



## Examining the Disaster Response Twenty Years After the 1999 Chi-Chi Earthquake

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The Chi-Chi earthquake, also known as the “921 earthquake,” struck Taiwan at 01:47:12 a.m. local time on September 21, 1999, leaving 2,415 people dead, 29 missing, and 11,305 injured. In 1999, there was no formal disaster medical assistance team (DMAT) nor a contemporary urban search and rescue (USAR) team available. Instead, domestic and international rescue teams arrived without coordination. Supplies were excessive but did not meet the needs of the population due to inadequate logistical management. A lack of incident command systems (ICS) further exacerbated a chaotic scenario of poor team coordination and organization. Aftermath management was another issue. Posttraumatic stress disorder (PTSD) had been mentioned, but in-depth data were not available in emergency medicine society. Conflicts of interest between local medical facilities of disaster sites and medical teams of centers from other cities/counties occurred during the recovery phase. A more sophisticated and comprehensive understanding of disaster management was required.

After the earthquake, Taiwan began to reinforce its disaster preparedness and response system by establishing a modern USAR team, initiating a DMAT in 2000, founding six regional emergency medical operation centers (REMOCs) in 2004, and creating a regional chemical and radiation accidents medical coordination center in 2005.<sup>1</sup> In 2008, the DMAT, the regional chemical and radiation accidents coordination center, and the hospital incident command system (HICS) program were integrated into the REMOCs project, which was aimed at promoting resource utilization and information sharing as well as improving

the quality and efficiency of disaster preparedness and response.

In the 20 years following the Chi-Chi earthquake, emergency physicians in Taiwan participated in many phases of disaster management including planning, preparedness, mitigation, response, and recovery for various natural and technological disasters. Taiwan confronted several severe disasters after the 921 earthquake, including Typhoon Nari (2001), which devastated the economy and prompted severe damage and fatalities in northern and central Taiwan; Typhoon Morakot, which wrecked southern Taiwan in 2009; the Alishan Forest Railway accident, which saw heavy casualties (2011); aircraft crash events in Pen-Hu (2014) and Taipei (2015); the Kaohsiung gas explosion (2014); the tragic dust blast incident at the Formosa Fun Coast water park (2015); the 2016 Southern Taiwan earthquake; and the 2018 Hua-Lien earthquake. Emergency medicine providers who experienced these and other catastrophic events should be encouraged to reflect on their experiences, learn from those reflections, and apply what was learned in the context of future disasters.

In this issue of the *Journal of Acute Medicine* (JACME), Dr. Lin reviewed scientific publications from Taiwan related to disaster medicine available from PubMed, Scopus, and the Web of Science over the past 20 years.<sup>2</sup> Dr. Lin et al. reviewed the initial emergency response of the 2015 Formosa Fun Coast dust explosion disaster and the corresponding outcomes of 33 major burn victims at a regional hospital without a burn unit,<sup>3</sup> while Dr. Chou et al. investigated whether functional exercise can increase the famil-

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arity of pediatric mass-casualty incident training and the effects of such among different trainee groups.<sup>4</sup> Dr. Cheng et al. reviewed the medical response during the 2015 TransAsia Airways Flight 235 aircraft crash and identified several important issues regarding medical response to disasters in Taiwan, including river rescue problems, the chain of command, and intercity communication, and stressed the necessity of re-evaluating protocols and standard procedures for dispatch, task, cooperation, staff training, and logistics of DMAT.<sup>5</sup> These articles provided experiences and reflection of disaster management and methods to improve statutory and regulatory processes in the future.

The death rate attributed to natural disasters decreased due to better education, new affordable solutions, and global collaborations.<sup>6</sup> However, technological disasters might kill more people in a single event as a result of advanced capacity and increased speed of transport. The past 20 years have seen improvements in disaster management. However, there are several issues to be emphasized and solved, including DMAT structure and regulation and team members' collaboration in overseas medical assistance; the national health insurance, which affects resource allocation; the impact of information technology; methods to implement the "all hazards approach" to disaster preparedness; meticulous implementation of HICS and its corresponding hospital accreditation, and the role and responsibilities of the current REMOCs system. The recurring issue of identifying and coping with PTSD emotions of rescuers was aroused by a recent experience. These emerging subjects all require further evaluation and revision.

Disaster management is a technique and is a

political and management science combined with sociology and humanities. We must consider more literature, even case reports, expert opinions, and personal observations, as a way to strengthen the level of evidence and recommendations for disaster medicine. JACME will continue publishing high-quality scientific and clinical research in all fields of acute care medicine, including disaster medicine, to promote scientific knowledge to improve disaster preparedness and management.

## References

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