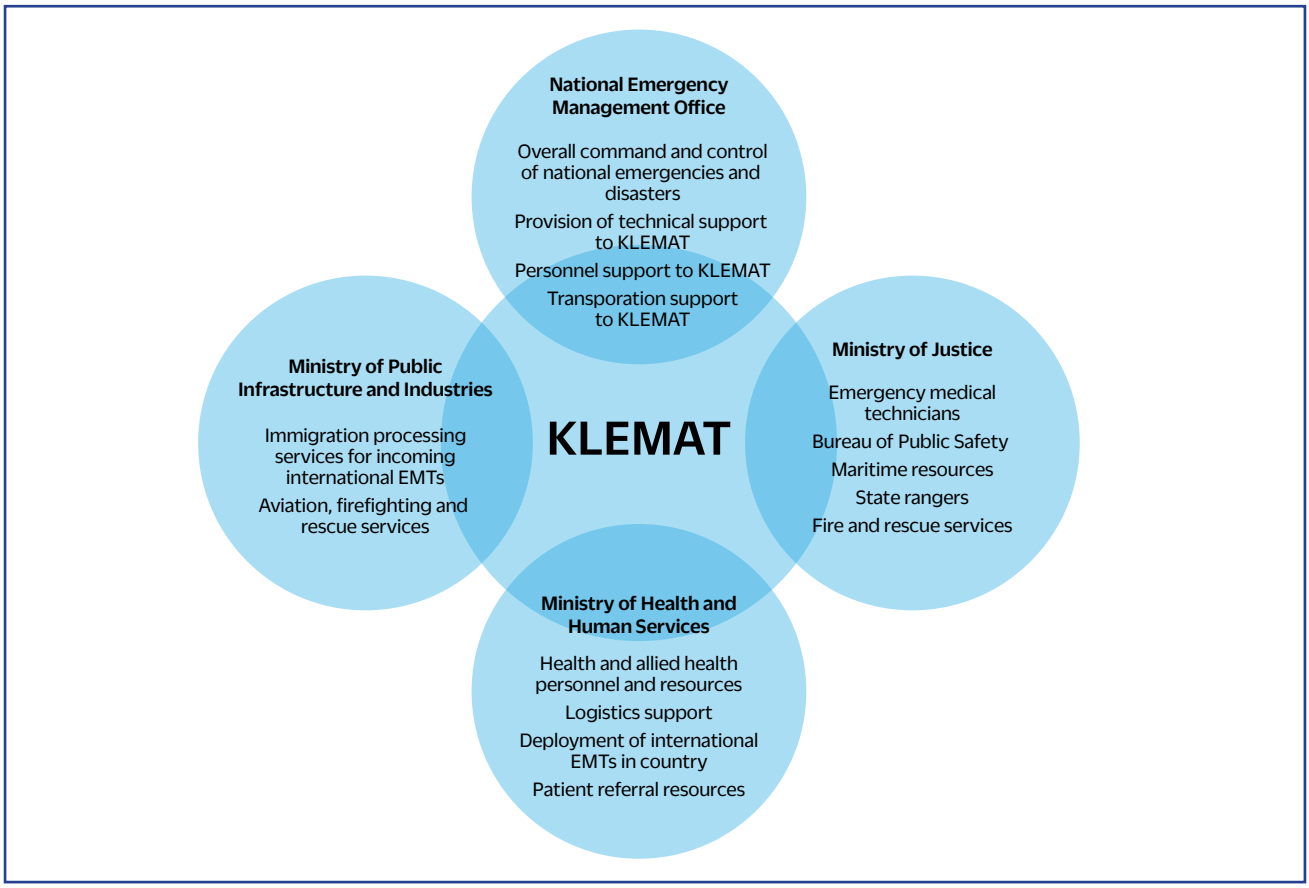
Fig. 1. **Technical Working Group comprising key stakeholders and their resource commitments to Palau's emergency medical team (KLEMAT), 2022**



EMT: emergency medical team.

Source: Palau National EMT (KLEMAT) Terms of Reference (unpublished).

emergency or disaster; KLEMAT is capable of providing fully self-sufficient tented outpatient and emergency medical services in the most challenging circumstances.

Continuation training and motivational impetus

Post-training, the challenge for the KLEMAT team was maintaining members' motivation and skills and continuing to develop the team's deployment preparedness. This involved three key elements: goal-setting, establishing ground rules and clarifying roles.[8] KLEMAT team members were involved in establishing their own SOPs, which in turn addressed those three key elements. The challenge was then to consider how to further develop the team while maintaining their motivation. Salas et al. highlight that developing teams further can be achieved only by providing ongoing support, education and skills training.[9] In order to address this, the team began holding monthly training sessions or meetings. At each meeting, team members are asked if they have any specific training requests, thus enabling the facilitators to develop training to meet the team's needs.

These sessions have been deliberately varied and have utilized local and international services and experts. The sessions have included:

- casualty simulation exercises;
- radio and verbal communications;
- table-top exercises, covering topics such as optimal site setup for responses and local disaster scenarios;
- visits to tertiary response units to increase KLEMAT's awareness of possible external resources and to explore the capacity and capability of these units in the event of tertiary assistance being requested for Palau during a major disaster; and
- external specialist speakers.

Table 1. **Palau emergency medical team (KLEMAT) personnel and roles, 2022**

Role	Specialty	Description	No. of personnel
Medical director	Doctor	Overall responsibility for the Health Emergency Operations Centre and in charge of KLEMAT deployment	1
Focal point coordinator	Coordinator	Manages the roster, mobilizes the team, oversees pre-deployment preparations, works with the Health Emergency Operations Centre during deployment, oversees demobilization, acts as single source for emergency contacts	1
Administrator	Team administration, human resources	Manages patient documentation, team administration	1–2
National Emergency Management Office	Operational support	Provides advice, agreed resources and on-site support to KLEMAT	1–2
Team leader	KLEMAT team leader	Manages the team, makes decisions during deployment, acts as point of contact for any agencies involved, monitors wellness of team	1
Emergency medical technician	Triage	Manages triage on site and manages security if required; maintains ambulance equipment if applicable	2–4
Clinical lead	Doctor	Oversees all patient care: acts as resuscitation team leader, provides initial care for patients requiring emergency intervention, performs minor surgeries, acts as obstetric care lead	1–3
Nurse	Clinical	Manages all patient care in cooperation with the doctor, manages infection control in cooperation with IPC staff	1–4
Nurse specialist	IPC	Acts as forward deployment to assess site and patient expectations, relays information back to base, manages and advises all staff regarding infection control, supervises isolation tent if applicable	1–2
Logistician	Logistics	Manages storage, maintenance, accountability and distribution of cache; prepares cache for EMT to pick up; accompanies EMT if required	1–4
Environmental health	WASH	Acts as forward deployment to prepare for WASH, manages environmental health issues and vector control, advises on waste management	1–4
Active and support services	Palau Red Cross	Dependent on skill set	1–4
Pharmacist	Pharmacy management (remains at Belau National Hospital)	Orders, prepares and maintains medications for EMT use; provides medication labels and dispensing packs for EMT	1
Maintenance	Maintenance specialist (remains at Belau National Hospital unless required on site)	Performs maintenance on all equipment, electronics, generator, and lighting, both while stored and on site, as required	1

EMT: emergency medical team; IPC: infection prevention and control; WASH: water, sanitation and hygiene.

Source: KLEMAT Standard Operating Procedures (unpublished).

This approach to ongoing education and skills practice is supported by research that confirms that continuing training, such as simulation-based training, can be highly effective if correctly matched with the team's skill set.[10] In addition to regular team training, international specialized training that is relevant to the team's skills has been arranged. In May 2023, the Australian Defence Force sponsored two KLEMAT members, one logistician and one water, sanitation and hygiene (or WASH) specialist, to attend short courses in Australia.

Maintaining motivation among team members has been further achieved by providing activities that are varied, relevant and essential for building on existing skill sets, hence assisting the team's overall readiness to respond effectively to any emergency or disaster. In addition, and as a result of the ongoing training, the team continues to develop as a cohesive group and members are readily able to step into their roles, as observed by training facilitators and Palau's national EMT coordinator during training exercises.

Conclusions

In the future, KLEMAT will invite regional EMTs to join its training sessions. This initiative will provide KLEMAT with external options for learning as well as expand the regional EMT support network. Palau's development and ongoing training of its national EMT demonstrates that even the smallest of countries can establish a self-sufficient and motivated team capable of national and regional responses.

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Ethics statement

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Developing the Disaster Medical Responder's Course in Singapore

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Problem: Emergency medical teams (EMTs) deployed to mass casualty incidents (MCIs) are required to work outside their usual settings and according to different principles, which may affect their performance and the survival of casualties. Prior to 2013, training offered to domestic EMTs was limited to ad hoc and infrequent simulation exercises.

Context: Domestic EMTs are activated from public tertiary hospitals to provide pre-hospital medical support to the Singapore Civil Defence Force and establish a first-aid post (FAP) for triaging, stabilizing and treating casualties. These casualties are then evacuated to public hospitals for further management.

Action: Recognizing the need for a more systematic approach to the training of domestic EMTs, the Disaster Medical Responder's Course (the Course) was developed as a multi-institutional collaboration to equip EMT members attending a MCI with the necessary skills to perform effectively at the FAP.

Outcome: The Course was first run in 2013 and is usually offered six to eight times a year. Since June 2019, a total of 414 health-care staff and allied health professionals have participated. There have been numerous revisions of the course content and delivery to reflect the latest concepts in operations and global best practice, as well as developments in educational methodologies.

Discussion: Preparedness is crucial to optimize the survival and outcomes of casualties. The Course provides standardized training of domestic EMTs and plays a pivotal role in ensuring operational readiness for MCIs in Singapore.

PROBLEM

A mass casualty incident (MCI) is an incident in which resources and capabilities of a health-care system run the risk of becoming overwhelmed by the number and severity of casualties.[1] Casualties are triaged and, as appropriate, stabilized and treated by emergency medical teams (EMTs) at the MCI site before being evacuated to a hospital, as per the "scoop and run" principle. MCIs present a unique set of challenges, often different to those faced by medical staff during the course of their routine clinical practice in a hospital environment. EMT members need to be able to adapt their roles and work processes to meet the demands of providing emergency care at the site of a MCI to improve their performance and the survival of casualties.

Prior to 2013, preparation for response to MCIs in Singapore was primarily focused on developing standard operating procedures. Training of domestic EMTs was mostly conducted during ad hoc and infrequent simulation exercises for anticipated MCIs. As Singapore is generally free from natural disasters, the training focused on responses to intentional and unintentional man-made events such as transportation accidents and building collapses, as well as explosions and releases of dangerous chemicals. The exercises often lacked clear training objectives and specific learning outcomes. Concerns had also been raised by the Ministry of Health, the Singapore Civil Defence Force (SCDF) and EMT members themselves about Singapore's MCI operational preparedness and readiness.

In response to these concerns, the Disaster Medical Responder's Course (the Course) was developed in 2013 to provide regular, standardized training for domestic EMT members on disaster medical response and on the role and expectations of a domestic EMT in the event of

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a MCI in Singapore. The primary aim of the Course was to improve the effectiveness and efficiency of the EMT response upon activation. In this report, we describe the development of the Course and how it has evolved over time.

CONTEXT

The SCDF is responsible for delivering pre-hospital emergency medical services during peacetime and MCIs. During peacetime, SCDF is activated by calling 995, and an ambulance crew, comprising a paramedic and emergency medical technician, is dispatched to respond to medical emergencies. In the event of a MCI, the Ministry of Health, through the Disaster Site Medical Command (DSMC), supports the SCDF in their pre-hospital response by sending EMTs to the site.

All eight public tertiary hospitals in Singapore have a nominated domestic EMT comprising two doctors and four nurses rostered on every shift. Upon MCI activation, each hospital sends its EMT to the MCI site. The EMT brings its logistics bags, which contain medical equipment, drugs and consumables. They report to the DSMC and provide pre-hospital medical support to the SCDF according to the scoop and run principle. The EMTs only respond to MCIs within Singapore – they are not deployed overseas as international EMTs.

ACTION

Course content

The goal of the Course is to enhance disaster preparedness and operational readiness of domestic EMTs by familiarizing members with the functions and operations of a first-aid post (FAP). The learning objectives are based on Bloom's taxonomy (levels of remember, understand and apply; **Table 1**).[2] The Course is run over 1 day but uses the "flipped classroom" approach, whereby the lecture slides are sent out 2 weeks beforehand so that participants can go through them before attending the Course. The Course itself consists of a combination of interactive lectures (first half of the day) and three skills stations (second half of the day). The latter comprise a communication exercise on the use of radio sets, a familiarization exercise (with the equipment and supplies available in logistics bags), and a session on the treatment of casualties using the available equipment and supplies.

The development of the course content was guided by a global operational learning framework for disaster education and training of EMTs, which has three components:[3]

- ensuring professional competency with licence to practise;
- adapting professional capacities (technical and non-technical) to low-resource and emergency contexts; and
- preparing effective performance as a team in the field.

The principles and standards enshrined in the World Health Organization's (WHO's) *Classification and minimum standards for emergency medical teams* (2021) (the "Blue Book")[4] were also considered in the development of the Course. However, as Singapore's EMTs are intended for local deployment, only those principles and standards relevant to local concepts of operations were incorporated. For example, the Blue Book's clinical care technical standards on triage, assessment, resuscitation, stabilization, referral and transfer, which help to improve the quality of care provided to casualties at the FAP according to the scoop and run principle, are relevant to the Course and were thus incorporated. Course content on the treatment of wounds, burns, fractures and limb injuries, as well as the use of analgesia and anaesthesia, was also based on the standards specified in the Blue Book. Similarly, WHO's technical standards relating to medical stock management and pharmacy supply underpinned the skills station on the familiarization with equipment and supplies available in the logistics bags.

To ensure it remains relevant to current operations and aligns with best practices globally, the content of the Course has been reviewed annually by the training branch of DSMC. This process includes a thorough review of the published literature and conference proceedings.

Course faculty

The course faculty is comprised of DSMC representatives nominated by their public tertiary hospitals. All faculty members are certified emergency physicians and nurses with a strong interest and training in disaster medicine

Table 1. **Learning objectives of the Disaster Medical Responder's Course in Singapore**

Learning objectives
• Describe the mass casualty response in Singapore
• Discuss the command structure, roles and responsibilities of Disaster Site Medical Command and EMTs
• Explain the activation process of Disaster Site Medical Command and EMTs during a civil emergency
• Describe the organization of, and operations at, the first-aid post
• Demonstrate how casualties are triaged and evacuated at the first-aid post
• Recognize and locate the medical logistics available
• Demonstrate the effective use of communication equipment at the first-aid post
• Describe the psychological support available
• Execute a table-top exercise involving the Disaster Site Medical Command and EMTs at the disaster site

EMT: emergency medical team.

and all have contributed to course content development and delivery.

Course evaluation

Course evaluation is based on the Kirkpatrick Model[5] and comprises several mechanisms. Feedback is provided by faculty members during the skills stations, in the form of observations about participants' performance in relation to the learning objectives of the Course.[6] For example, during the communication exercise on the use of radio sets, participants are required to demonstrate effective use of communication equipment at the FAP. Faculty members make observations about aspects of participants' communication skills, such as clarity, simplicity and brevity of messages and use of alphanumeric phonetics, as well as the discipline of radiocommunications, which facilitates discussion with participants about their performance, the challenges they faced and potential strategies that could be used to overcome them.

A feedback form is used to evaluate the reactions of participants to the course content, the trainers and administration. Learning of the participants is evaluated through a table-top exercise based on a bomb blast scenario, conducted at the end of the Course. As part of this table-top exercise, participants assume their respective roles within the various FAP areas and are encouraged to work collaboratively to apply the concepts learned during the Course.

To evaluate behaviour change, which is indicative of sustained knowledge, skills and attitudes beyond the Course, and to maintain the competency of domestic EMTs, EMT members are invited to participate in formal exercises within Singapore.[5] These formal exercises are held three or four times per year and offer EMT members the opportunity to hone and refresh their skills. These formal exercises are evaluated using an exercise assessment matrix that mirrors the objectives of the Course and that provides an evaluation of the Course and an indication of the operational readiness of the EMTs. This allows gaps in training and performance to be identified and appropriate modifications to be made to improve the content and delivery of the Course.

Education methodologies

Course development was guided by Kern's model for curriculum development.[7] A literature review was performed to identify training needs and perceptions and readiness of staff involved in mass casualty responses, as well as to define expected roles, competencies and skills.[8,9]

The Course is based on the adult learning principles of i) experience of participants, ii) use of problem-centred approaches to course delivery, and iii) relevance to participants.[10] There is emphasis on tailoring the MCI-specific content to the current experiences of participants during non-emergencies, and allowing participants to practice what they learn during the skills stations. The Course is relevant to participants as they can apply what they have learned to direct casualty management at a FAP during a MCI.

The Course is also anchored in Gagne's Theory of Instructional Design, which states that participant outcomes must be determined before constructing and tailoring the instructional events.[11] The learning

outcomes (**Table 1**) were first developed by the faculty so that the curriculum would enhance the preparedness and readiness of domestic EMT members. Kolb's learning style and experiential learning cycle were also applied to enhance learning through participant reflection on their practice and sharing of experiences during the interactive lectures and skills stations.[12] By adopting these approaches, participants are encouraged to observe, think, experiment and perform as part of their learning process.

The use of simulation exercises, which are integral components of the skills stations and the final table-top exercise, provides experiential learning to participants in a safe setting.[13] Simulated aides are used to replicate real-life MCI casualties, and participants are required to make clinical decisions about the management of these casualties at the FAP.

OUTCOME

Since 2013, the Course has been run between six and eight times per year. From June 2019 onwards, the Course was conducted at a single site, the SingHealth Duke-NUS Institute of Medical Simulation; previously it was held at various public hospitals on a rotational basis. A total of 414 participants have attended 14 courses since June 2019 (**Table 2**).

The Course was last updated in 2020 in response to the coronavirus disease pandemic. Introduction of safe management measures in Singapore, such as minimizing in-person gatherings and limiting group sizes, led to modifications to course delivery. Interactive lectures were delivered via an online platform, participants were divided into smaller institutional groups for the skills stations, and the individual groups were assigned the same faculty member. Additional cleaning requirements increased the duration of the Course and the amount of administrative support needed.

DISCUSSION

In this report, we have described the development of the Disaster Medical Responder's Course, which aims to enhance disaster preparedness and operational readiness of domestic EMTs responding to MCIs in Singapore. Our experience and lessons learned in developing this training course may be useful for other countries wishing to create a similar course specific to their context.

The short 1-day duration of our face-to-face course was made possible by the use of a flipped classroom approach, whereby the theoretical content is delivered ahead of the in-person part of the Course.[14] This approach allows participants to view the required materials for knowledge acquisition at their own pace and in an environment of their choice before attending the in-person part of the Course, which can then be devoted to interactive discussions and skills stations. As well as reducing in-person course time, the flipped classroom approach has been shown to improve student satisfaction and engagement with learning.[14]

Due to its practical nature, the use of a table-top exercise to evaluate the Course was preferred over more theoretical assessments (e.g. multiple-choice tests) and also over a large-scale simulation exercise. A table-top exercise exposes participants to operations at the disaster site in a step-wise manner, and allows them to apply what they have learned at each stage. A large-scale simulation exercise is staff- and resource-intensive, making it a less sustainable and cost-effective option for the evaluation of a 1-day course. However, formal full-scale exercises that build on the 1-day course evaluation process are conducted routinely each year.

The course content and delivery are similar to other training courses that have been developed across the Western Pacific Region for other EMTs such as Japan's Disaster Medical Assistance Team (DMAT), the Republic of Korea's DMAT, the Australian Medical Assistance Teams (AUSMAT) and the New Zealand Medical Assistance Team (NZMAT). These similarities exist despite the fact that these national EMTs are designed for international deployment, whereas Singapore's EMT has a domestic deployment focus. In terms of the content, commonalities exist in the concept of operations, command and control, in the roles and responsibilities of team members, and in essential field skills such as triage, medical management, logistic familiarization and communications. Methods of delivery generally include a mix of didactic or interactive lectures, practical trainings and simulations including desktop and table-top exercises.

The move to a centralized delivery model in 2019 proved advantageous on a number of levels. It meant that the faculty and participants were drawn from different public tertiary hospitals, whereas previously the faculty and participants were restricted to individuals from the public tertiary hospital hosting the Course. A

Table 2. **Disaster Medical Responder's Course participants by role and workplace, Singapore, June 2019 to December 2022 (*N* = 414)**

Role	No. of participants, *n* (%)
Doctors	113 (27.3%)
Nurses	256 (61.8%)
Allied health professionals	8 (1.9%)
Administrative staff	37 (8.9%)
Workplace	
Public hospitals	354 (85.5%)
Other health-care institutions	57 (13.8%)
Ministry of Health	3 (0.7%)

centralized delivery model not only allows more diverse interaction and exchange of experience and practice but also replicates the real-world MCI setting in which EMT members from different public tertiary hospitals have to work together. In addition, a dedicated, single course location simplifies the logistics of delivering a training course and is therefore more cost-effective. The centralized model also widens participation and increases the number of participants that can be trained. However, the varied background of participants can pose a challenge, requiring the faculty to tailor the content and delivery of the Course to maximize attendees' learning.

There are some limitations to this report. As there have not been any MCIs within Singapore that required deployment of domestic EMTs, we were unable to assess how the training has contributed to real-world preparedness and response. Also, we were unable to analyse course evaluations that were conducted prior to the centralization of the Course in 2019, and therefore information relating to course evaluation is limited to that from June 2019 onwards.

In conclusion, ensuring preparedness of domestic EMTs is a vital part of disaster response. It requires a continuous cycle of planning, organizing, training, equipping, conducting exercises and evaluations, and making adjustments to ensure that EMTs responding to a MCI can function to their maximum capacity and capability and thereby optimize the survival of casualties and their outcomes.[15]

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Conflicts of interest

The authors have no conflicts of interest to declare.

Ethics statement

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Tonga national emergency medical team response to the 2022 Hunga Tonga-Hunga Ha'apai volcanic eruption and tsunami: the first deployment of the Tonga Emergency Medical Assistance Team (TEMAT)

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Problem: The undersea Hunga Tonga-Hunga Ha'apai volcano erupted on 15 January 2022, causing a tsunami that affected Tonga as well as other countries around the Pacific rim. Tonga's international borders were closed at the time due to the coronavirus disease pandemic, but clinical surge support was needed to respond to this disaster.

Context: Tonga's Ministry of Health formed the Tonga Emergency Medical Assistance Team (TEMAT) in 2018 to provide clinical care and public health assistance during disasters, outbreaks and other health emergencies. TEMAT was activated for the first time in January 2022 to respond to medical and public health needs following the eruption and tsunami.

Action: On 16 January 2022, a five-person TEMAT advance team was deployed to conduct initial damage assessments and provide casualty care. Subsequently, TEMAT rotations were deployed to provide clinical care and public health support across the Ha'apai island group for over 2 months.

Outcome: TEMAT deployed to the islands most affected by the volcanic eruption and tsunami within 24 hours of the event, providing emergency clinical, psychosocial and public health services across four islands. TEMAT reported daily to the Ministry of Health and National Emergency Management Office, providing critical information for response decision-making. All TEMAT actions were documented, and an after-action review was conducted following the deployment.

Discussion: TEMAT's deployment in response to the 2022 volcanic eruption and tsunami highlighted the importance of national emergency medical teams that are prepared to respond to a range of emergency events.

On 15 January 2022, the undersea Hunga Tonga-Hunga Ha'apai (HTHH) volcano erupted violently, triggering an unprecedented plume of smoke and ash, and a tsunami that struck low-lying coastal areas of Tonga's most populous island of Tongatapu, the nearby island of 'Eua, and multiple islands in the country's Ha'apai island group, in addition to other countries around the Pacific rim.[1,2] Thick volcanic ash covered nearly the entire kingdom, and the health impacts were initially expected to be significant. The country's undersea internet cable was damaged, cutting off nearly all domestic and international communications. Tonga's Prime Minister declared a State of Emergency, although, with communication channels inoperable, the needs in the kingdom's outer islands were not initially known. The Tonga Emergency Medical Assistance Team (TEMAT) was activated by Tonga's Ministry of Health to support the health response in the Ha'apai island group. This report describes TEMAT's activities and documents the lessons learned during the response.

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CONTEXT

Tonga is an island nation of approximately 100 000 people located in the South Pacific with 172 islands, of which 45 are inhabited, spread across four archipelagos covering 700 000 km^2 of ocean territory.[3] As an island kingdom with a high proportion of its population in low-lying coastal areas, Tonga is particularly vulnerable to natural hazards and climate change impacts, including tropical cyclones, earthquakes, tsunamis, flooding and volcanic eruptions.[4] In 2018, the World Risk Index ranked Tonga as the second most at-risk country in the world, after Vanuatu.[5]

Recognizing the persistent threat of disasters and outbreaks, particularly with the potential to affect the country's outer islands, Tonga's Ministry of Health established TEMAT as the kingdom's national emergency medical team (EMT) in 2018.[6] This was accomplished with technical and operational support from the World Health Organization (WHO), and with funding and technical support from the governments of Australia and New Zealand. TEMAT is located in Tonga's Ministry of Health, with coordination linkages to Tonga's National Emergency Management Office and National Emergency Management Committee. TEMAT was established based on the principles and standards detailed in the WHO *Classification and minimum standard for foreign medical teams in sudden onset disasters* (updated in 2021 to *Classification and minimum standards for emergency medical teams*[7]), with adaptations to account for Tonga's small size, limited human resources and unique island context.

The aim of TEMAT is to provide clinical care and public health assistance to populations affected by disasters, outbreaks and other health emergencies. TEMAT consists of physicians, nurses, pharmacists, environmental health officers and operations support and logistics personnel. TEMAT developed standard operating procedures (SOPs) and received a cache of equipment and supplies from WHO to ensure self-sufficiency in deployment (**Table 1**). TEMAT members had been trained by WHO and regional experts in 2018 and 2019 but had not been deployed in response to a disaster until the HTHH volcanic eruption and tsunami in January 2022.

ACTION

Tonga's National Emergency Management Committee convened an emergency meeting on the night of the HTHH eruption on 15 January 2022.[1] A multidisciplinary team was deployed on 16 January to the Ha'apai islands (**Fig. 1**) aboard His Majesty's Armed Forces (HMAF) Guardian-class patrol ship, the VOEA Ngahau Koula. This deployment included a five-person TEMAT advance team consisting of two physicians and three nurses,[8] tasked with undertaking an initial damage/needs assessment and caring for casualties. As communication with the Ha'apai islands had not been re-established, the level of damage and needs were unknown.[2]

The Ngahau Koula reached the island of Nomuka on the morning of 17 January, after sailing for approximately 20 hours, with the ship encountering delays due to significant debris in the sea following the tsunami. Enormous destruction from the tsunami was observed, with nearly all coastal dwellings destroyed, including Nomuka's local health centre. TEMAT assessed that there was a comparably small number of injuries, which they were able to treat on-site in a makeshift clinic, with the medicines and clinical supplies they had brought with them. One patient was evacuated to the national referral hospital in Tongatapu, and one death from the tsunami was recorded from Nomuka.

The five-person TEMAT team was subsequently divided into two teams, with one supporting clinical service delivery on Nomuka and the other travelling on board the HMAF ship to other Ha'apai islands to continue assessments. The people of Ha'apai's Mango island sighted the HMAF ship and communicated with it using a signal mirror. Upon TEMAT's arrival onshore, the island's population was sitting in the open on a hillside as the tsunami had destroyed every structure on the island. On 21 January, another team was deployed with four members: one medical officer and three emergency nurses. They assisted Tonga's Armed Forces to evacuate the entire population of Mango (n = 62) to Tongatapu and 'Eua.

While the first TEMAT rotation was in Ha'apai, a second, larger team was mobilized and deployed to

Fig. 1. **Map of Ha'apai islands indicating the islands to which TEMAT responded**

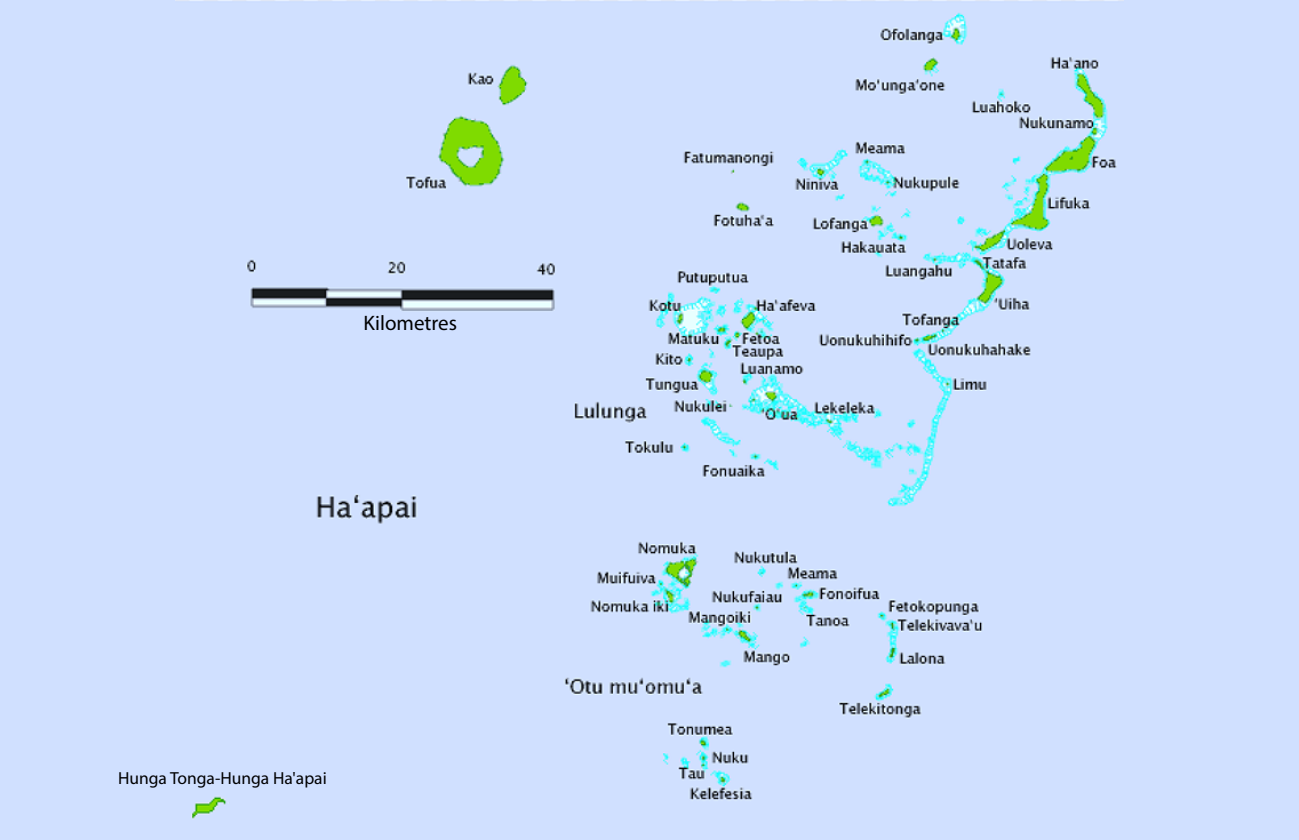

Table 1. **TEMAT deployment cache**

Item	Quantity
Personal deployment kit (including camping supplies such as headlamps, sleeping bags, mats, torches, clear safety glasses, tarpaulins, etc.)	16
First aid kit	16
Medical backpack with supplies provided by Tonga Central Pharmacy	8
Accommodation tent (four-person tent)	4
Community LifeStraw® water filtering system	4
N95® mask	5 boxes
Generator EU10i (1kVA)	1
Drum of diesel (200 litres)	3
Food and cooking supplies (including gas stoves, gas bottles, pots, plates, bowls and utensils)	Food supplies for 1 week with regular replenishment from Tongatapu
Water (bottled water for team members)	50 packs
Mist blower for vector control	3
Chemical for insecticide spraying (Aqua K-Othrine® and bifenthrin)	6 bottles (4 litres each)
Satellite phone (provided by the World Bank office, Tonga)	1

Nomuka to ensure continuity of services for the affected population there, including clinical care and public health action. The composition of this team was decided based on feedback received from the first TEMAT rotation, reported via satellite phone to health authorities in Tongatapu. The second TEMAT rotation departed Tongatapu late on 18 January with eight team members: two medical officers, two clinical nurses, one health inspector, one pharmacist and two logisticians (water and sanitation officers). Additional TEMAT rotations followed during February and early March 2022 and were based on TEMAT's initial needs assessment. TEMAT was demobilized in March 2022, following a 7-week deployment to Ha'apai.

An after-action review (AAR) of the deployment was conducted in December 2022, which was delayed due to the coronavirus disease (COVID-19) response that was initiated soon after the volcanic eruption and tsunami.[9] The AAR was conducted using a hybrid workshop, which allowed for both virtual and in-person attendance. The attendees included TEMAT's chairperson, medical officers and nurses who were part of the deployments, as well as WHO regional EMT experts. The AAR provided valuable insights into the response effort, documented lessons learned and highlighted areas for improvement to ensure better preparedness and response in the future.

OUTCOME

TEMAT's response was launched within 24 hours of the volcanic eruption and tsunami, reaching the worst-affected islands within approximately 40 hours. TEMAT provided emergency clinical service delivery, psychosocial support and public health response to the most affected communities of the Ha'apai islands, caring for 381 patients across four islands (**Fig. 1; Table 2**). TEMAT's actions included emergency care for a small number of trauma patients, but also extensive action to manage patients with chronic noncommunicable diseases, replace lost medications, provide medical evacuation assistance and support local nurses to re-establish clinical services on the islands. They also conducted a range of environmental health actions, including water treatment, vector-control spraying and debris removal.

TEMAT reported to the Ministry of Health and National Emergency Management Office through a satellite phone, with reports conducted on a daily basis to provide critical information for decision-making at the national level.

The key lesson from TEMAT's deployment in response to the 2022 HTHH volcanic eruption and tsunami is the importance of having national EMT capability, regardless of a country's size. While Tonga is one of the world's smallest countries by population, having a trained, equipped and self-sufficient EMT that is rapidly deployable to remote locations is essential for health emergency response, particularly for countries with high vulnerability to natural and infectious hazards and challenging geography.

EMTs must be ready to respond at short notice, with the required equipment and documented procedures on hand. The availability of TEMAT SOPs and EMT trainings in 2018 and 2019 contributed to the team's deployment readiness. Having the EMT cache on-hand at the time of TEMAT's deployment ensured that team members were able to function safely, effectively and self-sufficiently in Ha'apai, even after the complete destruction of local health infrastructure. The fact that TEMAT was ready for rapid deployment with the appropriate cache was a key success factor, underscoring the importance of making these investments before disasters occur.

However, despite having a prepared EMT cache, the first TEMAT rotation departed without the full kit of equipment and supplies, as there was very little time to make arrangements before departure, and because communication lines were down at the time. Some team members departed with quickly packed bags of their own clothes and limited food, though HMAF provided rations for everyone deployed on the first mission to Ha'apai on 16 January. A satellite phone provided by the World Bank office in Tonga facilitated communication between TEMAT and the Ministry of Health in Tongatapu. However, as this was the only method of communication, reporting to the Ministry of Health was limited to daily calls via the satellite phone. It was not possible to report standard surveillance data collection, and the WHO EMT Minimum Data Set was not used in this response.

Given the severity and extensive impact of the volcanic eruption and tsunami, extensive casualties were expected. However, the majority of the TEMAT response was not trauma-related. Instead, their work comprised providing psychosocial support, managing

Table 2. **Health-care services TEMAT provided to patients in Ha'apai (Fonoifua, Ha'afeva, Nomuka, Mango)**

Health-care services	No. of patients
Treatment for noncommunicable diseases (monitoring vital signs, dispensing medication, lifestyle advice)	297
Psychosocial support (advice and counseling)	39
Treatment for communicable diseases (monitoring vital signs, sample collection, diagnostic testing, dispensing medication, advice on preventive measures)	27
Treatment for traumatic injuries (wound care and dressing, intravenous medication and fluid resuscitation)	13
Transfers to the national referral hospital	5

noncommunicable diseases, treating diarrhoeal and skin diseases relating to damaged water and sanitation infrastructure, and repairing damaged infrastructure. Although TEMAT was well prepared to deploy to a post-disaster context, with the expectation of encountering more trauma presentations, the cache taken by the first teams required adjustment in subsequent re-supply shipments. TEMAT's flexibility, in terms of changing the team structure and roles, was another lesson learned. Just-in-time training on psychological first aid (PFA) provided by WHO's Country Liaison Officer in Tonga, who is a psychologist by training, helped some team members to care for the many acute stress presentations that they encountered. As all team members were affected, with their homes covered in ash from the volcanic eruption, and some unable to contact family members, they also required support.

While training had been conducted for TEMAT, with 40 members trained in 2018 and 2019, only a small number of those deployed for the HTHH response had been formally trained as TEMAT members prior to this activation – one of whom was the team leader for most of the deployment period. Significant turnover in the Ministry of Health, as well as competing demands related to COVID-19 preparedness and response, also reduced the pool of trained personnel available to deploy with TEMAT. Some TEMAT members were not aware of its SOPs, reporting procedures and operation of the cache. The need for regular TEMAT member training was another lesson learned from this response.

DISCUSSION

TEMAT's deployment to Ha'apai in response to the HTHH eruption and tsunami was an effective response that met the health needs of the affected population. It also presented an opportunity for learning and continuous improvement of TEMAT's capability. The AAR of TEMAT's HTHH response identified several lessons and areas for improvement. TEMAT's SOPs are now under review, including inventory lists for clinical and non-clinical cache, deployment checklists and reporting forms and protocols. A TEMAT training and simulation exercise was carried out in April 2023 with support from WHO, using a tailored Pacific EMT member training package.[10] Additional training on PFA and mental health and psychosocial support in emergencies is also planned. TEMAT will receive an additional cache in 2023, sourced and procured by WHO specifically for Pacific EMTs.[11] This will include personal deployment supplies for team members, as well as additional medical and communication equipment such as a portable ultrasound machine and satellite communication devices.

TEMAT's deployment to the Ha'apai islands was a challenging test for one of the first national EMTs to be developed in the Pacific, and it provides evidence that national teams like TEMAT are capable of independent, self-sufficient response to emergencies within their borders.[12] TEMAT's deployment, like all EMT deployments, provides opportunities for learning and continuous improvement, and Tonga's Ministry of Health and TEMAT members are committed to building on the lessons from the challenging yet rewarding deployment to Ha'apai in response to this large and complex disaster in January 2022.

Conflicts of interest

STC is an associate editor of the Western Pacific Surveillance and Response journal. He was not involved in the editorial decision to publish this article. The other authors have no conflicts of interest to declare.

Ethics statement

The preparation of this article was conducted in accordance with the ethical principles of respect for persons, beneficence and non-maleficence. The authors have made every effort to ensure its integrity

and transparency and to minimize any potential risks to participants.

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The roles of emergency medical teams in response to Samoa's 2019 measles outbreak

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Problem: On 15 November 2019, Samoa's Government declared a state of emergency in response to a rapidly worsening measles outbreak. The outbreak overwhelmed Samoa's health system, necessitating international assistance, including from emergency medical teams (EMTs).

Context: Measles spread globally throughout 2019, with cases rising by more than 300% in the first quarter of 2019, as compared with 2018. Given Samoa's low immunization coverage with a measles-containing vaccine at the time, at 40% for the first dose and 28% for the second, the country was soon overwhelmed with measles cases, hospitalizations and deaths.

Action: Following a request for international assistance, 18 EMTs from around the world deployed to Samoa, bringing more than 550 additional clinical, public health and logistics personnel to the country's measles response. Working alongside Samoan health workers, EMTs provided critical surge assistance in clinical management, vaccination, surveillance, infection prevention and control, risk communication and community engagement, and mental health and psychosocial support.

Outcome: A total of 1867 hospitalized measles patients were treated from 30 September 2019 to 13 January 2020, with 83 measles-related deaths recorded. EMTs provided essential surge support across Samoa's health system during the most acute phase of the response, helping to care for the ill and control the outbreak.

Discussion: Samoa's measles response triggered a large-scale and unique EMT activation, with teams integrated into Samoa's hospitals and health centres. The response demonstrated the critical role that EMTs can play in outbreak response and the importance of strong coordination to ensure optimal use of international clinical surge support by a health system in crisis.

PROBLEM

On 15 November 2019, Samoa's Government declared a state of emergency in response to a rapidly worsening measles outbreak, which had initially been declared on 16 October 2019.[1] Years of suboptimal coverage of routine immunizations, fuelled in part by both local and international antivaccine campaigners, were compounded by the deaths of two young children following immunization with incorrectly reconstituted vaccines. These deaths and the associated lack of public trust in Samoa's vaccine programme led to an 8-month suspension of the national immunization programme and contributed to historically low coverage rates, with only 40% coverage of the first dose of measles-containing vaccine (MCV1) and 28% of MCV2.[2–4] These factors, alongside global and regional increases in measles transmission and reintroduction to Samoa, contributed to the ensuing outbreak and the increased hospitalizations and deaths, overwhelming Samoa's health system.

CONTEXT

Measles spread around the world throughout 2019, with global cases rising by more than 300% in the first quarter of 2019, as compared with 2018.[5] Significant transmission in the World Health Organization's Western Pacific Region was observed throughout 2019.[6]

Samoa is an independent island nation in the South Pacific, with a population of approximately 200 000 cared for by one tertiary hospital on the main island of

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Upolu, a referral hospital on the second island of Savai'i, six district hospitals, and a health workforce that includes 98 registered physicians (34 of whom are in private practice), 352 registered nurses, 72 registered midwives, 85 enrolled nurses and 68 allied health professionals.[7,8] During the 2020–2021 fiscal year, Samoa's national referral hospital, Tupua Tamasese Meaole (TTM) Hospital (located on Upolu), provided 38 700 outpatient consultations and admitted 1422 patients.[8]

Following the introduction of measles into Samoa in late September 2019, a large-scale outbreak ensued, leading to more than 5700 reported cases (only initial cases were confirmed by laboratory testing, with subsequent cases recorded based on clinical diagnosis) (**Fig. 1**).[2,7] Samoa's measles outbreak led to a massive surge in paediatric hospitalizations – approximately equivalent to Samoa's total annual number of hospital admissions occurring from 30 September 2019 to 13 January 2020 – overwhelming national health-care capacity and particularly the country's sole intensive care unit, which had only six beds, necessitating significant clinical surge support.

ACTION

In November 2019, recognizing its limited capacity to manage the surge in measles cases, Samoa's Ministry of Health (MOH) sought support from the Government of Australia. This led to the deployment of the Australian Medical Assistance Team (AUSMAT), an international emergency medical team (EMT) classified (i.e. having undergone peer verification against global standards) by the World Health Organization (WHO).[9] AUSMAT deployed a multidisciplinary team to support Samoa's measles response, working alongside Samoan health professionals at TTM Hospital to rapidly expand capacities for paediatric critical and emergency care, support clinical coordination, ensure continuity of essential services and provide surge capacities for epidemiology and health informatics. AUSMAT deployed specialized clinicians, tents and equipment to establish 28 additional critical care beds, doubling Samoa's critical care capacity and creating a dedicated tented high-dependency step-down unit.

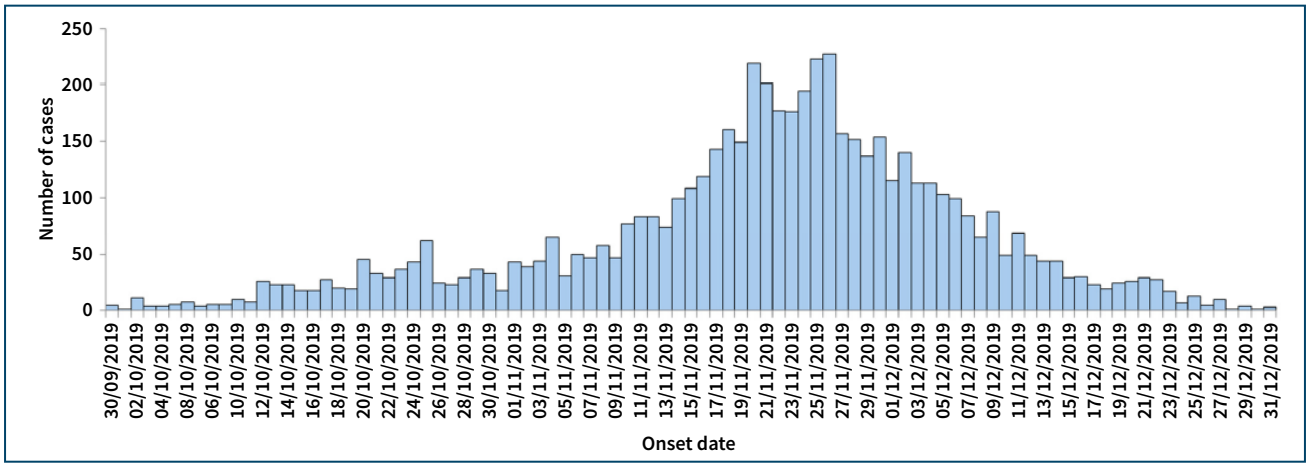
AUSMAT's deployment was soon followed by the New Zealand Medical Assistance Team (NZMAT). NZMAT initially provided clinical medical and nursing support to Leulumoega District Hospital, then supported an expanded second rotation of personnel at Samoa's Health Emergency Operations Centre as well as primary care services.

Samoa's MOH established an EMT Coordination Cell within its Health Emergency Operations Centre, which was jointly led by personnel from the Ministry and WHO, with embedded support from NZMAT. On 27 November 2019, as measles cases and hospitalizations surged, Samoa's MOH sought support from WHO to mobilize a larger-scale international EMT response. The WHO global EMT Secretariat published a call for international EMTs on 27 November 2019, requesting specialist teams that were already classified or in the process of completing WHO EMT classification, and which could work in support of Samoa's national health system. The call requested EMTs with specialist capacity in intensive care, paediatrics, maternal health, emergency medicine, mental health and psychosocial support, infectious diseases, rehabilitation and outpatient care. Teams were asked to submit written offers of support via WHO confirming their compliance with EMT principles and standards as outlined in *Classification and minimum standards for emergency medical teams* (known as the EMT Blue Book),[10] their ability to work in English and to be accountable to the local population and the MOH, to be fully self-sufficient and able to manage their own logistical arrangements, and their commitment to a deployment period of at least 4 weeks.

The call for international EMT support received swift and extensive responses. Within days, international EMT deployments had been offered and accepted by Samoa's Government, and teams began arriving in Samoa. EMTs arrived from Australia, French Polynesia (France), Hawai'i (United States of America), Israel, Japan, Kiribati, New Zealand, Norway, Papua New Guinea, Solomon Islands and the United Kingdom of Great Britain and Northern Ireland. Several additional teams were deployed by nongovernmental organizations (NGOs) including the Adventist Development and Relief Agency, Doctors without Borders, New Zealand's Pasifika Medical Association, Save the Children and Samoan Doctors Worldwide. A specialized midwifery team was also mobilized by the United Nations Population Fund (UNFPA).

All EMTs worked within Samoa's health system, and the EMT Coordination Cell was the primary interface

Fig. 1. **No. of reported measles cases, by onset date, Samoa, 30 September–31 December 2019**



Source: Reproduced with permission from the Ministry of Health, Samoa.

among incoming teams, the MOH and the Ministry of Foreign Affairs. The EMT Coordination Cell facilitated the acceptance, arrival logistics, clinical tasking and licencing of international EMTs. Every EMT health worker who deployed to Samoa was issued a temporary practice certificate by relevant departments in the MOH and the Samoa Council of Nursing and Midwifery, facilitated by the EMT Coordination Cell.

Clinical coordination of EMTs was led by the MOH with support from AUSMAT, NZMAT and WHO. A table summarizing the EMTs that were operational in Samoa, those whose arrival was pending and departing teams was presented in the daily Health Emergency Operations Centre meeting, enabling strategic planning and decision-making. More than 550 personnel from 18 EMTs were deployed throughout the response, including 294 nurses, 156 physicians, 29 logisticians, 23 midwives and 18 allied health professionals, among other technical, public health and support personnel (**Table 1**). TTM Hospital's Acting Director of Nursing was appointed as the primary clinical liaison at the hospital, integrating EMT clinicians into hospital rotations and coordinating rosters. Collaboration between TTM Hospital's senior clinicians, specialists from international EMTs and WHO advisers facilitated rapid establishment and revision of national clinical protocols in response to the evolving outbreak.

Most EMTs supported the specialist clinical management of infants and children hospitalized with measles. Pasifika Medical Association's Medical Assistance Team (PACMAT) brought specialist capacity in mental health and psychosocial support, including psychiatrists, psychologists and mental health nurses who aided families affected by measles, staff at the MOH and EMT members who were caring for the many sick children. Several EMTs also brought clinicians with local cultural understanding, deploying multiple team members from Samoa's large diaspora community in New Zealand, in particular. Several teams also deployed specialized allied health professionals, including physiotherapists with respiratory expertise and biomedical technicians. EMTs also brought critical equipment, including mechanical ventilators, and supported essential maintenance and logistics related to oxygen provision across hospitals.

In addition to EMTs, other partners including WHO, the United Nations Children's Fund (UNICEF), the Samoa Red Cross, New Zealand Red Cross and the International Federation of the Red Cross and Red Crescent Societies supported a national vaccination campaign. This campaign included a 2-day national lockdown, with hundreds of local and international health workers travelling across the country in more than 100 integrated mobile teams to vaccinate nearly every Samoan in their home, which ultimately contributed to reduced transmission and the eventual scaling down of EMT operations as hospital admissions declined.[11]

OUTCOMES

Working alongside Samoan health workers, EMTs and other international partners provided critical surge support for case isolation, clinical management, vaccination,

Table 1. **Emergency medical teams deployed to Samoa to assist with a measles outbreak, in order of arrival, 2019**

Order of arrival	Team	Country of origin	Period of deployment to Samoa	Number of deployed personnel	Scope of engagement
1	Australia Medical Assistance Team[a]	Australia	9 November 2019–5 January 2020	>110	Emergency medicine, intensive care medicine, high-dependency paediatrics, infectious diseases, radiology, laboratory specialist assistance, in addition to technical support for water, sanitation, oxygen, biomedical systems, epidemiology and surveillance, health informatics, vaccine data management
2	New Zealand Medical Assistance Team[a]	New Zealand	19 November–20 December 2019	40	Emergency medicine, intensive care medicine, paediatrics, nursing, midwifery and biomedical systems
3	Counties Manukau Health	New Zealand	20 November–18 December 2019	60	Intensive care and vaccination
4	New Zealand Red Cross	New Zealand	24 November 2019–1 February 2020	41	Nursing support for surgery, paediatrics, obstetrics and vaccination
5	Doctors without Borders	Australia and France	30 November–16 December 2019	3	Mobile clinical support for district hospitals; support for the development of clinical management protocols
6	French Polynesia Emergency Medical Team	French Polynesia	30 November–8 December 2019	13	Paediatrics and vaccination support
7	Pasifika Medical Association Medical Assistance Team	New Zealand	2 December 2019–26 January 2020	62	Emergency medicine, intensive care medicine, mental health care, psychosocial support and vaccination support
8	Japan Disaster Relief Infectious Diseases Response Team[a]	Japan	4–28 December 2019	15	Infectious diseases, paediatrics, and hospital and health centre support
9	Hawai'i Health Corps	United States	5–20 December 2019	70	Vaccination support, intensive care medicine
10	Norway emergency medical team[a]	Norway	7 December 2019–1 January 2020	20	Intensive care, anaesthesia and paramedicine support
11	Save the Children	United Kingdom	7 December 2019–11 January 2020	10	Reproductive and family health care
12	United Kingdom Emergency Medical Team[a]	United Kingdom	7–29 December 2019	31	Intensive care, paediatrics and physiotherapy support
13	Adventist Development and Relief Agency[b]	Australia and New Zealand	9–21 December 2019	7	Intensive care nursing
14	Israel emergency medical team[a]	Israel	9–21 December 2019	11	Intensive care medicine, paediatrics
15	Pacific Community, Kiribati and Solomon Islands teams	Kiribati and Solomon Islands	10–23 December 2019	4	Emergency medicine
16	United Nations Population Fund midwifery team	United Nations Population Fund Pacific Island Countries	18 December 2019–28 February 2020	10	Reproductive health care and family planning support
17	Papua New Guinea emergency medical team	Papua New Guinea	23 December 2019–18 January 2020	12	Nursing support for surgery, immunization, and antenatal and paediatric critical care
18	Samoan Doctors Worldwide	New Zealand	22 December 2019–29 March 2020	38	Surgery, paediatrics, intensive care medicine and family medicine support

[a] These are WHO-classified emergency medical teams.

[b] The Adventist Development and Relief Agency had a presence in Samoa prior to the 2019 measles outbreak.

epidemiology and surveillance, infection prevention and control, risk communication and community engagement, and mental health and psychosocial support for health workers and affected populations, as well as emergency logistics, nearly doubling the clinical workforce in Samoa's referral hospital during the most acute phase of the outbreak.

A total of 1867 patients with measles were hospitalized and 83 deaths from measles were recorded. Children aged <5 years accounted for 2966/5707 (51.9%) cases, 1277/1867 (68.4%) hospitalizations and 73/83 (87.9%) deaths. Most cases, 5332 of 5707 (93.4%), were reported from Samoa's main island of Upolu. The measles response required an additional 150 inpatient beds at TTM Hospital above the normal bed capacity of 200. At its peak in December 2019, measles cases occupied approximately 185 hospital beds, and there were as many as 21 admissions to intensive care in a single day – more than three times the normal ICU capacity at the hospital.

EMTs helped to expand isolation capacity, supported specialist clinical management and provided essential clinical surge capacity to an overwhelmed health system during the peak of the crisis. In addition to the extensive support provided by international EMTs at TTM Hospital, teams also supported Samoa's district hospitals and outpatient and primary care facilities. Many teams went beyond direct service delivery to support the overall response by providing training and through skills transfer, and by coordinating support and bolstering critical elements of the response, such as equipment maintenance, oxygen and supply logistics, and information management.

The national vaccination campaign resulted in more than 187 360 children and adults being vaccinated with a measles-containing vaccine in only a few weeks, achieving national vaccination coverage of more than 95%.[12,13]

Although significantly assisted by international EMTs, the measles response in Samoa was locally led, applying an integrated and unified approach to clinical management across the country's hospitals and health centres, while leveraging enormous contributions across a wide range of clinical and public health expertise and capabilities from international EMTs, NGOs and other partners.

DISCUSSION

Samoa's measles response was the largest EMT mobilization in the Western Pacific Region in 2019. It was a unique EMT activation that included large-scale integration of multiple teams into a small number of hospitals and health centres in the context of an outbreak in a small Pacific island country.

Large-scale EMT mobilizations in 2014 and 2015 were part of the response to outbreaks of Ebola virus disease in West Africa, but these largely led to the establishment of stand-alone Ebola isolation centres. EMTs have also deployed in response to outbreaks of diseases such as cholera, dengue, diphtheria and coronavirus disease (COVID-19).

The response to the 2019 measles outbreak in Samoa demonstrated the potential of EMTs to contribute to such responses and the importance of strong national leadership and coordination to ensure that EMTs are used optimally in support of a national health system in crisis. The activation of EMTs in response to outbreaks has highlighted the need for strengthened mechanisms and standards for these types of deployments; a technical working group on EMT engagement during outbreaks of highly infectious diseases was subsequently formed by WHO's EMT Secretariat to establish minimum technical and operational standards for these types of response operations.

Integrating EMTs from many different countries – with different ways of working, language abilities, shift patterns, skills, scopes of practice and expectations around care – into a small Pacific island health system proved challenging. Several key enabling factors identified by Samoa's MOH and the EMT Coordination Cell included:

- the rapid deployment mechanism of the global EMT network that was highly effective in mobilizing capable, self-sufficient teams of specialists within days, with some teams travelling across the globe;
- the EMT Coordination Cell's rapid facilitation of the request for assistance, acceptance of EMTs, EMT deployment, and EMT integration into Samoa's clinical operations in a short time;

- the adaptation of the EMT Coordination Cell's methodology, particularly in integrating EMTs into local health facilities and adapting reporting approaches to ensure that response actions were locally appropriate and responsive to the country's needs;

- the dedicated Samoan and international emergency coordination and clinical expertise within the EMT Coordination Cell to facilitate strategic planning for the response and day-to-day operational and clinical management;

- the pairing of international EMT personnel with Samoan clinicians to facilitate the rapid onboarding, orientation and integration of many foreign clinicians; and

- the codesign and rapid communication of measles clinical management guidelines by the MOH and supporting EMTs to strengthen effective patient management and facilitate the joint work of EMTs and the Samoan health workforce.

Specific challenges related to the EMT activation and how they were addressed included the following:

- the majority of teams deployed to Samoa were not WHO-classified EMTs, and some were unfamiliar with EMT methodology and thus needed to adapt in real time;

- many EMTs were not specifically designed and trained for outbreak response and had to mobilize additional team members, equipment and supplies that they would not typically deploy, and they had to work in ways that differed from their typical deployments. Expanding EMT rosters to include a wider range of specialists, and developing training and EMT cache (equipment/supplies) to respond to outbreaks may be beneficial to future deployments;

- most EMTs are designed to operate their own field hospitals or stand-alone tented clinics, yet the response in Samoa required that they operate within the country's established hospitals and health centres, necessitating adaptation of some teams' standard operating procedures;

- the standard EMT minimum data set collection system and forms were not optimal, as nearly all affected patients were treated in Samoan hospitals and health centres, rather than in stand-alone EMT field hospitals. Instead of employing the standard EMT reporting mechanisms, each team provided brief updates during regular EMT Coordination Cell meetings and shared detailed exit reports at the end of their deployments. Daily communication was maintained between the EMT Coordination Cell and EMTs through messenger applications and email. These mechanisms were helpful in addressing challenges as they arose and did not create an excessive reporting burden on EMTs; however, they limited the quality and completeness of the data collected. WHO's EMT Secretariat and the global EMT network should consider how clinical activity reporting can be optimized in integrated deployment settings such as this one;

- the large number of incoming teams and personnel within a short time span posed challenges, particularly for Samoan clinical leaders, in terms of integrating them into an already overwhelmed health system. The EMT Coordination Cell adopted a number of strategies, including semistructured induction briefings, coordination through messenger groups and consolidation of mini-biographies of incoming team members to help smooth this process. EMTs were specifically asked to follow the guidance and direction of Samoa's clinical coordination personnel to avoid confusion or conflict, and this was largely respected by the deployed personnel; and

- some EMT personnel had limited English fluency, which was required for effective clinical practice in Samoa.

Building on lessons learned from the 2019 measles outbreak and the subsequent COVID-19 pandemic response, Samoa's MOH formally launched its own national EMT in 2022: the Samoa Emergency Medical Assistance Team, or SEMAT.[14] SEMAT will contribute to Samoa being better prepared to respond to health emergencies in the future with its own deployable clinical surge capacity. SEMAT is one of many Pacific nation EMTs

established in recent years, emphasizing the growing recognition of the importance of deployable, resourced, trained and coordinated teams to provide clinical surge capacity for the wide range of hazards facing Pacific island countries and areas.[15]

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Conflicts of interest

STC is an associate editor of the *Western Pacific Surveillance and Response* journal. He was not involved in the editorial decision to publish this article. The other authors have no conflicts of interest to declare.

Ethics statement

Ethical clearance was not required because this report used routinely available data, and no personal identifying information was collected.

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Equipping Pacific emergency medical teams for self-sufficient health emergency response in remote and resource-limited island settings

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Problem: Pacific island countries and areas represent some of the most disaster-vulnerable locations in the world, facing a range of natural and infectious hazards along with incredibly challenging logistics and limited human resource pools.

Context: The World Health Organization supports the development of emergency medical teams across the Western Pacific Region. Since 2021, one aspect of this support has been supplying health emergency response equipment called cache kits for these unique island contexts. This report describes the process of designing and implementing standardized cache kits for these teams.

Action: Emergency medical team cache kits were designed and sourced using a semi-structured six-step approach: 1) problem identification and review of existing literature; 2) targeted key informant interviews and stakeholder consultations; 3) the alignment of cache with the goals and objectives of the teams' operations; 4) creation of the kits; 5) local and international procurement of selected items; and 6) monitoring of the delivery of cache to destination countries.

Outcome: The Organization procured specialized cache kits for 12 teams across the Pacific subregion. They comprise portable, durable, lightweight equipment that enables teams to deliver high-quality emergency medical care in remote and resource-limited island contexts.

Discussion: The Organization's centralized procurement of the cache kits in the Pacific aimed to facilitate nationally led health emergency responses, enhance team interoperability in the subregion, and ensure access to high-quality equipment in resource-constrained locations. The model established in the Pacific could serve as a blueprint for national emergency medical teams in low- and middle-income countries globally.

PROBLEM

Pacific island countries and areas (PICs) represent some of the most logistically challenging locations, with thousands of remote islands spread over millions of square kilometres (km^2) of ocean territory. For instance, the Federated States of Micronesia (FSM) encompasses 607 islands dispersed over an extensive maritime area of nearly 3 million km^2, comparable in size to India, despite its land area being only 702 km^2 (or 0.02%).[1]

Earthquakes, landslides, volcanic eruptions, storm surges, floods, cyclones/hurricanes/typhoons and tsunamis cause extensive damage, lead to injuries and deaths, aggravate the risks and intensity of diseases, and negatively impact access to health-care facilities.[2] While some PICs have areas of high population density, many comprise dozens or hundreds of islands spread over massive distances, with the outer islands often contending with a lack of physical infrastructure, limited transport connections, and suboptimal communication and power networks. Routine logistical challenges are frequently compounded in disasters, causing system disruptions and an interactivity of deleterious factors, accelerating the rate at which a disaster may escalate.[3] Infrastructure damage, reduced transport connections, communication and power network disruptions,

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physical damage to health-care facilities and population displacements are only a few examples making response operations complex and presenting a range of challenges in the provision of timely medical assistance to affected populations. With improvements in the understanding of disaster relief, emergency logistics has become a key aspect in increasing the efficiency of relief and the alleviation of disaster impacts.[3]

CONTEXT

The World Health Organization (WHO) Emergency Medical Team (EMT) Initiative, launched in 2010 following the Haiti earthquake, aims to enhance the development and deployment of medical teams to respond to public health emergencies and disasters.[4] EMTs consist of trained local health professionals such as doctors, nurses and paramedics who can deploy and provide essential medical care in the immediate aftermath of a crisis, supported by logisticians and emergency management professionals.[4]

Since 2017, WHO and its partners have supported the development of EMTs across 13 PICs. These include one internationally classified EMT, the Fiji Emergency Medical Assistance Team (FEMAT), as well as 12 national EMTs in Cook Islands, FSM, Kiribati, the Marshall Islands, the Commonwealth of the Northern Mariana Islands, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu (**Fig. 1**).[5–11] In January 2021, the WHO Regional Office for the Western Pacific embarked on a research and consultation process with experts to determine the optimal equipment and supplies (known as the "EMT cache") for EMTs in the Western Pacific Region. This initiative was guided by the *Classification and minimum standards for emergency medical teams* (also referred to as the Blue Book), and took into account the unique operational context in the Region.[4] Cache kits are pre-assembled and pre-packed (commonly referred to as "kitted") by teams in-country, and stored locally in backpacks and cargo boxes for rapid identification, pickup and deployment. These kits are prepared according to a team's scope of work and expected interventions in the field. Through this process, the Regional Office designed kits, and procured and delivered supplies to EMTs across the Pacific.[4,9–12]

This paper highlights actions taken to support EMTs in small island/large ocean states in the Pacific to enhance their health emergency response capabilities by identifying and sourcing appropriate equipment to enable teams to deploy swiftly and provide quality medical care to affected populations.

ACTION

The design, development and procurement of a standardized EMT cache kit for Pacific EMTs followed a semi-structured six-step approach.

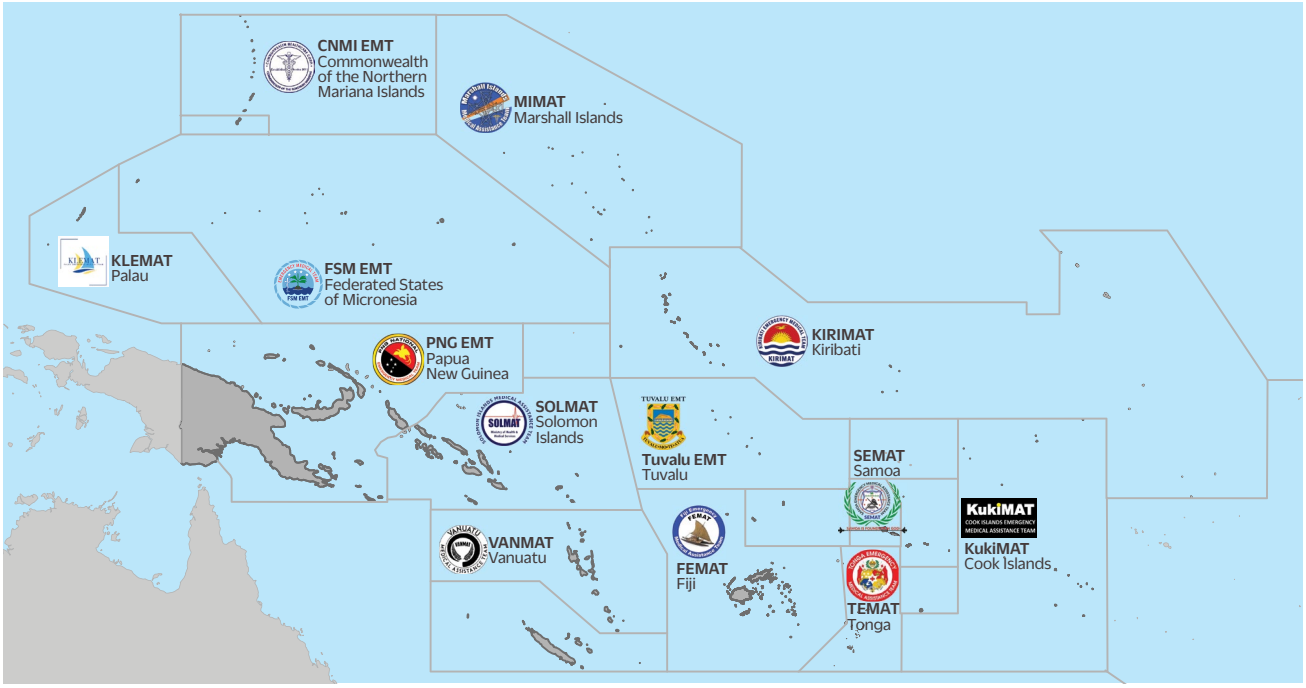
Step 1: Problem identification and literature review

Before developing a tailored cache kit for Pacific EMTs, no standardized equipment list existed for national teams. The Regional Office launched the process by identifying key deployment challenges, analysing after-action reviews (AARs) from past responses and assessing international EMT standards. A literature review of EMT disaster deployments since the 2010 Haiti earthquake was conducted to further refine field equipment needs.[9,13,14]

Step 2: Targeted expert interviews and stakeholder consultation

Semi-structured key informant discussions were held with logistics, medical, and water, sanitation and hygiene (WASH) experts with relevant Pacific EMT deployment experience. These discussions explored past challenges, the use of specific equipment in remote island settings and lessons from previous responses. Consent was obtained to use insights from these interviews for this article. Experts from existing EMTs were consulted, including the Australian Medical Assistance Team (AUSMAT), the Fiji Emergency Medical Assistance Team (FEMAT), the New Zealand Medical Assistance Team (NZMAT), the Solomon Islands Medical Assistance Team (SOLMAT), the Vanuatu Medical Assistance Team (VANMAT), Team Rubicon based in United States of America and other subject matter experts throughout the EMT global network. The process considered the numerous EMT operational support requirements, including medical services, staff living quarters, site power, radio and

Fig. 1. **Pacific island countries and areas receiving tailored emergency medical team cache kits, 2021–2022**



CNMI: Commonwealth of the Northern Mariana Islands; EMT: emergency medical team; FEMAT: Fiji Emergency Medical Assistance Team; FSM: Federated States of Micronesia; KIRIMAT: Kiribati Medical Assistance Team; KLEMAT: Palau EMT; KukiMAT: Cook Islands Medical Assistance Team; MIMAT: Marshall Islands Medical Assistance Team; PNG: Papua New Guinea; SEMAT: Samoa Emergency Medical Assistance Team; SOLMAT: Solomon Islands Medical Assistance Team; TEMAT: Tonga Emergency Medical Assistance Team; VANMAT: Vanuatu Medical Assistance Team.

Source: Based on Casey et al.[10]

satellite communications, food preparation, safety and security, and WASH for both the team and patients in the health-care setting.

Step 3: Goals and objectives of EMT cache kit

Following the outlined steps, the Regional Office defined the EMT cache kit's goal: a self-sufficient, fully equipped kit enabling teams to deliver high-quality emergency and clinical care for at least 3 days with minimal or no footprint on local resources.

Step 4: EMT cache kit list creation

Understanding the lifecycle of emergency deployment was key to developing Pacific-tailored EMT cache kits, focusing on surveillance, on-the-ground tasking, monitoring, demobilization and preparation for re-tasking. To streamline this process, EMT activities were grouped into three main categories: logistics support, medical care delivery and WASH management, each covering key aspects of crisis response. Defining these categories helped structure the organization of supplies and equipment within the cache kits, frequently relying on Sphere guidelines.[13] A systematic approach ensured each category was further divided into subcategories, detailing specific activities, supplies and required quantities for EMT deployments.

Step 5: EMT cache kit procurement

Supplies were researched based on strict specifications to ensure durability and sustainability. Suppliers were vetted through a global call for offers, requiring proof that all items met durability, sustainability and minimum quality standards.

Step 6: Monitoring cache delivery and EMT feedback

A dedicated tracking system was developed to monitor and record each shipment and the delivery status of the cache items across the Region.

OUTCOMES

This section outlines the key challenges, solutions, and their impact on strengthening EMT response capabilities in the Pacific for each of the above steps.

Step 1: Problem identification and literature review

Understanding the challenges of disaster deployments in the Pacific was the first step in shaping a relevant equipment and supply list for national EMTs. Key insights from AARs informed the development and procurement of EMT cache kits, highlighting the following themes:

- sea transport is difficult to organize and coordinate, and is often the *de facto* option for reaching remote islands;
- navigating open water on small vessels is dangerous;
- delays occur due to a lack of pre-planning and pre-packaging of EMT (kitted) cache;
- securing temporary accommodation for deployed teams in remote areas can be difficult;
- accessing fresh and nutritious food for the team not only burdens afflicted local markets further but also proves challenging in devastated areas;
- communication failures between deployed teams and the Health Emergency Operating Centre occur due to the absence of adequate, functional equipment, such as very high frequency radios or basic satellite communication devices;
- ensuring fuel and power availability is a persistent issue;
- high humidity and salt exposure accelerate wear and tear, causing medical devices, radios and power systems to fail during deployment;
- mosquitoes and other vectors thrive in tropical environments, rapidly increasing malaria, dengue and leptospirosis risks for both teams and patients; and
- medical waste disposal is challenging on remote islands, creating biohazard risks and contamination if not properly managed.

Published literature on EMT logistics is scarce. At present, no common or baseline standard kit exists for EMTs, either globally or in specific contexts, such as tropical islands or extreme cold conditions. During the cache kit development process, the Blue Book's international EMT standards were a key reference, focusing on Type 1 Mobile (T1M) teams – the lightest and most agile EMT configuration – due to their adaptability for remote deployments.

Step 2: Targeted expert interviews and stakeholder consultation

Expert discussions underscored the critical need for timely supply delivery, highlighting procurement and transport as major challenges following a sudden-onset disaster. In the Pacific, transitioning from a fixed to a mobile operational model proved the most effective strategy. Overcoming transport obstacles requires mapping in advance of all available resources, including military, law enforcement and private assets such as fishing boats. Experts also emphasized that T1M EMTs should not be confined to a single site – they should be able to cover multiple villages or islands, especially after floods or storms when communities are displaced, and health facilities are inoperable.

Step 3: Goals and objectives of EMT cache kit

The EMT cache kit was designed to enable national EMTs in PICs to deploy rapidly with minimal logistical burden. Research and planning ensured the kit remained light, mobile and optimized for small aircraft or sea vessel transport to reach remote and vulnerable populations. The WHO team built the cache kit around several key design principles:

- the cache is built to meet T1M EMT requirements, ensuring teams have the necessary tools for rapid deployment;
- all equipment and supplies adhere to EMT Blue Book standards but are tailored for national, rather than international, deployments;
- medical consumables and pharmaceuticals are excluded, requiring national EMTs to source their own supplies based on country-specific needs;
- each kit supports a fully autonomous 3-day deployment without reliance on external resupply;
- the setup is designed for a four- to six-member team, including one doctor, three nurses, one team leader and one logistician;

- all supplies are built for durability, capable of withstanding multiple deployments in high humidity and saltwater conditions; and
- weight and size are optimized for transport by small aircraft and sea vessels with limited cargo capacity.

Step 4: EMT cache kit list creation

The curated Pacific EMT cache kits feature portable, durable and light equipment, built to withstand several deployments before requiring significant maintenance or replacement. A detailed breakdown of the EMT cache specifications for a four-member team (typically one doctor, two nurses and one logistician) is provided in **Table 1**. Excluding pharmaceuticals, medical consumables and food, a cache kit contains 135 items, weighs approximately half a tonne and is fully scalable and modular, meaning cache kits can be aggregated if a response requires scaling up. It is divided into three categories of supplies: mobile clinic, logistics and operations, and WASH. Of the total, 58% fall under logistics and operations, 23% under medical and 19% under WASH – underscoring the practical realities and self-sufficiency required for remote island deployments.

The mobile clinic category includes a light tent and packable tables, chairs, stretchers and patient cots, along with essential medical equipment such as a point-of-care glucometer, ultrasound machine, autoclave and automatic external defibrillator. The logistics and operations category includes a personal deployment kit for each team member, along with base camp supplies for daily living needs, a camp kitchen, communication devices and a mobile office to coordinate operations in the field. The WASH category ensures sanitation, hygiene and water safety, providing washroom facilities, vector control, a temporary morgue, and equipment for water testing, treatment, control and storage. In some remote island locations with limited freshwater sources, a hand-operated desalination unit was included in the cache.[13]

Step 5: EMT cache kit procurement

The Regional Office procured cache kits for 12 EMTs across the Pacific in 2021–2022, adopting a bulk procurement strategy after consultations with Pacific partners. Global suppliers were contracted to source and deliver the equipment directly to each country to streamline logistics and reduce costs.

Step 6: Monitoring cache delivery and EMT feedback

A cargo tracking system fed a dashboard visualizing the deployments' progress by country, indicating the estimated arrival times, shipping references and volume measurements of each shipment. This allowed the teams to coordinate customs clearance and secure proper storage upon arrival. WHO continues to evaluate EMT feedback and best practices, focusing on equipment effectiveness and cache readiness to refine future deployments.

DISCUSSION

With an improved understanding of disaster relief, emergency logistics has become a key component in improving relief efficiency and alleviating disaster impacts.[14,15] Despite this progress, PICs often face severe gaps in equipment availability, supply chain resilience and operational readiness. The EMT cache kit initiative addressed these challenges by providing standardized, quality medical equipment to national response teams and ensured better preparedness in resource-limited settings. Beyond improving access, this approach also strengthened regional interoperability, an objective aligned with the EMT 2030 Strategy.[16] Effective implementation is ensured by the participation of Pacific EMTs in dedicated training sessions and hands-on exercises, enabling them to develop operational familiarity and practice using their new equipment in real-world conditions.[17,18]

Although the process strengthened cache availability for national EMTs in the Pacific, it also revealed several important limitations. First, while the cache kit design drew heavily on key informant interviews with EMT logisticians and clinicians who had direct deployment experience across the Pacific, the study did not include structured field testing or follow-up user evaluations post-deployment. As such, the long-term appropriateness of the kitting approach, as experienced by teams after delivery, remains an area for further research. Furthermore, the study did not include

Table 1. Illustrative contents of an emergency medical team cache kit to support a four-member team for **3 days of self-sufficiency**

Category	Subcategory	Item	Quantity
Medical	Mobile clinic	Medical backpacks	3
		Tent, 16 m^2	1
		Foldable table	2
		Foldable chair	2
		Foldable, portable stretcher made of water-resistant, nonwoven material	3
		Foldable patient cot	4
		Tarpaulin, 4 m x 5 m (privacy screen)	2
	Medical equipment	Narcotic lockbox	1
		Slap-on triage bands (multiple colours)	50
		Vaccine carrier	2
		Tourniquet	10
		Blood pressure cuff (adult)	4
		Blood pressure cuff (paediatric)	4
		Pulse oximeter (adult)	4
		Pulse oximeter (paediatric)	4
		Otoscope	1
		Ophthalmoscope	1
		Spare batteries for otoscope-ophthalmoscope	8
		POC glucometer	2
		Glucometer test strips (pack of 50)	4
		Safety lancets (box of 200)	2
		POC haemoglobin machine	1
		POC haemoglobin testing strips (pack of 50)	2
		Timer (for lab management)	2
		Handheld ultrasound machine	1
		Ultrasound gel, 250 mL	2
		Autoclave	1
		Automatic external defibrillator	1
		Trauma shears	8
		Sharps container	4
		Plastic cups for patient use (pack of 100)	1
Logistics	Personal deployment kit	Backpack, 75 L, with rain cover	4
		Dry bag, 35 L, for large items such as clothing	4
		Dry bag, 5 L, for personal effects such as phone or wallet	4
		Rain poncho	4
		Inflatable sleeping pad	4
		Inflatable camping pillow	4
		Sleeping bag or sleeping sheet adapted to local temperatures	4

Category	Subcategory	Item	Quantity
Logistics	Personal deployment kit	Lightweight travel camping sheet	4
		USB rechargeable headlamp	4
		Camping personal towel (pack towel)	4
		Water filter bottle	4
		Hand sanitizer 70%, min 200 mL	4
		Ultralight folding chair	4
		Knife with can opener	4
		Waterproof solar power bank	4
		Mess kit with mug and spork	4
		Waterproof notepad with pen	4
		Ultralight, water-resistent personal medical kit	4
		High-visibility vest	4
		Clear safety glasses	4
		Safety whistle	4
		Earplugs (pair)	8
		Safety work gloves (pair)	4
		Zipper-closure plastic bag (for toilet paper)	4
		Sunblock, SPF 50	4
		Personal flotation device, up to 95 kg	4
		EMT sun hat	4
		EMT t-shirt and trousers (set)	16
	Base camp	Small ABC fire extinguisher	1
		Tent, 16 m^2	1
		Waterproof tent, 42 m^2 (voluminous and heavy; its deployment is pending on the severity of the situation and available transportation options)	1
		Fence stake (camp perimeter and patient flow), pack of 50	1
		Parachute cord roll, 4-mm outdoor binding rope, length 100 m (camp perimeter and patient flow)	2
		Machete	1
		Axe	1
		Folding saw (wood)	1
		Extra-strong steel tent peg, minimum length 25 cm	20
		Car DC-to-AC inverter, minimum 500 W	1
		Universal plug adapter with USB	3
		Outdoor extension cord, minimum length 6 m	2
		Power strip, surge protector with 6 universal outlets	2
		Gasoline 1 kVA generator/inverter	2
		International Air Transport Association-compliant fuel tank, 20 L	4
		Foldable shovel	1
		200-piece toolbox	1
		Heavy duty zip ties (pack of 200)	2

Category	Subcategory	Item	Quantity
Logistics	Base camp	Portable lamp with cord and hang-up hook	2
		Solar light	2
		Space light bulb, 100 W	2
		Two-person tent	4
		Reflective guyline tent rope, diameter 3–5 mm, length 15 m	15
		Portable shower and toilet pop-up tent	4
		Team first aid kit	1
		Duct tape, large	4
		Water-resistant fabric patch (tent, mattress, pillow repair)	1
		Heavy-duty, water-resistant case, 60 L	8
	Kitchen	Multi-fuel compact stove	2
		Outdoor cooking set	1
		Waterproof matches, 100-pcs pack	2
		Zipper-closure plastic bag (for food storage)	1
		Magnesium flint fire starter	1
		Ultralight kitchen set	1
		Cleaning scrub sponge	1
		Biodegradable soap, liquid	1
		Regular garbage bag, roll	1
		Fishing rod and a few accessories	1
	Communications	Handheld, portable satellite communicator enabling two-way messaging and emergency location sharing	1
		Portable satellite internet router (pending available coverage)	1
		Two-way VHF radio	4
	Office	Laptop	1
		Monochrome laser printer	1
		Toner replacement	1
		Watt voltage transformer converter with built-in regulator	1
		Pen	8
		Printing paper (pack of 500 sheets)	1
		Water-resistant accordion file organizer	4
		Letter-size clipboard	4
		Plastic sheet protector (pack of 50)	1
WASH	Patient washroom/ sanitation equipment	Telescoping tent poles	12
		Adapted bucket as a toilet	4
		Tarpaulin, 2 m x 6 m, opaque	2
		Biohazard waste disposal bags (roll of 30)	2
		Human waste treatment powder	1
		Handwashing station, ultralight, foot pump (adapted bucket)	4

Category	Subcategory	Item	Quantity
WASH	Patient washroom/ sanitation equipment	Disinfecting wipes, minimum 75 pcs	6
		Toilet paper	8
		Regular soap bar	8
	Temporary morge	Peg, 30 cm (to anchor tarpaulin)	4
		Tarpaulin, 4 m x 5 m	2
		Body bag (adult)	5
	Vector control	Bed net	6
		Insect repellent	6
	Water storage	Collapsible water container, 20 L	20
		Bucket with lid, 20 L	10
	Water testing	Free residual chlorine test strips, 50 pcs	2
		Turbidity test device	1
		pH level test device	1
	Water treatment	Hand-operated desalination unit, 4.5 L/hr	1
		Potable aqua chlorine dioxide water purification tablets, 67 mg, minimum 20 pcs per pack	6
		Gravity-fed filtration system, 4 L	10
		Team water filtration system (potable), 50 L	1
		Heavy-duty chemical-resistant gloves	1
		Handheld electrochlorinator	1
		Multipurpose bleach, 4 L	1

cm: centimetre; EMT: emergency medical team; kg: kilogram; kVA: kilovolt-ampere; L: litre; m: metre; m^2: square metre; mg: milligram; mL: millilitre; mm: millimetre; pcs: pieces; POC: point-of-care; VHF: very high frequency; W: watt; WASH: water, sanitation and hygiene.

a structured assessment of end-user perspectives regarding cache content or configuration. Future efforts could benefit from incorporating systematic feedback from deployed EMT personnel to further align kits with evolving field needs.

Second, cache maintenance and storage demand systematic planning, along with sustained financial and human resources. Replacing worn-out equipment remains a challenge, as is often the case in low- and middle-income countries (LMICs), particularly in PICs. Additionally, securing warehouse space with adequate environmental controls is difficult in many Pacific contexts, further complicating long-term cache sustainability.

Third, food for team members was excluded from the cache kits. While military-style "meals ready to eat" offer flexibility and self-sufficiency, they are costly and require strict rotation due to their limited shelf life, leading to potential waste. Instead, Pacific EMTs rely on local markets for food procurement at the time of deployment, a "just-in-time" approach that reduces storage needs but increases risk. Disrupted supply chains could make food access unreliable in a major catastrophe, delaying deployments and straining operations.

Fourth, Pacific EMTs typically lack dedicated transport and must rely on external partners, including police, fire departments, the military or private sector assets, adding a layer of uncertainty to response efforts. This dependency makes transport planning a key aspect of preparedness. Deployment logistics must align with cache weight, volume and team size to ensure rapid and efficient mobilization.

Fifth, operational preparedness in disaster response remains an underexplored area, with limited literature guiding best practices. Strengthening health emergency logistics in the Pacific requires a deeper focus on procurement, pre-deployment quality assurance, emergency transportation, communications, warehousing, infrastructure and post-deployment maintenance. Addressing these gaps will be key to

improving the speed and effectiveness of future EMT operations.

In conclusion, designing, developing and procuring cache kits for national EMTs in the Pacific provides a scalable model for other EMTs and their partners in LMICs. However, ensuring long-term impact requires further action. Sustaining cache readiness depends on ongoing training, maintenance and operational planning. Additionally, documenting and sharing EMT cache logistics experiences is essential for improving disaster response efficiency and strengthening future operations. Prioritizing these efforts will help build a more resilient emergency response system – not just in the Pacific, but worldwide.

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Conflicts of interest

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Ethics statement

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Challenges of establishing an emergency medical team in Papua New Guinea

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Problem: Papua New Guinea (PNG) is situated in the Pacific Ocean and has experienced multiple natural disasters and disease outbreaks. However, PNG lacks the ability to rapidly and systematically deploy trained personnel to provide surge capacity in response to major national disasters. It was therefore decided to establish a national emergency medical team (EMT) in PNG.

Context: PNG's responses to the 2018 earthquake in the Highlands Region and the coronavirus disease (COVID-19) pandemic required assistance from international EMTs. PNG began developing its own EMT in 2019, coinciding with the development of other Pacific EMTs.

Action: PNG's EMT project was initiated in 2019 with the creation of a technical working group. By 2021, a focal point had been identified, standard operating procedures had been drafted and training of EMT members had been completed. Pilot deployments of the national EMT members contributed to the COVID-19 response during 2021.

Outcome: Four major challenges were identified during the early phase of PNG's national EMT development: introducing the concept of EMTs in an EMT-naïve landscape; integrating the national EMT into existing PNG National Department of Health organizational structures; assembling adequate members at short notice to respond to disasters; and securing funding for deployment.

Discussion: Solutions identified for these challenges included strengthening stakeholder involvement through engagement in the development process and participation in technical working groups and consultative group discussions, offering exposure to other Pacific-based EMTs, and creating incentive schemes for EMT members and their place of employment.

Papua New Guinea (PNG) is a lower-middle income country situated in the Pacific Ocean with an estimated population of over 7 million people (according to the 2011 census).[1] Like many low- and middle-income countries (LMICs), PNG confronts challenges related to a high disease burden, low socioeconomic status and an inadequately sized health-care workforce. With only 0.7 doctors per 10 000 people, PNG's physician density is well below the average for LMICs of 8 per 10 000 people.[2,3]

Papua New Guinea has witnessed multiple disasters and infectious disease outbreaks. These include a major landslide in Simbu (1991), the Rabaul volcano eruption (1994), the Aitape tsunami (1998), a 7.8 magnitude earthquake in the New Guinea Islands (2000), cholera outbreaks (2009), measles outbreaks (2014), a poliomyelitis outbreak (2018) and the PNG Highlands earthquake (2018).[4] The health response to national disasters and epidemics has historically been organized by disaster management teams led by the PNG National Disaster Centre and comprised mainly public health personnel from the National Department of Health (NDOH), both at national and provincial levels. When PNG's front-line health service capacity was exceeded, international emergency medical teams (EMTs) were requested. Assistance from international EMTs was most recently requested during the coronavirus disease (COVID-19) pandemic and served to highlight the deficiencies in PNG's national emergency medical response provision.

Despite the frequency of these disasters and repeated requests for assistance from international EMTs, a national EMT has never been established in PNG.

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CONTEXT

After the earthquake in Haiti in 2010, the World Health Organization (WHO) launched its global EMT initiative to improve the timeliness and the standard of care offered to affected populations in the aftermath of a disaster by both national and international EMTs. This initiative was also designed to enhance national capacity to coordinate and respond to disasters.[5]

Since 2017, regional WHO teams have been assisting Pacific island countries and areas (PICs) to establish their own national EMTs and to navigate the verification process. In 2019, the Fiji Emergency Medical Assistance Team (FEMAT) was verified by WHO.[6] EMTs have also been established in the Cook Islands (KukiMAT), Kiribati (KIRIMAT), the Marshall Islands (MIMAT), the Federated States of Micronesia (FSM EMT), the Commonwealth of the Northern Mariana Islands (CNMI EMT), Palau (KLEMAT), Samoa (SEMAT), Solomon Islands (SOLMAT), Tonga (TEMAT), Tuvalu (Tuvalu EMT) and Vanuatu (VANMAT).[7]

Several newly established Pacific EMTs have responded to incidents of national and international significance. For example, FEMAT was deployed for a measles outbreak, tropical cyclones and COVID-19 in 2019, and VANMAT provided the health response during Tropical Cyclone Harold in 2020.[6] EMTs in the Cook Islands and Tonga aided in COVID-19 preparedness and response efforts. In January 2022, Tonga's EMT responded to the Hunga Tonga–Hunga Ha'apai volcanic eruption and tsunami and provided care for 381 patients.[8]

International EMTs were deployed to PNG in 2018 following the earthquake that struck the Highlands region affecting 544 000 people, of whom 270 000 needed immediate humanitarian assistance. At least 18 000 people were displaced from their homes and the health system quickly became overwhelmed.[9] The Australian Medical Assistance Team (AUSMAT) was one of the first international EMTs deployed to the region to assist with the response and to support national efforts to deploy several EMTs. These teams comprised emergency physicians, paramedics, acute care staff and public health officers, as well as WHO/UNICEF officers who were quickly assembled by the medical controller of the region. The assistance of several international EMTs was also requested during the COVID-19 pandemic when the health system in PNG was again overwhelmed.

ACTION

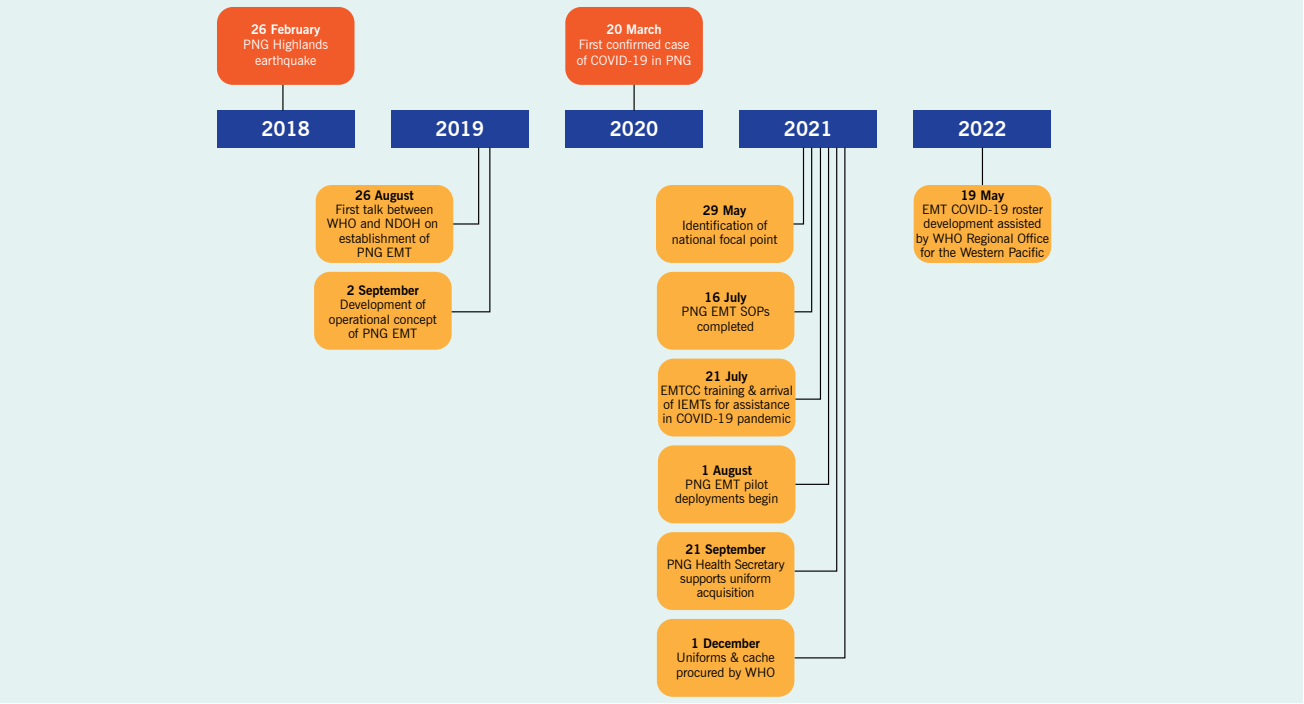
In August 2019, WHO had initial discussions with NDOH regarding the establishment of a national EMT for PNG. Following these discussions, and with additional support from the Australian Department of Foreign Affairs and Trade (DFAT), the Australian Department of Health and the Australian National Critical Care and Trauma Response Centre (NCCTRC), a technical working group was created. This led to the development of an operational concept for the PNG EMT that set out the essential components of the team and its operations, such as the team's structure; staffing, equipment and training needs; and deployment procedures. The overarching objective was to gradually transition away from the reliance on international EMTs, and instead establish a fully functional national EMT coordination cell capable of rapidly deploying a medical team.

In 2021, a PNG EMT focal point was identified. Focal point staff attended training at the NCCTRC in Darwin to learn how to coordinate the response to a surge in health-care needs resulting from increased morbidity or damage to existing capacities.[10] In addition, COVID-19 standard operating procedures (SOPs) for the PNG EMT were finalized, and initial pilot deployments were carried out in response to COVID-19 surges in several provinces.[11] A cache of EMT equipment and consumables and uniforms was also procured (**Fig. 1**).[12]

The recruitment of EMT members followed a stepwise process, beginning with an initial call-out to the emergency medicine and anaesthesia fraternities, the allied health-care community, and biomedical as well as infection prevention and control (IPC) officers. Those who expressed an interest in volunteering to be part of the team were subsequently invited to participate in a screening and selection process managed by the PNG EMT lead, which resulted in 34 members being selected.

In October 2021, following consultations with senior members of AUSMAT, PNG EMT members were given further training in essential skills, such as basic life support and advanced cardiovascular life support. Team members also completed Major Incident Medical Management and Support training, an Australian-based course on handling a major health disaster.

Fig. 1. **Timeline of key events in the establishment of an emergency medical team in Papua New Guinea**



EMT: emergency medical team; EMTCC: emergency medical team coordination cell; IEMT: international emergency medical team; NDOH: National Department of Health; PNG: Papua New Guinea; SOP: standard operating procedure; WHO: World Health Organization.

During 2021 and 2022, PNG's EMT had 11 deployments. Four were to provinces within PNG that requested assistance with their clinical services during a surge of COVID-19 cases. The remaining seven deployments were dedicated to peacetime activities and involved delivering week-long, just-in-time COVID-19 training to provincial and district hospital staff. Training materials were developed in consultation with the WHO case management team, NDOH clinicians and visiting clinical experts and covered topics such as the appropriate use of oxygen, maintenance of oxygen delivery equipment and oxygen concentrators; COVID-19 health-care pathways and clinical management; and IPC measures. Selected EMT members (senior clinicians, biomedical focal points and IPC officers) were trained to deliver these trainings. The deployments typically involved teams of five to six individuals, comprising a medical doctor, a nurse, a biomedical officer, an IPC officer and a WHO case management consultant. The training sessions also provided an opportunity to raise EMT awareness among senior provincial managers and staff of provincial health authorities (PHAs).

OUTCOME

The four main challenges surrounding the establishment and deployment of the PNG EMT can be summarized as follows:

- unfamiliarity with the EMT concept leading to lack of cooperation among health stakeholders;
- integration of the EMT into existing organizational structures;
- availability of team members at short notice for deployment; and
- availability of funding for deployment.

Introducing the concept of emergency medical teams

Introducing the EMT concept in an EMT-naïve country proved more challenging than anticipated. The difficulties in getting the full cooperation of PHAs, hospital

sectional heads and clinicians during both disaster and peacetime deployments illustrated that many did not fully understand the role of an EMT. Volunteers were mainly recruited from Port Moresby, the nation's capital, whereas the yield of volunteers from other parts of the country was poor. Furthermore, many clinicians were not given necessary approvals by their sectional heads to be part of the EMT.

Integrating the emergency medical team into existing organizational structures

To be effective and sustainable, the national EMT's framework needs to be integrated into existing national health structures. The PNG EMT was developed during the COVID-19 pandemic under the National Control Centre as part of the COVID-19 response. However, the subsequent integration of the PNG EMT into the NDOH structure has been slow due to uncertainty around which of NDOH's three major subdivisions – the Corporate Services Division, the Public Health Division and the Medical Standards Division – would be the most appropriate host. Given the overlap between their services and those provided by an EMT (which include both clinical and public health components), both the Public Health and the Medical Standards Divisions were proposed as potential hosts. This decision had important implications for the integration process, as it governed how PNG's EMT will be activated during a crisis, what will be the trigger points for activation, and how it will be funded. Other external factors, such as the restructuring of NDOH in the wake of the 2021 launch of the National Health Plan 2021–2030, have further impacted the pace of the integration process.

Assembling members at short notice for disaster response

For an EMT to serve its purpose, there needs to be a prompt, organized and coordinated deployment of trained professionals in response to an incident or emergency. This was not observed during the initial deployments of the PNG EMT to provinces that were experiencing COVID-19 case surges. Although there were urgent calls for help from affected provinces, it proved difficult to assemble sufficient numbers of EMT personnel to respond to requests for assistance. Sectional heads were reluctant to allow their staff to be released for EMT deployments, and the urgency of the deployment was not recognized by various PHAs or the EMT personnel themselves. This resulted in frequent postponements and even cancellations of scheduled deployments. In some cases, deployment delays of up to 1 week were reported, which clearly fell short of WHO's recommended time frame of deployment within 24 hours for a Type 1 mobile EMT response in the event of disasters or emergencies.[5]

Funding for deployment

The initial deployments of the PNG EMT were funded by nongovernmental agencies. During the COVID-19 Delta surge, PNG EMT deployments were fully partner-funded by WHO and other partners such as Australia's DFAT, which – working through the PNG-Australia Transition to Health (PATH) programme – oversaw all operational and logistical costs. Domestic funding mechanisms have not yet been put in place, which means that PNG is currently not able to fund its own EMT programme. Continued reliance on funding from nongovernmental agencies risks causing delays in deployment as formal requests for funding must go through partner-specific protocols.

DISCUSSION

The process of establishing an EMT in PNG has not been without its challenges, but some valuable lessons have been learned. Strengthening stakeholder involvement in EMT development and operations was identified as key to addressing some of the initial barriers to the introduction of the concept of a national EMT. Based on our experience, we would recommend engaging with senior executive members and clinical and sectional heads of the NDOH and PHAs, with a view to raising awareness of the EMT concept and how it will function during a disaster. As part of these awareness-raising activities, it is important to highlight how EMTs can benefit the national disaster response as well as PHAs during a disaster. Awareness activities also present an opportunity to forge partnerships with provincial hospitals to ensure effective communication and coordination during emergencies, as well as to facilitate mobilization of EMT personnel. It can also be helpful to invite other established EMTs, particularly from the Pacific region, to present their experiences in establishing a national EMT. This can provide insights into the usefulness of a national EMT and into the challenges experienced by other teams in similar settings.

In addition to engaging with stakeholders through various EMT concept awareness activities, we would suggest inviting representatives from each of the above-mentioned key stakeholder groups to join technical working groups and/or to participate in consultative group discussions. This facilitates a two-way conversation and provides feedback and learnings from previous emergency responses that could be used to improve future responses. This form of stakeholder engagement may also pave the way for meaningful discussions about the positioning of the EMT within the health system, as well as the protocols for activation.

Engagement with other partners and agencies involved in the emergency response system – which in PNG includes the National Disaster Centre managed by the defence forces, St John's Ambulance and various other health cluster partners – can also help overcome some of the challenges associated with integration. The roles and responsibilities of each group in the EMT would need to be determined, agreed upon and communicated. It is recommended that EMT leads work to secure longer-term partnerships and working relationships with local and international organizations to ensure ongoing support for its cause, particularly in terms of funding and technical assistance.

Identified solutions to the difficulties in assembling an adequately sized EMT at short notice include creating awareness of the benefits of the EMT concept among senior management and sectional heads both at the NDOH and PHA levels. This will ensure that staff who are part of the EMT will be released when required by their supervisors within the time frames required. Recommended strategies for improving recruitment include providing incentives for health-care professionals to join the PNG EMT, such as career development opportunities, professional recognition and financial compensation. NDOH can also develop and implement policies that mandate participation in the PNG EMT as part of the job requirements for health-care workers. At the PHA level, the PNG EMT can provide training and support to hospital staff to ensure they are aware of the importance of the role of the PNG EMT and encourage their participation. Rostering of EMT-specific training for hospital staff could be introduced to equip EMT members with the necessary skills to support the PNG EMT response during deployments. In addition, incentives can be offered to hospital staff who participate in PNG EMT deployments, such as additional compensation or time off in lieu. Branding the national EMT as a prestigious group, one that staff may be proud to be part of, can also improve its attractiveness and could increase recruitment figures.

Public awareness campaigns to educate the public about the importance of an EMT and its role in responding to emergencies may also be helpful. Several published studies have found that lack of public awareness was a factor that directly hindered implementation of an emergency medical services system.[13,14] Awareness is key to obtaining stakeholder buy-in to the initiative. Partnerships with other nongovernmental organizations can also be used as an avenue for increasing awareness and support for the EMT initiative.

In conclusion, although the establishment of the PNG EMT has been challenging, it is expected to become a sustainable entity within PNG's NDOH. As a result, PNG will join a growing number of countries in the Pacific region that have successfully established their own EMTs. It is hoped that the challenges and solutions outlined in this article can assist other LMICs that are considering setting up a national EMT.

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Conflicts of interest

The authors have no conflicts of interest to declare.

Ethics statement

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Emergency medical teams in WHO's Western Pacific Region

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This regional analysis aims to provide a comprehensive review of emergency medical team development and action in health emergency response in the Western Pacific Region from 2010 to 2024. It details national, subregional and regional efforts to strengthen health emergency preparedness, response and resilience; it notes challenges faced by the teams in these efforts; and it provides examples that could be adopted or adapted to strengthen their development and action around the world. Emergency medical teams are critical components of national, regional and global health emergency workforces, enabling rapid, high-quality and self-sufficient responses to health emergencies domestically or internationally. They comprise clinical, mental health, public health, logistics and water/sanitation/hygiene personnel who collaborate in providing critical services to affected populations during health emergencies. By the end of 2024, emergency medical teams had been established in nearly every country in the Western Pacific Region, with 16 classified for international deployments, and many national teams developed to strengthen response to domestic emergencies. This analysis is based on published peer-reviewed literature on emergency medical team development and action in health emergencies in the Western Pacific Region, as well as publicly available data on team collaboration and deployment for health emergency response. This analysis considers the global evolution of the World Health Organization Emergency Medical Team Initiative and describes its development in the Western Pacific Region, including how the teams have contributed to emergency response efforts, and the key enabling factors and challenges faced as they develop and respond to emergencies. The analysis concludes by highlighting opportunities for future development, collaboration, research and insights that may be applicable to the global development of emergency medical teams.

THE EMERGENCY MEDICAL TEAM INITIATIVE

The World Health Organization (WHO) Emergency Medical Team (EMT) Initiative aims to enhance the speed and quality of health emergency response provided by both national and international EMTs, which include deployable field clinics, hospitals and specialist medical teams in disasters, disease outbreaks and other emergencies with significant health consequences. The initiative was established following the January 2010 Haiti earthquake, which saw hundreds of nongovernmental organizations (NGOs), foreign medical teams (FMTs) and individual foreign clinicians deployed to the country.[1–6] While not the first large-scale disaster with significant international medical engagement, the Haiti earthquake response highlighted significant gaps in coordination with national authorities and in the quality of medical response provided. For instance, some individual clinicians and medical teams were deployed without basic equipment or medications to operate self-sufficiently, and some provided inadequate or inappropriate care.[4–6] The Haiti response also highlighted significant gaps in quantitative and qualitative data on the responders and the clinical services provided, a lack of standards and accountability to patients and national authorities, and a lack of professionalism in some clinical response actions.[4–6]

The Haiti earthquake response demonstrated the beneficial impact that FMTs can have during major sudden-onset disasters, with teams caring for thousands of patients and enabling a significant expansion of clinical services alongside a surge in complex presentations.[4–6] However, it also highlighted the shortcomings of medical response actions in terms of quality of care, scope of practice, self-

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Table 1. Emergency medical team typologies, based on the 2021 Blue Book[2]

Type	Capability
Type 1 mobile	Provides daylight-hours care for acute trauma and non-trauma presentations, referrals and community-based care. Must be operational within 24 hours of arrival and be able to manage at least 50 outpatient and emergency cases per day for at least 14 days, working in multiple locations (including hard-to-reach populations) for at least 2 weeks. May perform minor procedures in an outpatient setting (e.g. wound debridement); no major surgical procedures.
Type 1 fixed	Provides daylight-hours care for acute trauma and non-trauma presentations, referrals and community-based care. Must be operational within 24 hours of arrival and be able to manage at least 100 outpatient and emergency cases per day in a fixed location for at least 14 days. May perform minor procedures in an outpatient setting (e.g. wound debridement); no major surgical procedures.
Type 2	Provides Type 1 services, plus general and obstetric surgery and inpatient care, operating 24 hours/day, 7 days/week. Must be operational within 24–36 hours of arrival and be able to manage at least 100 outpatients, one operating theatre and at least 20 inpatients, including at least 7 major or 15 minor surgical operations, per day for at least 3 weeks.
Type 3	Provides Type 2 services, plus complex surgical and intensive care capacity, operating 24 hours/day, 7 days/week. Must be operational within 36–48 hours of arrival and be able to manage at least 100 outpatients, two operating theatres/tables and at least 40 inpatients per day, including at least 15 major or 30 minor surgical operations per day. Must have at least four intensive care beds. Must be able to operate for at least 4 weeks.
Specialized care teams	Teams that can be embedded into local health-care facilities or with other emergency medical teams, or that can be self-sustained, and that can provide specialized care (e.g. rehabilitation, surgical, highly infectious diseases, etc.).

Source: World Health Organization.[23]

sufficiency and coordination with national authorities.[1–6] With the aim of addressing these deficiencies, WHO and the Pan American Health Organization (PAHO) convened a meeting of disaster medicine experts, governmental health emergency focal points and NGO representatives to establish common principles and standards for medical teams deploying to emergencies with significant health consequences.[3] This meeting, held in Havana, Cuba, from 7 to 9 December 2010, led to the development and publication in 2013 of the foundational document, *Classification and minimum standards for foreign medical teams in sudden onset disasters*, which became informally known as the FMT Blue Book.[1] This WHO publication formalized core principles and minimum standards for FMTs and led to the establishment of a global governance structure, with WHO hosting the FMT secretariat. It also established specific typologies for FMTs based on their scale, scope of practice and complexity of clinical services to be provided. The creation of this typology framework aimed to establish common terminology, understanding and predictability around FMT engagements, which was previously lacking (**Table 1**). It set out minimum staffing based on typology, expected deployment periods (generally at least 2–4 weeks), self-sufficiency requirements and daily reporting requirements.[1]

In the years following the Haiti earthquake and subsequent meetings to establish FMT standards, teams deployed in response to numerous disasters and outbreaks around the world, including Typhoon Haiyan in the Philippines in 2013 – where the Blue Book was applied for the first time in international EMT coordination – the West Africa Ebola outbreak in 2014–2015, Tropical Cyclone Winston in Fiji in 2016, and many others (**Fig. 1**).[7–17] During this period, alongside the development of additional formal medical teams by governments and NGOs, WHO established more robust global and regional secretariat functions, such as facilitating FMT development according to established standards and quality assurance of these teams through a process called EMT classification, and supporting nationally led coordination in emergencies. WHO did not set out to establish its own FMTs but worked to coordinate a global network of predictable and coordinated teams capable of providing high-quality care, even in challenging outbreaks or disaster conditions. More national medical teams also emerged in the years that followed the development of formal FMT standards, adopting and adapting the WHO Blue Book principles and standards, including predictable typology (**Table 1**).[18,19]

Fig. 1. **Timeline of key Western Pacific Region EMT events, January 2010–December 2024**

2010
- Haiti earthquake
- WHO/PAHO and partners convene in Cuba to improve the engagement of FMTs in emergencies

2011
- A working group on FMTs convenes and agrees on the need for minimum standards and registration/coordination systems

2013
- WHO publishes *Classification and minimum standards for FMTs in sudden-onset disasters*, the first documented FMT/EMT standards, known as the Blue Book
- Super Typhoon Haiyan strikes the Philippines; the Blue Book is used for the first time by national authorities to coordinate the deployment of at least 150 FMTs/EMTs

2014
- A dedicated FMT/EMT Secretariat is established within WHO headquarters

2016
- Japan Disaster Relief (JDR) becomes the first WHO-classified EMT in the Western Pacific Region; the Australian Medical Assistance Team (AUSMAT) and China EMT (Shanghai) are also classified

2017
- China EMT (Guangdong) and the New Zealand Medical Assistance Team (NZMAT) are classified
- An initiative to develop EMTs in Pacific island countries and areas is launched, with funding support from the Governments of Australia and New Zealand

2018
- Aspen Medical (Australia) is the first private sector FMT/EMT to be classified
- China EMT (Sichuan) becomes the first Type 3 team in the Western Pacific Region
- WHO expands Pacific EMT development support, facilitating training for EMTs in Fiji, the Solomon Islands, Tonga and Vanuatu

2019
- The Fiji Emergency Medical Assistance Team (FEMAT) becomes the first Pacific EMT to achieve classification; EMTs are classified in Macao SAR and Tianjin, China
- The Pacific EMT initiative is further expanded with support from the United States Agency for International Development Bureau for Humanitarian Assistance (USAID/BHA)
- National EMT workshops/trainings are facilitated by the WHO Western Pacific Regional Office in the Cook Islands, Fiji, the Commonwealth of the Northern Mariana Islands, Samoa, the Solomon Islands, Tonga and Vanuatu
- A measles outbreak in Samoa leads to the largest EMT mobilization of the year in the Region, with 18 international teams from around the world responding over 3 months

2020
- The first EMT orientation workshops are held in the Federated States of Micronesia and Tuvalu
- In response to the COVID-19 pandemic, EMTs from across the Western Pacific Region support national, regional and global response efforts
- FEMAT and the Vanuatu Medical Assistance Team (VanMAT) support national responses to multiple tropical cyclones

2021
- An updated version of WHO's EMT Blue Book is published and retitled: *Classification and minimum standards for emergency medical teams*
- With extensive border closures due to the COVID-19 pandemic, WHO hosts an 11-week EMT webinar series to provide online training to EMTs across the Pacific
- With support from multiple donor-partners including Australia, the European Union, Japan, New Zealand and the United States of America, the WHO Western Pacific Regional Office undertakes a large-scale procurement of EMT cache, with kits tailored for 12 Pacific EMTs

2022
- The Tonga Emergency Medical Assistance Team (TEMAT) deploys in response to the Hunga-Tonga Hunga-Ha'apai volcanic eruption and tsunami; the Pasifika Medical Association's Medical Assistance Team (PACMAT) also deploys a mental health and psychosocial support specialized care team to Tonga
- The Korean Disaster Relief Team (KDRT) is classified as a Type 1 Fixed EMT
- The fifth EMT Global Meeting is held in Armenia with over 70 representatives from the Western Pacific Region, and nearly 20 presentations by Western Pacific Region EMTs
- A new Regional EMT Chair group is installed
- National EMTs are launched in Kiribati, the Republic of the Marshall Islands, Mongolia, Palau and Samoa
- FEMAT undertakes its first international deployment to support neighbouring Tuvalu's COVID-19 response

2023
- Multiple Western Pacific Region EMTs deploy in response to massive earthquakes that strike Türkiye and Syria
- VanMAT responds to back-to-back tropical cyclones in Vanuatu; EMTs from the Western Pacific Region also support the response – FEMAT, PACMAT and Respond Global
- MERCY Malaysia becomes the first nongovernmental organization EMT to be verified in Asia-Pacific
- National EMT trainings continue with WHO and partner support in French Polynesia, Samoa, the Solomon Islands and Tonga
- EMTs JDR, AUSMAT and NZMAT are reclassified
- EMTs participate in OCHA-led earthquake regional exercise in Brisbane, Australia

2024
- EMT training and capacity-strengthening continue in nearly every country in the Region
- The Singapore Emergency Medical Team (SGEMT) and three Philippine Emergency Medical Teams (PEMATs) achieve WHO EMT classification
- EMTs activate for multiple events, including mass gatherings in Papua New Guinea and Samoa, and in response to disasters in Malaysia, the Philippines and Vanuatu
- Over 100 representatives from EMTs across the Western Pacific Region come together for the sixth EMT Global Meeting in Abu Dhabi, presenting 40 abstracts and sessions, and collaborating to plan for the coming years

EMT: emergency medical teams; FMT: foreign medical team; OCHA: Office for the Coordination of Humanitarian Affairs; PAHO: Pan American Health Organization; SAR: Special Administrative Region; WHO: World Health Organization.

Table 2. WHO-classified and reclassified[a] EMTs in the Western Pacific Region in order of verification date, as of 31 December 2024[23]

EMT	Base (city, country)	Type	Year classified (reclassified)
Japan Disaster Relief (JDR)	Tokyo, Japan	T1F/M, T2, SCT	2016 (2023)
China International EMT (Shanghai)	Shanghai, China	T2	2016
Australia Medical Assistance Team (AUSMAT)	Darwin, Australia	T2, T1F, T1M and SCT (surgical and outbreak)	2016 (2023)
China International EMT (Guangdong)	Guangzhou, China	T2	2017
New Zealand Medical Assistance Team (NZMAT)	Auckland, New Zealand	T1F	2017 (2023)
Aspen Medical	Australia	SCT	2018
China International EMT (Sichuan)	Chengdu, China	T3	2018
China International EMT (Macau)	Macao SAR, China	T1F	2019
Fiji Emergency Medical Assistance Team (FEMAT)	Suva, Fiji	T1F	2019
China International EMT (Tianjin)	Tianjin, China	T2	2019
Korea Disaster Relief Team (KDRT)	Seoul, Republic of Korea	T1F	2022
MERCY Malaysia	Kuala Lumpur, Malaysia	T1F	2023
Singapore Emergency Medical Team (SGEMT)	Singapore	T1F	2024
Philippines Emergency Medical Assistance Team (PEMAT), Visayas	Tacloban, Philippines	T1F	2024
PEMAT, Metro Manila	Metro Manila, Philippines	T1F	2024
PEMAT, Luzon	Pampanga, Philippines	T1F	2024

EMT: emergency medical team; SCT: specialized care team; SAR: Special Administration Region; T1F: Type 1 fixed; T1M: Type 1 mobile; T2: Type 2; T3: Type 3.

[a] Classified EMTs should undergo reclassification – or additional peer review/quality assurance 5 years after initial classification.

Source: World Health Organization.[23]

In 2015, the language of "foreign medical teams" evolved into "emergency medical teams," recognizing that national actors are always the first to respond and that strengthening national clinical health emergency response capacity was essential.[20] This priority was reflected at the highest level through WHO Executive Board 146, Resolution 10 (2020), which called for "the development of effective and high-performing national, subnational, and regional Emergency Medical Teams, as appropriate, in line with WHO classification and minimum standards".[21] In 2021, WHO's EMT secretariat, building on nearly a decade of FMT/EMT development, through extensive global consultation, and with the consent of the EMT Strategic Advisory Group (EMT SAG) comprising EMT representatives from the six WHO regions, published updated principles and standards in a new EMT Blue Book entitled, *Classification and minimum standards for emergency medical teams*.[2]

The EMT secretariat is based in WHO headquarters in Geneva, Switzerland. It oversees the global classification process of EMTs with each of WHO's six regional offices in Africa, the Americas, the Eastern Mediterranean, Europe, South-East Asia and the Western Pacific.[22] The secretariat focuses on EMT governance, standard-setting, coordination of EMT classification and emergency response coordination. Within WHO regional offices, EMT regional focal points engage in EMT development and training, participate in EMT classification, facilitate information management, and enable regional EMT networks and collaboration (**Tables 2–4**).[22] Regional focal points also engage with ministries of health and WHO country offices, ensuring coordination across the three levels of the Organization. Financial and technical support from national, regional and international donor-partners enable EMT secretariat functions. These donor-partners sometimes fund and/or provide staffing to national EMT

Table 3. EMTs in the Western Pacific Region receiving direct support from the WHO Western Pacific Regional Office (national and international)

EMT	City, country	Type	Year established	Status/notes
Cambodia EMT (CAM-EMT)	Phnom Penh, Cambodia	T1F	2023	SOPs drafted. Cache on hand. Pursuing classification as of October 2024.
Cook Islands Medical Assistance Team (KukiMAT)	Rarotonga, Cook Islands	T1M (Pacific adaptation)	2019	SOPs established. Roster established with several team member trainings and exercises completed. Cache on hand.
French Polynesia EMT	Tahiti, French Polynesia	T1M	2023/2024	SOPs in development. EMT orientation workshop held in December 2023.
Kiribati Medical Assistance Team (KiriMAT)	South Tarawa, Kiribati	T1M (Pacific adaptation)	2022	SOPs established and under revision. Roster established with one team member training held (2022).
Lao People's Democratic Republic EMT	Vientiane, Lao People's Democratic Republic	T1F	2023	SOPs developed. Roster established with several team member trainings (2023, 2024). Cache on hand.
Marshall Islands Medical Assistance Team (MI-MAT)	Majuro, Republic of the Marshall Islands	T1M (Pacific adaptation)	2022	SOPs established. Roster established with two team member trainings held (2022, 2024).
Federated States of Micronesia EMT (FSM EMT)	Federated States of Micronesia	T1M (3)	2019	SOPs drafted. Rosters established in two States, with multiple team member trainings held (2023, 2024).
Mongolia Global Emergency Response EMT (M-GER EMT)	Ulaanbaatar, Mongolia	T1F	2022	SOPs in development. Specialized (winterized) cache on hand.
KLEMAT (Palau EMT)	Koror, Palau	T1M (Pacific adaptation)	2022	SOPs developed. Roster established with several team member trainings (2022, 2023, 2024). Cache on hand.
Papua New Guinea EMT (PNG EMT)	Port Moresby, Papua New Guinea	T1M	2023	SOPs developed. Roster established with several team member trainings (2023, 2024). Cache on hand.
Samoa Emergency Medical Assistance Team (SEMAT)	Apia, Samoa	T1M (Pacific adaptation	2022	SOPs developed. Roster established with several team member trainings (2022, 2023, 2024). Cache on hand.
Solomon Islands Medical Assistance Team (SOLMAT)	Honiara, Solomon Islands	T1M (Pacific adaptation)	2018	SOPs developed. Roster established with several team member trainings. Cache on hand. Multiple national deployments completed.
Tonga Emergency Medical Assistance Team (TEMAT)	Nuku'alofa, Tonga	T1M (Pacific adaptation)	2018	SOPs developed. Roster established with several team member trainings (2018, 2019, 2023, 2024). Cache on hand. One national deployment completed.
Tuvalu EMT	Tuvalu	T1M (Pacific adaptation)	–	National EMT orientation workshop held in January 2020. Further progress limited.
Vanuatu Medical Assistance Team (VanMAT)	Port Vila, Vanuatu	T1M (Pacific adaptation)	2018	SOPs developed. Roster established. Cache on hand. Multiple team member trainings held, and multiple national deployments completed.
Viet Nam EMT	Hanoi, Viet Nam	T1F	2024	National EMT orientation workshop held in 2024.

EMT: emergency medical team; SOP: standard operating procedure; T1F: Type 1 fixed; T1M: Type 1 mobile; WHO: World Health Organization.

Table 4. EMTs in the Western Pacific Region pursuing WHO classification, as of 31 December 2024

EMT (host country/organization)	Base (city, country)	Type
Cambodia EMT	Phnom Penh, Cambodia	T1F
China International EMT (Hunan)	Changsha, China	T2
China International EMT (Zhejiang)	Hangzhou, China	T2
Fiji Emergency Medical Assistance Team (FEMAT)	Suva, Fiji	T1M
Humanitarian Medical Assistance (HuMA)	Tokyo, Japan	T1M
Mongolia EMT	Ulaanbaatar, Mongolia	T1F
Pasifika Medical Assistance Team (PACMAT/Pasifika Medical Association)	Auckland, New Zealand	T1M
Peace Winds (Japan)	Tokyo, Japan	T1M
Respond Global	Noosa, Australia	T1M/SCT
Tokushukai Medical Assistance Team (TMAT)	Tokyo, Japan	T1M

EMT: emergency medical team; SCT: specialized care team; T1F: Type 1 fixed; T1M: Type 1 mobile; T2: Type 2.

coordination structures in emergencies, support staffing for the WHO EMT secretariat, enable regional and global meetings, support EMT mentoring and classification, and enable work to develop national and subnational EMTs, particularly in low- and middle-income countries (LMICs) and areas.[15,18,19]

The process to quality-assure EMTs for international deployments, known as EMT classification, began in earnest in 2015 with the first EMTs undergoing structured mentoring and external peer review, also known as EMT verification.[1,2,23] This peer-review process, based on the principles and standards detailed in the EMT Blue Book, was established to ensure that EMTs provide high-quality clinical services to patients, are able to function with a high degree of self-sufficiency, and provide receiving countries and ministries of health with a high level of predictability when EMTs deploy.[1,2] In 2016, the first year in which EMTs achieved classification, seven international teams were verified/classified, including Type 1, 2 and 3 teams in WHO's European and Western Pacific regions (**Table 2**).[23] The classification process included mentorship by peer EMTs, as well as multiple check-in points before verification, to ensure that teams were prepared for their final verification process. As of 2024, no EMT had failed verification. The same standards apply to all teams, regardless of the financial or human resources a government or NGO has available.[1,2] Several teams have been in the mentorship phase for several years, for instance, due to operational and logistical challenges, financial and human resources constraints, and the impacts of the COVID-19 pandemic. To date, there are no published data regarding the number of EMTs that have initiated but not completed the EMT classification process; this represents an opportunity for future analysis and research.

While continuing to mentor and undertake quality assurance of EMTs for international classification and deployments, the initiative also supports the development of national and subnational EMTs and strengthens the capacity of national health systems to lead the coordination and activation of the response in disasters, outbreaks and other emergencies.[18,19] The EMT Initiative aims to support governments, NGOs and other health emergency responders to strengthen health emergency surge capacities and workforces, improving response to emergencies and strengthening global health security.[1,2,23–28]

EMTs have become a critical part of national, regional and global health emergency workforces, enabling rapid, high-quality and self-sufficient response to health emergencies. EMTs comprise clinical, mental health and public health personnel, including physicians, nurses and allied health specialists, as well as experts in health logistics and emergency water, sanitation and hygiene (WASH).[1,2] In recent years, more specialized care teams (SCTs) have developed, further expanding the scope and specialization of EMTs responding to health emergencies.[2,23]

In 2023, the EMT SAG adopted the *Emergency Medical Teams 2030 strategy*, which recognizes the value of international surge capacity while stressing the importance of: developing and maintaining national

EMTs; ensuring accessible and quality health services in emergencies, partnerships and operational governance for the EMT network at global and regional levels; standardization and quality assurance at all levels; and strengthening information systems and evidence to continue to improve EMT development and action.[24] The strategy aligns with the International Health Regulations (IHR, 2005), World Health Assembly (WHA) Resolution 75.20 Strengthening the Global Architecture for Health Emergency Preparedness, Response and Resilience, WHO's Triple Billion targets, the United Nations Sustainable Development Goals, the Global Health Emergency Corps Framework, the Asia Pacific Health Security Action Framework, and the "Grand Bargain," all of which emphasize strengthening health systems and health emergency preparedness and response capacities.[24–31]

EMT DEVELOPMENT IN THE WESTERN PACIFIC

The WHO Western Pacific Region comprises 37 countries and areas (until the addition of Indonesia in May 2025), with some of the world's largest and smallest countries by population, and with diverse economies and geographies, many of which face a wide range of hazards, including earthquakes, volcanoes, tsunamis, cyclones/typhoons, and a broad array of infectious hazards.[32] Every year, millions of people in the Region face a wide array of health emergencies. Some countries in the Western Pacific Region have world-class national resources and capacities, some are emerging and rapidly developing economies, while others face significant and persistent financial, material and human resource constraints.[15,18,19] Recognizing the unique risk profile of the Region and the importance of timely and quality response to health emergencies, many countries and areas across the Region have committed to applying the EMT methodology to save lives and relieve suffering in emergencies (**Tables 2–4**). At the same time, several countries/areas have adopted and adapted global standards to their specific contexts, recognizing unique country risk profiles, human resource pools and financial resources availability.[18,19]

EMTs in the Western Pacific Region frequently engage in capacity development and health emergency response, contribute to the development of EMT standards, and engage in global and regional EMT governance. The Executive Director of Australia's National Critical Care and Trauma Response Centre, which houses the Australian Medical Assistance Team (AUSMAT), served as the global EMT SAG Chair from 2021 to 2024, and AUSMAT was among the first EMTs to be classified for international response.[23,33] EMTs from the Region contribute clinical and logistics mentors to support the development of other teams pursuing classification, and they support the development of emerging national teams in the Region and beyond.[15,18,19] In addition, Japan's EMT, Japan Disaster Relief (JDR), through its secretariat in the Japan International Cooperation Agency (JICA), has worked as a key partner to collect, consolidate and analyse clinical data from EMT response actions, and led the development of the EMT Minimum Data Set (MDS).[34–39] EMTs in the Region also contribute to EMT coordination training and are consistently represented in EMT technical working groups to expand and refine clinical and operational standards to strengthen EMT action in emergencies.[40–42]

In the Western Pacific Region, EMTs have expanded in number, scope, capability and interoperability since the genesis of the EMT Initiative (**Tables 2–4**).[18,19,23] The Region was home to 16 of the 52 classified international EMTs as of 31 December 2024, including: SCTs capable of providing specialized surge support in surgery, haemodialysis and outbreak response; mobile Type 1 teams that can reach remote islands and villages in a disaster or outbreak; fixed Type 1 teams that can replace or supplement damaged or destroyed health centres and provide emergency and outpatient care; and larger Type 2 and Type 3 EMTs capable of providing inpatient, surgical and specialized care in large-scale emergencies, including intensive/critical care.[1,2,23] Ten EMTs in the Region are pursuing EMT classification (as of 31 December 2024) (**Table 4**). EMTs have been established in the largest and smallest countries, by governments and NGOs, and have responded to emergencies in the Region and around the world.[15,16,18,19,23,43–63]

International EMTs often capture the spotlight in health emergency response, and they play a critical role, as demonstrated by EMTs from the Region responding to emergencies as far away as Liberia, Nepal, Sudan and Türkiye.[9,10,12–14] At the same time, national EMTs across the Region have continuously demonstrated that investing in strong local health emergency response capacities has enabled local response when emergencies strike.[15,18,19,43–50] Unfortunately, national EMT response

actions are rarely reported in the literature, limiting the ability to assess the impacts of their engagements.

By the end of 2024, nearly every country in the Western Pacific Region had established at least one EMT or engaged with the WHO EMT Initiative to establish national and/or international EMT capability.[15,18,19,23] Larger, higher-income countries such as Australia, China and Japan have established sophisticated international EMTs with some of the most advanced capabilities, including complex surgical and intensive-care capacity.[23,64–69] A number of these countries have also established networks of thousands of local clinical response teams, sometimes known as Disaster Medical Assistance Teams, designed specifically for response to domestic emergencies.[69–71]

At the same time, LMICs, including some of the smallest Pacific island countries and areas (PICs), have also taken steps to establish international or national EMTs in recent years, often with financial and technical support from the WHO Western Pacific Regional Office and regional donor-partners.[15,18,19,72–79] As of 1 November 2024, 14 PICs had already established EMTs or were in the process of doing so, training team members, sourcing equipment and supplies (known as "EMT cache" – many through bulk procurement by the Western Pacific Regional Office leveraging donor-partner financing), and developing standard operating procedures (SOPs) for emergency activations.[18,19,76–78] Several countries within the Association of South-East Asian Nations (ASEAN) also took action to develop EMTs, with WHO-classified EMTs in Malaysia, the Philippines (3) and Singapore by the end of 2024.[58–61,80–85] Several more are being developed, with at least one seeking international classification.

Responding at home and around the world: Western Pacific Region EMTs

EMTs have proven to be central to health emergency response in many countries across the Western Pacific Region.[15] Even before the global EMT classification process, EMTs from the Region responded to large-scale disasters, such as Typhoon Haiyan (locally named Yolanda) in the Philippines in 2013, Tropical Cyclone (TC) Pam in 2015 in Vanuatu, and TC Winston in Fiji in 2016, among others (**Table 5**).[7,8]

In 2019, the largest EMT activation in the Region was mounted in the South Pacific country of Samoa, where 18 international EMTs deployed in response to a measles outbreak that swept across the country.[16] This response, led by Samoa's Ministry of Health, integrated EMTs from around the world into Samoa's hospitals and health centres and established standalone, spillover clinical areas, significantly expanding intensive, high-dependency and general bed capacity. EMTs also supported Samoa's large-scale national vaccination campaign, helping to end the outbreak.[16] While EMTs typically deploy for 2–4 weeks, several of them extended their deployments to Samoa by several months, requiring multiple team member rotations and resupply of medicines and consumables from their countries of origin. EMT composition, based on EMT Blue Book typology and standards, was partially designed for disaster response, and required adaptation to Samoa's outbreak scenario (**Table 1**).[16]

Throughout the COVID-19 pandemic response, international EMTs deployed to provide technical and operational response support.[45,50,64,68] Teams from Australia and New Zealand played particularly important roles in supporting national response efforts in the South Pacific, with multiple deployments reinforcing local capacities in case management, infection prevention and control, vaccination and health logistics in Cook Islands, Fiji, Niue and the Solomon Islands.[50,86] China International EMT (Macao) deployed to Algeria and Sudan to support early COVID-19 response efforts.[87]

In 2022, EMT activations in the Region highlighted the importance of this diversified portfolio of national and international teams of various sizes and capabilities. In January 2022, the Tonga Emergency Medical Assistance Team (TEMAT) deployed independently to the island kingdom's Ha'apai island group following a volcanic eruption and tsunami that damaged infrastructure and led to several deaths.[43,44] In 2023, the Vanuatu Medical Assistance Team (VanMAT) deployed in response to back-to-back tropical cyclones.[62] Several EMTs from the Western Pacific Region deployed to Türkiye in response to multiple earthquakes, including EMTs from Japan, Mongolia and the Philippines.[14] In 2024, EMTs deployed to multiple disasters in the Region, including the Philippine Emergency Medical Assistance Teams (PEMATs) in response to six typhoons in 1 month in the Philippines, MERCY Malaysia in response to flooding

Table 5. EMT activations/deployments in/from the Western Pacific Region (January 2010–December 2024, non-exhaustive)

Year	EMT	Location	Event
2010	AUSMAT, JDR	Pakistan	Flooding
	KDRT, MERCY Malaysia, TMAT	Haiti	Earthquake
	MERCY Malaysia	Malaysia	Flooding
	MERCY Malaysia, TMAT	Chile	Earthquake
	MERCY Malaysia	Indonesia	Earthquake and tsunami
	MERCY Malaysia	Pakistan	Flooding
2011	AUSMAT	New Zealand	Christchurch earthquake
	TMAT	Japan	Great East Japan Earthquake
	MERCY Malaysia	Malaysia	Flooding
	MERCY Malaysia	Libya	Conflict
	MERCY Malaysia	Somalia	Conflict
2012	MERCY Malaysia	Malaysia	Flooding
	MERCY Malaysia	Philippines (Cagayan de Oro)	Tropical storm
	MERCY Malaysia	Philippines (Davao)	Typhoon Bopa
2013	AUSMAT, China, JDR, KDRT, NZMAT, TMAT	Philippines	Typhoon Haiyan
	AUSMAT, NZMAT	Solomon Islands	Dengue fever outbreak
	AUSMAT	Australia (Manigrida, NT)	Trachoma outbreak
	MERCY Malaysia	Malaysia	Flooding, conflict
	MERCY Malaysia	Philippines (Leyte, Bohol)	Typhoon Haiyan, earthquake
2014	China	Liberia	West Africa Ebola outbreak
	NZMAT	Solomon Islands	Severe flooding
2015	AUSMAT, JDR, NZMAT, PACMAT	Vanuatu	Tropical Cyclone Pam
	AUSMAT, JDR, KDRT, MERCY Malaysia, TMAT	Nepal	Earthquake
2016	AUSMAT, NZMAT, PACMAT	Fiji	Tropical Cyclone Winston
	MERCY Malaysia	Indonesia (Aceh)	Earthquake
	TMAT	Japan	Kumamoto earthquake
	TMAT	Haiti	Hurricane Matthew
2017	MERCY Malaysia	Malaysia	Flooding
	MERCY Malaysia	Bangladesh	Flooding
	MERCY Malaysia	Sri Lanka	Flooding and landslides
2018	AUSMAT	Indonesia, Thailand, Papua New Guinea, Bangladesh	Earthquake, tsunami, cave rescue, diphtheria outbreak
	KDRT	Lao People's Democratic Republic (the)	Flooding
	AUSMAT, PACMAT	Tonga	Tropical Cyclone Gita
	MERCY Malaysia	Indonesia, Lao People's Democratic Republic (the), Malaysia	Flooding, earthquake, dam break/ flooding

Year	EMT	Location	Event
2019	AUSMAT	New Zealand, Australia	White Island eruption, bushfires
	JDR	Mozambique	Tropical Cyclone Idai
	18 international EMTs	Samoa	Measles outbreak
	China International EMT	China	Earthquake, mudslide, water penetration
	FEMAT	Fiji	Measles outbreak, Cyclones Sarai and Tino
	SOLMAT	Solomon Islands	Rennel oil spill
	MERCY Malaysia	Malaysia (Johor)	Chemical spill
2020	China International EMT (several)	China, Italy, Algeria, Sudan	COVID-19
	PEMAT	Philippines	Taal volcanic eruption, Typhoon Ambo, COVID-19
	FEMAT	Fiji	COVID-19, Cyclones Harold and Yasa
	AUSMAT	Japan, China, Australia (various locations)	COVID-19
	SOLMAT	Solomon Islands	COVID-19
	MERCY Malaysia	Malaysia	COVID-19
2021	China International EMT (several)	China	Various earthquakes, social security incidents
	FEMAT	Fiji	COVID-19, Tropical Cyclone Ana
	AUSMAT, NZMAT	Fiji, Australia (various locations)	COVID-19
	PEMAT	Philippines	Typhoon Odette
	MERCY Malaysia	Malaysia	COVID-19
	NZMAT	Cook Islands	COVID-19
2022	PACMAT, TEMAT	Tonga	Hunga-Tonga eruption and tsunami
	China International EMT	China (Sichuan, Tibet)	Earthquakes, avalanche
	AUSMAT	Australia, multiple Pacific island countries (Kiribati, Solomon Islands, Vanuatu)	COVID-19
	PEMAT	Philippines (Northern Luzon)	Earthquake
	FEMAT, NZMAT, PACMAT	Niue, Fiji	COVID-19
2023	PACMAT	New Zealand	Tropical Cyclone Gabrielle
	JDR, Mongolia Military EMT, PEMAT, TMAT	Türkiye	Earthquake
	FEMAT, PACMAT, Respond Global, VanMAT	Vanuatu	Tropical Cyclones Judy and Kevin
	MERCY Malaysia, MIMAT	Pacific Islands, Malaysia	COVID-19
2024	Peace Winds Japan, TMAT	Japan	Earthquake
	PNG EMT	Papua New Guinea	Papal visit
	NZMAT, SEMAT	Samoa	Commonwealth Heads of Government meeting
	PEMAT	Philippines	Multiple typhoons
	MERCY Malaysia	Malaysia	Flood response
	AUSMAT, FEMAT, JICA,[a] NZMAT, PACMAT, Respond Global, VanMAT	Vanuatu	17 December 7.3 offshore earthquake

AUSMAT: Australian Medical Assistance Team; EMT: emergency medical team; FEMAT: Fiji Emergency Medical Assistance Team; JDR: Japan Disaster Relief; JICA: Japan International Cooperation Agency; KDRT: Korea Disaster Relief Team; MIMAT: Marshall Islands Medical Assistance Team; NT: Northern Territory of Australia; NZMAT: New Zealand Medical Assistance Team; PACMAT: Pasifika Medical Assistance Team; PEMAT: Philippine Emergency Medical Assistance Team; PNG EMT: Papua New Guinea Emergency Medical Team; SEMAT: Samoa Emergency Medical Assistance Team; SOLMAT: Solomon Islands Medical Assistance Team; TEMAT: Tonga Emergency Medical Assistance Team; TMAT: Tokushukai Medical Assistance Team; VanMAT: Vanuatu Medical Assistance Team.

[a] Data/information management support.

in Malaysia, and multiple EMTs in response to the 7.3 magnitude offshore earthquake that struck the South Pacific nation of Vanuatu in mid-December 2024 (**Table 5**).

International surge capacity remains essential when national capacities are overwhelmed, but strong national EMTs have proven important to rapid response that is adapted to a country's unique needs and operational contexts (**Table 4**).[15,18,19,43–49] In recent years, national EMTs have responded more frequently and more independently to emergencies within their countries; unfortunately, these actions are not frequently documented through robust data collection and reporting, or in the academic literature.[17,18] At the same time, international EMTs in the Western Pacific Region have expanded their technical and operational collaboration with these teams, focusing on capacity development and exchange.[15,18] Collaborative efforts between national and international EMTs are essential to national, regional and global health security. Together, these capacities strengthen national health emergency response capacities, quickly identify when national capacities are overwhelmed, and enable rapid deployment of quality-assured and interoperable EMTs. Together, these comprise key components of what WHO is terming the Global Health Emergency Corps.[26]

The application of EMT principles, standards and coordination mechanisms is now well established in many countries and areas, particularly in the Western Pacific Region. At the subregional level, ASEAN has adopted and applied the EMT coordination methodology through the *Standard operating procedure for regional standby arrangements and coordination of joint disaster relief and emergency response operations* (known as the SASOP).[83] National and international EMTs in the Region now ensure a high level of predictability and reliability in health emergency response, including in clinical quality, self-sufficiency, coordination mechanisms and reporting. However, some of these teams continue to rely heavily on donor-partner support and are not yet fully integrated into national emergency plans, systems and structures.[15,18,19] Ensuring the sustainability of national EMT capacities remains challenging, as does objectively documenting their work and impacts.[24]

Enabling EMT development and response action

The development of EMTs in the Western Pacific Region, particularly the development of national teams in LMICs, has been enabled through years of commitment and investment by countries and organizations developing their own EMTs, as well as several partners, including: the Government of Australia through its Department of Foreign Affairs and Trade; the European Union; the Health Bureau of the Government of Macao Special Administrative Region, China; the Government of Japan; the Government of New Zealand through its Ministry of Foreign Affairs and Trade; the Government of the United States through the United States Agency for International Development Bureau for Humanitarian Assistance (through to 20 January 2025); and the World Health Organization.[15,18,19] This support, based on political will and diplomatic commitments, technical exchange and capacity-sharing, in-kind material support and funding, has enabled the network of EMTs across the Region to expand and develop. Some support has also been received through bilateral engagements between individual countries.

Additionally, donor-partners have funded WHO's Western Pacific Regional Office to support EMT development across the Region. Since 2016, through WHO and bilateral support, donor-partners have invested over US$ 5 million in the development of EMTs across the Region and have played a key enabling role in the expansion of the EMT network.[18,19] Their support has provided funding for EMT member training, facilitated procurement of appropriate cache for mobile EMTs, including centralized cache procurement for many teams by the Western Pacific Regional Office, and enabled shared learning and continuous improvement across teams.[15,18,19,72–79] This investment supports the localization of health emergency capacities in line with the Grand Bargain localization commitments made at the 2016 World Humanitarian Summit.[31]

Challenges

While EMT development progress is evident across the Region (**Tables 2–4**), and EMT engagement in health

emergency response efforts is now occurring consistently, there remain challenges worth noting. National and international EMTs have developed relatively quickly in recent years (**Tables 2–4**) across the Region; however, some of these efforts have been heavily reliant on external support. National EMTs are yet to be fully institutionalized in laws, policies and budgets in several countries, and continued reliance on external financial support may compromise the sustainability of EMTs if such support were reduced or withdrawn.[18,19]

Beyond financial concerns, many national EMTs – especially in smaller PICs – face logistical and operational hurdles. Some lack dedicated personnel to support team deployment readiness, dedicated warehousing to store EMT cache, and codified mechanisms to release funds for rapid deployment, sometimes leading to delayed deployments and risking damage or loss of critical supplies. EMT logistics remains a significantly under-researched area, and this reflects an opportunity for future consideration by EMTs and academics researching EMT actions.[76–79]

Across the Region, EMTs have been active in health emergency response efforts for more than 14 years (**Table 5**). However, quantifiable data demonstrating the impacts of these deployments in terms of reduced population morbidity and mortality, improved access to quality health services delivery, and the speed of health system recovery remain limited. Efforts are underway to strengthen EMT information and data management, analysis and reporting/visualization, particularly with the support of partners such as JICA/JDR. However, this is an area ripe for additional efforts, investments and operational research to demonstrate quantifiable impacts and utility of EMTs.[24,34–39,59]

While the EMT Blue Book, the EMT 2030 strategy and other key frameworks have highlighted the importance of coordinated and predictable EMT response based on medical needs, some variances from these approaches have been noted in recent response efforts. In some cases, international EMTs have anecdotally deployed based on requests at diplomatic rather than technical levels, with receiving ministries of health sometimes learning of EMT deployments after they have been initiated. Some EMTs have also deployed outside of the scope of their EMT classification, potentially compromising predictability, quality and patient safety. Since these matters may be considered diplomatically or politically sensitive, there is little formal reporting or research on such actions. However, efforts should be made to apply EMT standards, including ensuring that teams work within their classified typology and deploy only when requested by appropriate and empowered health officials. This is another area that would benefit from future operational research.[24]

DISCUSSION

Recent health emergencies, including the COVID-19 pandemic, other disease outbreaks, and disasters, have demonstrated the critical roles that national and international EMTs have played within the Western Pacific Region and around the world. At the same time, operational research on EMT deployments remains limited, with significant opportunities to better capture their impact on clinical outcomes and health systems in crisis, in line with the EMT 2030 strategy.[24]

Looking forward, EMTs will remain essential to national, regional and global health emergency response, contributing to health security strengthening, limiting morbidity and mortality in major emergencies, easing pain and suffering, and strengthening the containment of outbreaks. The EMT network has grown significantly in recent years, with teams now established in nearly every country of the Region. Opportunities remain for teams to enhance collaboration and interoperability, to continue to learn and improve, to leverage their capabilities for diversified response, including in coordination with other rapid response/surge capacities, and to document their impact through data collection, analysis and publication.[15]

The Region has several EMTs already applying the EMT 2030 strategic goal of expanded interoperability. These include PEMAT in the Philippines, which had three EMTs classified within the same week in 2024, with common SOPs and team member training.[60] Federated States of Micronesia EMT (FSM EMT) applies a similar principle, with its national and state-level teams working together under a common structure and procedures. The national teams of Federated States of Micronesia are able to respond within their respective states but also to work together in case of a larger national or subregional emergency.[51] While many Pacific EMTs have been developed primarily for national response, they have common WHO Western Pacific Regional Office-procured cache, their team members have been trained using a

common curriculum with Regional Office support, and their SOPs are based on a common template, facilitating future collaboration.[18,19,72–78] Beyond reflecting the EMT 2030 objective, this interoperability, at both national and regional levels, can serve as a useful point of reference for other regions by simplifying EMT development through common goods, such as templated SOPs, facilitating access to EMT cache through bulk procurement for multiple teams, and enabling collaboration, with common training and operational approaches.

While expanding in number, EMTs in the Western Pacific Region also continue to expand in their scope of practice and depth of experience, building on response experience and further refining and expanding capabilities. These teams are largely designed for health emergency response, but they are also actively contributing to global EMT technical working groups, supporting learning and strengthening standards across the global EMT network, and resources for health emergency response more generally. At the EMT Global Meeting in November 2024, EMTs from across the Region reiterated their commitment to supporting one another and to strengthening health emergency response in the Region and around the world.

Limitations and future research

With progress made in EMT development and coordination, there remains significant scope for ongoing learning, improvement and strengthening the EMT evidence base. The Western Pacific Regional Office has contributed to this effort through the development of this EMT Special Edition of WHO's *Western Pacific Surveillance and Response* (WPSAR) journal, as well as by supporting the development of abstracts for oral and poster presentations at EMT global meetings and in other fora. However, many EMT development efforts, response actions and lessons from the field go undocumented, underscoring the need for continued efforts and investments in these areas, including collecting and publishing data on clinical presentations, patient outcomes, response times and health system recovery timelines following EMT deployments.

This regional analysis, the first to focus on EMT development and action in the Region, leverages published and publicly available information from EMTs to consolidate data and present the most comprehensive summary to date on the work that has been done, as well as on the opportunities that remain. This article draws on extensive peer-reviewed and other official sources, although a systematic literature review was not undertaken. Further documentation of EMT development and response actions, and the sharing of learnings through these efforts, are reflected in strategic objective 4 of the EMT 2030 strategy and are critical for continued EMT improvements in the future.[24]

Teams are already working together frequently, collaborating in training, development and deployments; however, opportunities to strengthen collaborations remain, at the subregional level (for example, ASEAN) and through bilateral collaborations, joint trainings and exercises, and through "twinning" arrangements. Continued investments in national and subnational EMT development can strengthen the speed and quality of national response efforts to emergencies, and potentially also reduce reliance on international EMTs and other responders. Evidence on these kinds of impacts is limited but should continue to be a subject for future research, based on more robust data collection and reporting by EMTs.[24]

Several EMTs in the Region have developed or are now developing SCTs, and this effort can continue to be expanded and researched. SCTs, such as for mental health and psychosocial support, may contribute to future emergency response efforts. However, technical standards for several proposed SCTs do not yet exist or are in development, and research on their impacts, both positive and negative, is critical for understanding how to optimize their engagement in future health emergency response efforts.

Finally, very few EMTs from the Region have engaged in response to conflicts, deliberate events, or other events related to chemical, radiological and/or nuclear hazards (**Table 5**). As EMTs continue to evolve, expanding capabilities in these areas will be essential. Future research should focus on developing technical standards, response protocols and training for these emerging challenges.

Conclusions

EMTs are now a well established and trusted component of health emergency response and form a core component of the global health emergency workforce.

This is evidenced by the extensive actions that EMTs have taken in health emergency response efforts, by the investments that governments, NGOs and donor-partners have made in EMT development and quality assurance, and by the active engagement of thousands of individual health workers, logisticians and other EMT members. This regional analysis highlights the achievements of the EMTs and their alignment with the global and regional priorities of Member States, reinforcing their critical role in health emergency preparedness and response.

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Conflicts of interest

STC is an associate editor of the *Western Pacific Surveillance and Response* journal. He was not involved in the editorial decision to publish this article. The other authors have no conflicts of interest to declare.

Ethics statement

Ethical clearance was not required because this report used published and publicly available data. No personal identifying information was collected.

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