

Review Article

Medicine at mass gatherings: current progress of preparedness of emergency medical services and disaster medical response during 2020 Tokyo Olympic and Paralympic Games from the perspective of the Academic Consortium (AC2020)

Naoto Morimura,^{1,2}  Yasumitsu Mizobata,³ Manabu Sugita,¹ Satoshi Takeda,^{4,5} Tetsuro Kiyozumi,⁴ Tomohisa Shoko,⁴ Yoshiaki Inoue,⁴ Yasuhiro Otomo,^{2,6} Atsushi Sakurai,⁷ Yuichi Koido,⁸ Seizan Tanabe,⁸ Tetsu Okumura,⁹ Fumihiko Yamasawa,¹⁰ Hideharu Tanaka,⁵ Tomoya Kinoshi,¹¹ Koki Kaku,¹² Kiyoshi Matsuda,¹³ Nobuya Kitamura,¹⁴ Tatsuya Hayakawa,¹⁴ Yasuhiro Kuroda,^{7,15} Yumiko Kuroki,⁹ Junichi Sasaki,^{16,17}  Jun Oda,¹⁶  Masataka Inokuchi,¹⁸ Toru Kakuta,¹⁸ Satoru Arai,¹⁸ Noriaki Sato,¹⁹ Hiroyuki Matsuura,²⁰ Masahiro Nozawa,²⁰ Toshio Osamura,²⁰ Kazunori Yamashita,¹⁵  Hiroshi Okudera,¹¹ Akihiko Kawana,¹⁷ Tsugumichi Koshinaga,²¹ Satoshi Hirano,²¹ Erisa Sugawara,¹² Michihiro Kamata,²² Yasuhito Tajiri,²² Mototsugu Kohno,²³ Michiyasu Suzuki,²⁴ Hiroyuki Nakase,²⁴ Eiichi Suehiro,²⁴ Hiroaki Yamase,²⁵ Hiroshi Otake,²⁶ Hiroshi Morisaki,²⁶ Akiko Ozawa,²⁶ Sho Takahashi,²⁷ Kotaro Otsuka,²⁸ Kiyokazu Harikae,¹³ Kazuo Kishi,²⁸ Hiroshi Mizuno,²⁸ Hideaki Nakajima,²⁹ Hiroki Ueta,²⁹  Masao Nagayama,³⁰ Migaku Kikuchi,³⁰ Hiroyuki Yokota,² Takeshi Shimazu,¹ Tetsuo Yukioka,¹ and The Joint Committee of the Academic Consortium on Emergency Medical Services, Disaster Medical Response Plan during the Tokyo Olympic and Paralympic Games in 2020 (AC2020)

¹Japanese Association for Acute Medicine, Tokyo, Japan, ²The Scientific Research Group of Ministry of Health, Labor and Welfare of Japan, Tokyo, Japan, ³Japanese Society for Emergency Medicine, Tokyo, Japan, ⁴The Education and Training Working Group of AC2020, Tokyo, Japan, ⁵AED Foundation of Japan, Tokyo, Japan, ⁶Japanese Association for the Surgery of Trauma, Tokyo, Japan, ⁷Japanese Society of Intensive Care Medicine, Tokyo, Japan, ⁸Japanese Association for Disaster Medicine, Tokyo, Japan, ⁹Japanese Society for Clinical Toxicology, Tokyo, Japan, ¹⁰Japanese Society of Clinical Sports Medicine, Tokyo, Japan, ¹¹Japanese Association of First Aid and Emergency Medicine, Kyoto, Japan, ¹²Japanese Society for Infection Prevention and Control, Tokyo, Japan, ¹³Japan Prehospital Trauma Evaluation and Care Council, Tokyo, Japan, ¹⁴Japanese Society for Aeromedical Services, Tokyo, Japan, ¹⁵Japanese Society of Reanimatology, Ube, Japan, ¹⁶Japanese Society for Burn Injuries, Tokyo, Japan, ¹⁷Japanese Association for Infectious Diseases, Tokyo, Japan, ¹⁸Tokyo Medical Association, Tokyo, Japan, ¹⁹Japanese Association for Emergency Nursing, Tokyo, Japan, ²⁰Japan Pediatric Society, Tokyo, Japan, ²¹Japan Surgical Society, Tokyo, Japan, ²²Japanese Orthopaedic Association, Tokyo, Japan, ²³Japanese Society for Prehospital Medicine, Tokyo, Japan, ²⁴Japan Society of Neurotraumatology, Tokyo, Japan, ²⁵Japan Academy of Critical Care Nursing, Tokyo, Japan, ²⁶Japanese Society of Anesthesiologists, Kobe, Japan, ²⁷Japanese Society of Psychiatry and Neurology, Tokyo, Japan, ²⁸Japan Society of Plastic and

*See Appendix S1S1 for complete details of The Joint Committee of the Academic Consortium on Emergency Medical Services and Disaster Medical Response Plan during the Tokyo Olympic and Paralympic Games in 2020 (AC2020).

The institutions at which the work was carried out together with: Secretariat of Japanese Association for Acute Medicine, Ks Building 3F, 3-3-12 Hongo, Bunkyo-ku, Tokyo 113-8033 Japan.

Corresponding: Naoto Morimura, MD, PhD, The Joint Committee of AC2020, Department for Acute Medicine, Graduate School of Medicine, University of Tokyo, Tokyo, Japan. E-mail: morimuran-eme@h.u-tokyo.ac.jp; molimula@r6.dion.ne.jp.

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Reconstructive Surgery, Tokyo, Japan, ²⁹Japan EMT School Association, Kyoto, Japan, and ³⁰Japan Resuscitation Council, Tokyo, Japan

Mass gatherings are events characterized by “the concentration of people at a specific location for a specific purpose over a set period of time that have the potential to strain the planning and response resources of the host country or community.” Previous reports showed that, as a result of the concentration of people in the limited area, injury and illness occurred due to several factors. The response plan should aim to provide timely medical care to the patients and to reduce the burden on emergency hospitals, and to maintain a daily emergency medical services system for residents of the local area. Although a mass gathering event will place a significant burden on the local health-care system, it can provide the opportunity for long-term benefits of public health-care and improvement of daily medical service systems after the end of the event. The next Olympic and Paralympic Games will be held in Tokyo, during which mass gatherings will occur on a daily basis in the context of the coronavirus disease (COVID-19) epidemic. The Academic Consortium on Emergency Medical Services and Disaster Medical Response Plan during the Tokyo Olympic and Paralympic Games in 2020 (AC2020) was launched 2016, consisting of 28 academic societies in Japan, it has released statements based on assessments of medical risk and publishing guidelines and manuals on its website. This paper outlines the issues and countermeasures for emergency and disaster medical care related to the holding of this big event, focusing on the activities of the academic consortium.

Key words: COVID-19, emergency medical service, mass gathering, Olympics, public health-care

INTRODUCTION

MASS GATHERINGS ARE events characterized by “the concentration of people at a specific location for a specific purpose over a set period of time that have the potential to strain the planning and response resources of the host country or community” by the World Health Organization (WHO).¹ These include large-scale sports competitions, city marathons, concerts, and fireworks. Traditional definitions according to the number of people range from “25,000 or more”² to “1,000 or more”.³ One of the largest mass gatherings in the world is a pilgrimage of millions to Mecca (Saudi Arabia). Another definition is “a situation in which has potential for a delayed response to emergencies because of limited access or other features of the environment or location” such as transportation in large cities (subway/train), large shopping malls, airport, cruise ships, public demonstrations.⁴ Needless to say, the Olympics and Paralympics are two of the largest mass gathering events in the world.

On 24 March, 2020, the Olympic and Paralympic Games (the 2020 Tokyo Olympics) were postponed to the summer of 2021 in consideration of the new coronavirus infection (COVID-19) epidemic.⁵ The 2020 Tokyo Olympics will be held in Tokyo and will involve mass gatherings on a daily basis. This paper outlines the issues and countermeasures for emergency and disaster medical care related to the running of this big event, focusing on the activities of the Academic Consortium.

RISKS AND BENEFITS OF MASS GATHERING EVENTS FOR THE LOCAL HEALTH-CARE SYSTEM

MASS GATHERING CAUSES an increase in the emergency medical demand due to a temporary concentration of people in the area, and imposes a burden on the operation of daily emergency medical service systems. Previous reports showed that injuries and illnesses occurred as a result of the concentration of people in a limited area. It is necessary to build a comprehensive emergency medical services system that includes local residents not related to the events. Severity of the injuries and illnesses are not often serious, but occasionally serious cases were reported. Crowd size and density, venue air conditioning, or weather conditions such as high or low temperature and high humidity, event type and period,² access to the venue,⁶ public health facilities, enthusiasm,⁷ alcohol, legal drugs, and the adequacy of the medical services system in the venue are the risk factors of the increase of patient presentation. The limitation of access to the local emergency medical services system is also regarded as a risk factor.⁸

In these situations involving high concentrations of people, mass casualty incidents (MCI) can occur due to crowd avalanches, terrorism, and the spread of infectious diseases. A previous report described a crowd avalanche at the Akashi Fireworks Festival in 2001 that caused MCI of 11 dead and 247 injured.^{9,10} An unusual congestion at the pedestrian bridge on the access route to the venue was the cause of this MCI. The concentration of 13 to 15 people per square meter

occurred at the end of the bridge where spectators from the train station and spectators from the venue met.

High level of international interest of a mass gathering event such as the Olympic Games is also associated with causing MCI. During the 1996 Atlanta Olympics, a bomb explosion occurred at an outdoor concert space at the Centennial Olympic Park in the city. The casualties were more than 100 injured and two dead.¹¹ Another report of MCI was the terrorism that occurred during the 1972 Munich Olympics.¹² Eleven athletes were killed.

More recently, a terrorist bombing occurred at the citizen marathon held in Boston, USA in 2014, resulting in three deaths and 264 injuries.¹³ In the 2015 Paris terrorist attacks,

356 injured people were transported to 18 hospitals and 129 people died at the scene.^{14,15}

Infectious diseases represent another significant problem. Mass gatherings also have the potential to escalate the transmission of widespread infectious diseases, such as COVID-19. In 2000 and 2001, an outbreak of meningococcal infection was reported during a pilgrimage to Mecca. Since then, vaccination of participants has been carried out.^{16,17} At the 23rd World Scout Jamboree (WSJ2015) held in Japan in 2015, it was reported that three Scouts from the North Scotland Corps and one Scout from the Swedish Corps developed meningococcal infection.^{18,19} In addition, epidemics of infectious

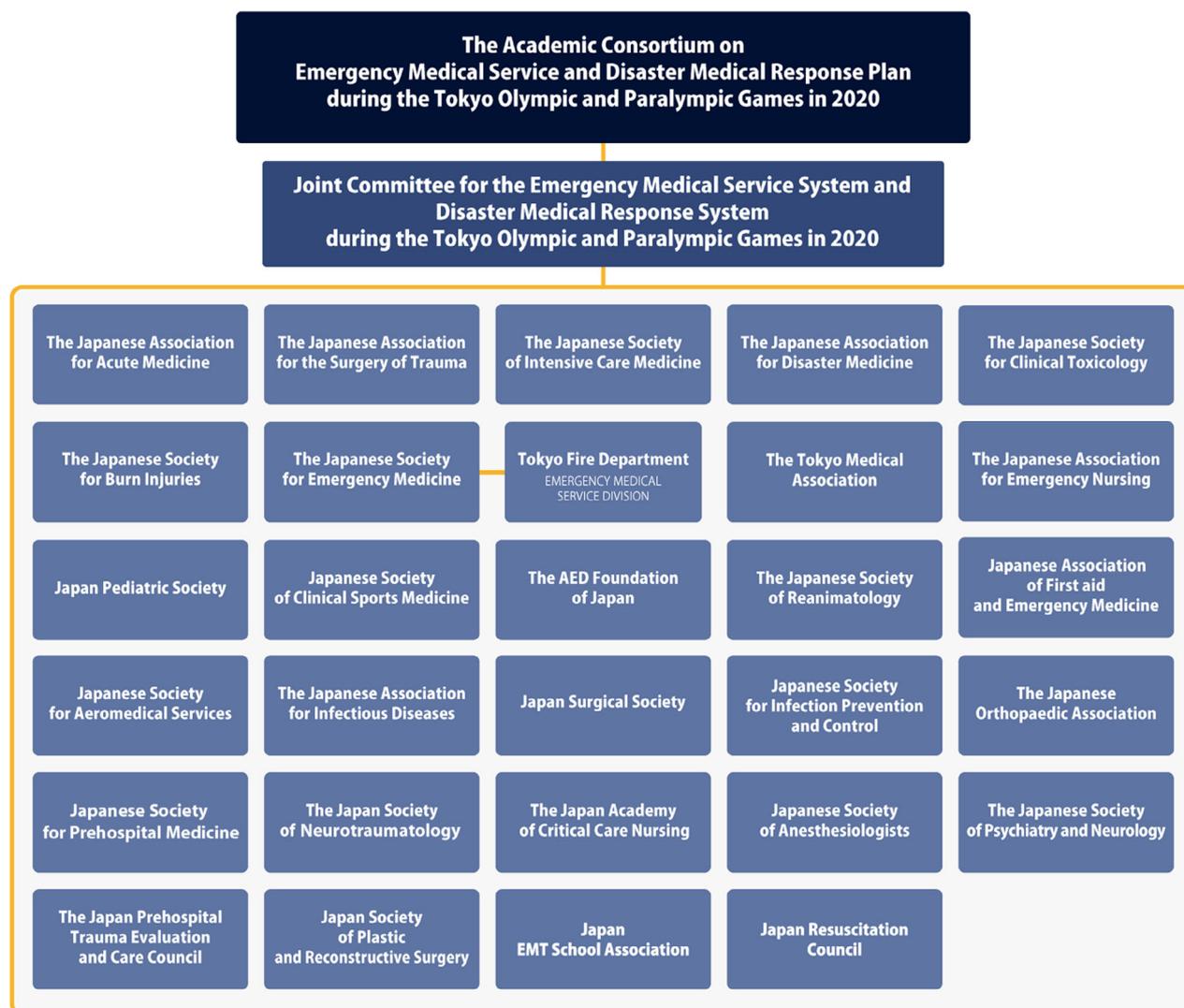


Fig. 1. Organization chart of the Academic Consortium on Emergency Medical Services, Disaster Medical Response Plan during the Tokyo Olympic and Paralympic Games in 2020 (AC2020).

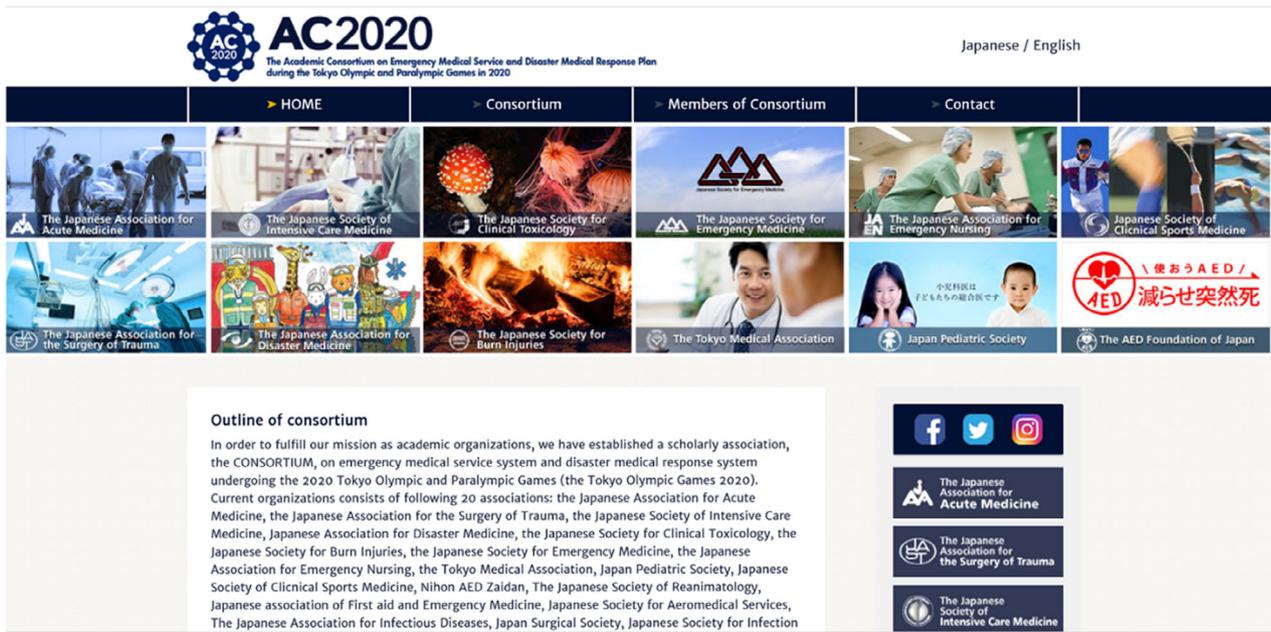


Fig. 2. Website of the Academic Consortium on Emergency Medical Services, Disaster Medical Response Plan during the Tokyo Olympic and Paralympic Games in 2020 (AC2020).

diseases such as influenza, measles, and norovirus²⁰ have been reported at mass gathering events.

In recent years, it has been reported that the mortality rate of out-of-hospital cardiac arrest and acute myocardial infarction during a large-scale citizen marathon event in the United States was significantly higher than when it was not held. The delay of definitive treatment by restricting access to emergency medical institutions is considered to be one of the causes.⁸ The WHO Collaborating Centres on Mass Gatherings refers to local residents who are not involved in the event as "penumbra"; these residents may be adversely affected by the mass gathering in terms of provision of timely medical care.^{21,22} Thus, maintaining the activities and quality of a daily emergency medical services system for local residents is essentially very important.

In view of the above context, mass gathering events with a predetermined date can be prepared as a "scheduled disaster or MCI". In other words, it is easy to make a preliminary plan "because the time of the disaster or MCI, if any, has been determined". A mass gathering event places a significant burden on the local health-care system, including the preparation of an aggressive response plan, but provides the opportunity for long-term benefits after the end of the event. It can provide a stronger public health-care system and opportunities to determine how to protect against certain illness and injury for residents and visitors.

HISTORY OF MEDICINE AT MASS GATHERINGS IN JAPAN

THE SOPHISTICATED PRACTICE of medical support at mass gatherings and the formation of consensus among medical professionals and stakeholders have gradually increased through the lessons learned from previous experiences of events such as the 1985 International Science and Technology Expo (Science Expo, Tsukuba 1985),²³ the 1998 Nagano Winter Olympics,²⁴ the 2000 Okinawa Summit,²⁵ the 2001 Akashi Fireworks Festival accident,^{9,10} and the 2002 FIFA World Cup Games in Japan and Korea.⁶

At the 2002 FIFA World Cup Games, an emergency medical information sharing system based on a mailing list at 10 venues was established, which was old-fashioned but novel at that time.²⁶ At the symposium of the 12th Annual Meeting of the Japanese Association for Disaster Medicine (JADM) at Nagoya in 2007, a statement was made on the definition of mass gathering and the need for medical assistance. Since then, municipal department and health-care professionals, also with the event organizer, have tended to plan an on-site emergency medical services system in order to realize the early initial care and to reduce the burden on health-care providers in the surrounding hospitals and clinics. At the same time, JADM has been working on

Table 1. Medical problems and their causes related to 2020 Tokyo Olympics

Concentration of people in venue and surrounding area
<ul style="list-style-type: none"> ● Impact on daily emergency medical system <ul style="list-style-type: none"> ● Increase of number of medical telephone consultations and ambulance calls ● Increase of ambulance usage ● Hospital burden resulting from increase of referral to ED ● Impact on disaster medical system <ul style="list-style-type: none"> a MCI due to increased population density in limited areas b Earthquake directly under the capital city as an assumed natural disaster
Weather condition-related
<ul style="list-style-type: none"> ● Heatstroke ● Lightning strike
Nationwide increase in tourists including visiting foreigners
<ul style="list-style-type: none"> ● Epidemic of infectious disease <ul style="list-style-type: none"> a COVID-19 ● Impact on daily emergency medical system <ul style="list-style-type: none"> a Language, religion, insurance, repatriation
High international interest-related
<ul style="list-style-type: none"> ● Multisite MCI caused by terrorism <ul style="list-style-type: none"> ● Explosion, gunshot wound, special disaster
Health-care worker-related
<ul style="list-style-type: none"> ● Training of large number of medical staff and volunteers

ED, emergency department; MCI, mass casualty incident.

establishing a clear standard for how much valuable medical personnel and equipment should be put into the field for "preparation". The committee of the JADM has tried to develop of formula by using an algorithm based on the daily emergency patient presentation rate (PPR) in Japan and the transport to hospital rate at past similar events. However, as the same kind of event data in the past is indispensable, more useful methods are still being studied.

At a series of international conferences, such as the 2000 Okinawa Summit, the 2008 Toyako Summit, the 2010 Yokohama APEC, the 2016 Ise-Shima Summit, and the 2019 Osaka G20, as well as Rugby World Cup 2019 and the Enthronement Ceremony in 2019, a nationwide support system has come to be assembled according to the predicted risks. Of particular note is the 2019 Osaka G20, the first system with a clear awareness of maintaining the activities and quality of emergency medical care for local residents. The "local residents unrelated to the event (penumbra)" mentioned above were clearly considered.

LAUNCH OF THE ACADEMIC CONSORTIUM TOWARDS THE 2020 TOKYO OLYMPICS

IN APRIL 2016, the Academic Consortium on Emergency Medical Services and Disaster Medical Response Plan during the Tokyo Olympic and Paralympic Games in 2020 (AC2020) was launched to provide academic support for the establishment of an emergency and disaster medical system during the Games. As of October 2020, 28 various medical associations have participated.²⁷ The joint committee, consisting of members from each organization, has been set up as a department in charge of gathering knowledge from each specialty field (Fig. 1), undertaking academic studies, issuing statements, and disseminating manuals, seminar information, lecture content, and simulation training through its website (Fig. 2). AC2020 aims to be a "platform" for the transmission of information by experts, and a "portal" of information sources for citizens and those involved in planning.

EXTRACTING ISSUES RELATED TO EMERGENCY MEDICAL CARE DURING THE 2020 TOKYO OLYMPICS BY THE AC2020

IN TOKYO IN 2021, enormous mass gatherings will be added to the daily mass gathering. Not only the venue but also the area with the concentration of people on the road from the nearest public transport station to the venue (last mile), outdoor events (live sites or public viewing), and "penumbra" should be covered in the planning. Again, the response plan should provide timely medical care to the patients and reduce the burden on emergency hospitals, and maintain a daily emergency medical system for residents in and around the area.

First, the joint committee of the AC2020 discussed extracting the medical issues to formulate a plan for this event (Table 1). The first issue is caused by a concentration of people in the venue and surrounding areas. The emergency medical services system, which is tight on a daily basis, faces an additional burden. Emergency telephone consultation center calls (dial number: #7119 and #8000) and an increase in the number of operations for ambulance dispatch (dial number: 119) are considered inevitable. It is feared that not only the number of emergency outpatients will increase, but also congestion in the traffic network could cause delay in the arrival of ambulances and treatment within a therapeutic time. The second issue is weather-related. In the extremely hot and humid environment, there is a concern that the incidence of heatstroke will increase.

The third issue is associated with the increase in the number of foreign visitors, which is considered nationwide. The

Table 2. Risk assessment: staff, stuff (equipment, drug, ambulance), patient presentation rate (PPR), severity, load of hospitals

Problem		Predicted decline in the quality of emergency medical care accompanying addition of emergency demand				
Task		Reduce the load on EMS demand and lighten the impact on daily EMS flow				
Topic-related cause		Impact of temporary influx and concentration of people				
		Impact of opening time		Impact of risk included in the event		
Topic		Heatstroke	Lightning strike	Mass casualty incident	Explosive/burn/penetrating injury	Daily emergency (CVD, ACS, trauma) MCI due to natural disaster
Theme of topic		Command/control Safety			Establishment of unified coordination center during the exhibition Prevention	
		Communication Assessment			Reduction of access restriction to EMS	
		Communication flow path, monitoring of illness/injury				
		Risk assessment: staff, stuff (equipment, drug, ambulance), PPR, severity, load of hospitals				
		Standard manual of on-site medical station/first aid station				
		Standard manual of on-site medical station/first aid station, treatment for foreigners				
		Interhospital transport system, repatriation				

ACS, acute coronary syndrome; CVD, cerebrovascular disease; EMS, emergency medical service; MCI, mass casualty incident.

work burden associated with language, religion, insurance, and repatriation has a major impact on the daily emergency medical services system. Infectious diseases, including COVID-19, will spread as a result of the temporary increase of inbound and movement of domestic visitors. Finally, the risk of simultaneous or multisite MCI caused by terrorism in light of the recent international situation should be regarded as an important issue. It is necessary to keep in mind the possibility of vehicle ramming, mass shooting, and chemical, biological, radiological, nuclear, and explosive disasters, which are rarely experienced.

The participating organizations of AC2020 were then divided into groups according to related specialized areas, and after extracting the problems in each area, they were organized into command and control, safety, communication, assessment, triage, treatment, and transport categories (Table 2). Based on these problems, statements, guidelines, and manuals have been created as follows.

AC2020'S APPROACH TO PROBLEMS

THE JOINT COMMITTEE of AC2020 released statements in September 2016 and November 2017 through

its website, and in April 2018 that was directly sent to the Tokyo Metropolitan Government Administration Office. These three statements included the proposal to establish a multi-institutional coordination center being held during the holding period that functions as a joint command and coordination headquarters in case of an MCI. The statement also described a necessity of planning for the “last mile”, strengthening of communication and information systems based on the existing ones, code names and operations when MCI occurs (we do not yet have an emergency code, such as “Code Brown,” used in the UK, USA, and other countries), medical risk assessment based on daily emergency medical supply and demand balance, and verification at test event. As a result, a medical advisory board was established in the Tokyo Metropolitan Government in January 2019. This board has the function of giving advice from a medical point of view with the policies of AC2020 to the response plan for the entire host area, while keeping an eye on the medical response plan in the venue that the Tokyo Organising Committee of the Olympic and Paralympic Games (TOC) has been in charge of.

In addition, AC2020 has distributed approximately 40 items of information, including guidelines and manuals on

Table 3. Proposal on necessity for multiagency coordination center for medical and first response system at mass gathering events

No.	Organization in charge of document preparation	Document type	Title of document	Uploaded date
1	AC2020 Joint Committee	Statement	Formation of AC2020 joint committee	20 May, 2016
2	AC2020 Joint Committee	Statement	Basic policy of emergency medical service and disaster medical response plan during Tokyo Olympics 2020	30 Sep, 2016
3	AC2020 Joint Committee	Report	Report from participating organizations	7 Nov, 2017
4	AC2020 Joint Committee	Statement	The kick-off symposium of AC2020	7 Nov, 2017
5	Japanese Society of Intensive Care Medicine	Report	Survey of ICU capacity of each hospital around each venue	20 Apr, 2018
6	Japanese Society for Burn Injuries	Guideline	Survey on severe burns and guidebook of first response on burns	20 Apr, 2018
7	AC2020 Joint Committee	Statement	Proposal on necessity for multiagency coordination center for medical and first response system at mass gathering events	20 Apr, 2018
8	AC2020 Joint Committee	Statement	Proposal from the consortium regarding preparation for mass gathering event based on a plan by Tokyo Metropolitan Government	20 Apr, 2018
9	The AED Foundation of Japan	Statement	Preventing sudden death during exercise	18 May, 2018
10	The Japanese MHLW research team	Report	Report of the Japanese MHLW research team	19 June, 2018
11	AC2020 Joint Committee	Statement	Proposal for constructing medical and first responding system in event-site during Tokyo Olympics 2020	24 July, 2018
12	AC2020 Joint Committee	Recommendation	Consortium proposal of requirements for medical and EMS staff, version 1	5 Sep, 2018
13	Tokyo Medical Association	Event news	Workshop program on disaster responses for Tokyo Olympic and Paralympic Games by Tokyo Medical Association	19 Sep, 2018
14	Japanese Association for Surgery of Trauma	Guideline	Guideline of treatment for trauma by gunshot and explosion	20 Sep, 2018
15	Japanese Society for Aeromedical Services	Overseas invited lecture	Prehospital emergency medical care at the 2020 Tokyo Olympics – based on the experience of London helicopter EMS response at the 2012 London Olympics	12 Oct, 2018
16	AC2020 Joint Committee	Recommendation	Consortium proposal of requirements for medical and EMS staff, version 2	18 Oct, 2018
17	The Japanese Society of Intensive Care Medicine	Report	Guidance for disaster responses and preparedness in ICU	5 Nov, 2018
18	Japanese Society for Emergency Medicine	Guideline	Guideline of medical care for heatstroke	12 Dec, 2018
19	Japanese Society for Emergency Medicine	Guideline	Guideline of medical care points for visiting foreigners	12 Dec, 2018
20	National Center for Global Health and Medicine	Report	Report of symposium on medical preparedness for Tokyo Olympic and Paralympic Games 2020	21 Dec, 2018
21	The Japanese Association for Emergency Nursing, The Japan Academy of Critical Care Nursing, The Japanese Society for Emergency	Guideline	Guideline for nurses on Tokyo Olympic and Paralympic Games 2020	19 Feb, 2019

Table 3. (Continued)

No.	Organization in charge of document preparation	Document type	Title of document	Uploaded date
22	Medicine, The Japanese Society of Intensive Care Medicine, The Japan Society for Infection Prevention and Control, The Japanese Association of First Aid and Emergency Medicine AC2020 Joint Committee	Recommendation	The curriculum and program for the knowledge and skills training necessary for medical staff during the event have been started	19 June, 2019
23	Japanese Orthopaedic Association		Questionnaire results about correspondence at the time of genital injury	29 July, 2019
24	Japanese Association for Infectious Diseases	Manual	Response to inbound infectious diseases, for Tokyo 2020 Games: infectious diseases quick reference	29 July, 2019
25	Japanese Society for Burn Injuries	Report updated	Survey on the current state of medical care for severe burns, Heisei 30th, supported by Administrative Promotion for Survey of the Ministry of Health, Labor, and Welfare.	23 Aug, 2019
26	Japanese Association for Acute Medicine	Report	Committee visit report on heat stroke and hypothermia	12 Sep, 2019
27	Japanese Association for Acute Medicine	Statement	Symposium session "Emergency and disaster medical system for international mass gathering events"	7 Oct, 2019
28	Japanese Association for Acute Medicine	Report	Panel discussion in "Activities and issues for the Academic Consortium on Emergency Medical Service and Disaster Medical Response Plan during the Tokyo Olympic and Paralympic Games in 2020"	7 Oct, 2019
29	AC2020 Joint Committee	Recommendation	Medical staff training for the athletes in the venue has been started by the program created by the consortium	24 Nov, 2019
30	Special Research in Health and Labor Sciences	Guideline	Fourth generation agents: medical management guidelines (updated 18 Jan, 2019) (in Japanese translation)	16 Jan, 2020
31	Japanese Society of Anesthesiologists	Guideline	Guideline of in-hospital response for mass casualty incident: the final version	3 Feb, 2020
32	Japanese Society for Infection Prevention and Control	Guideline	Instructional video in countermeasure for imported infectious disease "To prevent an outbreak: infection control measures we all can start and deal with"	3 Feb, 2020
33	AC2020 Joint Committee	Statement	Activities of response to COVID-19 by AC2020	17 Mar, 2020
34	Japan Pediatric Society	Manual	Online QQ: Guide for pediatric medical emergency	5 June, 2020
35	AC2020 Joint Committee	Guideline	Guideline for holding training course of emergency/disaster medicine during the epidemic of COVID-19	27 July, 2020

AC2020, Academic Consortium on Emergency Medical Services, Disaster Medical Response Plan during the Tokyo Olympic and Paralympic Games 2020; EMS, emergency medical service; ICU, intensive care unit; MHLW, Ministry of Health and Welfare; QQ, emergency.

medical care and nursing on themes of heatstroke, foreign visitors to Japan, burns, gunshot wounds and bomb injuries, intensive care unit operation, and infectious diseases (Table 3). AC2020 formulated recommendations for medical staff requirements, and also drafted a curriculum and program for the knowledge and skills training necessary for the staff (Table 4). At the request of TOC, related academic societies and organizations have led the development of a training program with 30 videos for medical staff at the venue (Figs. 3 and 4). Currently, the Education and Training Working Group of AC2020 is exploring remote training methods using this educational content especially for skills training. The training courses are progressing in sequence using this content. Over the last 20 years, we have a wealth of experience in the development and implementation of off-the-job training courses for citizens and medical staff, with the aim of improving quality through standardization of medical care. A number of organizations worked together to formulate teaching materials and programs in a short period of time based on their achievements. Recommendations regarding these staff requirements and guidelines and teaching materials are widely taken up, and reflected and utilized in the training plan not only by TOC, but also by local governments, medical associations, and other related organizations at each venue.

The effects of the framework of the AC2020 are the great impact of the information transmitted from many organizations, the spread of information from each academic society site, and the rapid transmission of information based on the ease of building a collaborative system in related fields. A brief summary of activities of each member society of the AC2020 is shown in Appendix S1.

CORRESPONDENCE TO INFECTIOUS DISEASE

MEASURES AGAINST INFECTIOUS diseases have been initially taken from the viewpoint of responding to bioterrorism. For example, the government is importing five highly deadly viruses, such as Ebola and Lassa fever, to verify the accuracy of diagnostic tests under development.²⁸ The Tokyo Metropolitan Government has built an infectious disease emergency transport monitoring system based on an analysis of ambulance transport cases.²⁹ The WHO has published guidance on risk assessment of mass gathering events in the COVID-19 epidemic, emphasizing the importance of continuous risk assessment.^{30,31} In order to hold the 2020 Tokyo Olympics in the international epidemic of COVID-19, continuous status and trend monitoring and an accurate assessment of the current situation based on it are indispensable. At the same time, the preparation of surge capacity and

Table 4. Control of infectious diseases during mass gathering events

Title	Health-care workers			E-learning Total training time 2.5–3 h	Modular skills training Total training time 4 h
	Dr	Ns	Other		
General issues					
Medical control and regional EMS system	⊙	⊙	○	⊙	
Medicine at mass gathering	⊙	⊙	○	⊙	
Medical care points for visiting foreigners	⊙	⊙	○	⊙	
Control of infectious disease	⊙	⊙	○	⊙	
Common issues					
Resuscitation: BLS/AED	⊙	⊙	⊙	⊙	⊙
Resuscitation: ALS	⊙	⊙		⊙	⊙
Initial approach for trauma	⊙	⊙	○	⊙	⊙
First aid including tourniquet use	⊙	⊙	⊙	⊙	⊙
Triage for MCI, radio communication	⊙	⊙	○	⊙	⊙
Special issues					
Heatstroke medical treatment including ice pool	⊙	⊙	○	⊙	
Gun wound/blast injury	⊙	⊙	○	⊙	
Toxidrome	⊙	⊙	○	⊙	
Lightning strike	⊙	⊙	○	⊙	

⊙, required; ○, optional; AED, automated external defibrillation; ALS, advanced life support; BLS, basic life support; Dr, doctor; EMS, emergency medical service; MCI, mass casualty incident; Ns, nurse.

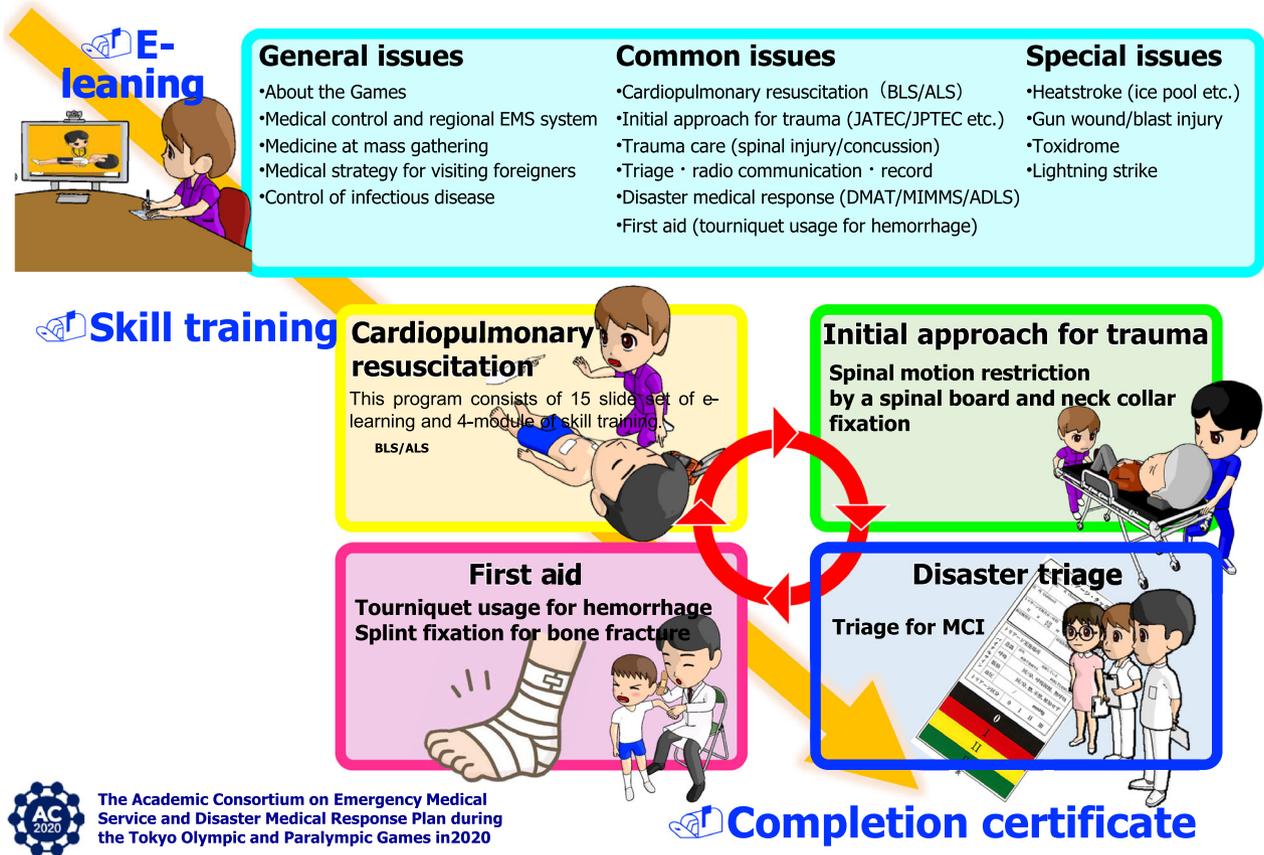


Fig. 3. Training program of medical staff for the spectators of the Tokyo Olympic and Paralympic Games in 2020 (E-learning lecture and skills training for 4 h). ADLS, advanced disaster life support; ALS, advanced life support; BLS, basic life support; DMAT, disaster medical assistant team; EMS, emergency medical services; JATEC, japan advanced trauma evaluation and care; JPTEC, japan prehospital trauma evaluation and care; MCI, mass casualty incident; MIMMS, major incident medical management and support.

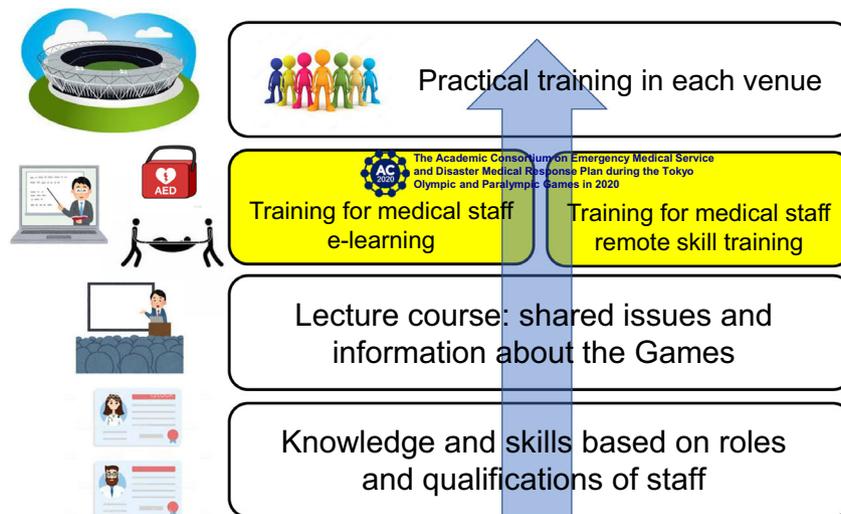


Fig. 4. Framework of training of venue staff.

the system for systematically and efficiently implementing these must be promoted by gathering the power of all related organizations.

In the future, we would like to use the abbreviation “MASS Gathering” to capture the salient features of these management tactics: Monitoring, Assessment, Surge capacity, and Systems. MASS Gathering could be used as a keyword for dealing with the double risks of this mass gathering event and COVID-19.

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REFERENCES

- World Health Organization. Public health for mass gatherings: key considerations (Interim Guidance). <https://apps.who.int/iris/rest/bitstreams/717805/retrieve>, 1 January 2015.
- Milsten AM, Maguire BJ, Bissell RA, Seaman KG. Mass-gathering medical care: a review of the literature. *Prehosp. Disaster Med.* 2002; 17: 151–62.
- De Lorenzo RA. Mass gathering medicine: a review. *Prehosp. Disaster Med.* 1997; 12: 68–72.
- Arbon P. The development of conceptual models for mass-gathering health. *Prehosp. Disaster Med.* 2004; 19: 208–12.
- Rodriguez-Morales AJ, Bonilla-Aldana DK, Balbin-Ramon GJ *et al.* History is repeating itself: probable zoonotic spillover as the cause of the 2019 novel Coronavirus Epidemic. *Infez. Med* 2020; 28: 3–5.
- Morimura N, Katsumi A, Koido Y *et al.* Analysis of patient load data from the 2002 FIFA World Cup Korea/Japan. *Prehosp. Disaster Med.* 2004; 19: 278–84.
- Wilbert-Lampen U, Leistner D, Greven S *et al.* Cardiovascular events during World Cup soccer. *N. Engl. J. Med.* 2008; 358: 475–83.
- Jena AB, Mann NC, Wedlund LN, *et al.* Delays in emergency care and mortality during major U.S. marathons. *N. Engl. J. Med.* 2017; 376: 1441–50.
- Akashi Citizens Summer Festival Accident Investigation Committee. Accident investigation report at the 32nd Akashi Citizens Summer Festival. 2002; 12–27. (in Japanese).
- Ishii N, Nakayama S, Nakamura M *et al.* Akashi citizens summer festival fireworks festival crowd accident. *Tiryogaku.* 2002; 36: 993–8. (in Japanese).
- Feliciano DV, Anderson GV Jr, Rozycki GS *et al.* Management of casualties from the bombing at the Centennial Olympics. *Am. J. Surg.* 1998; 176: 538–43.
- Boyle P, Haggerty KD. Planning for the worst: risk, uncertainty and the Olympic Games. *Br. J. Sociol.* 2012; 63: 241–59.
- Gates JD, Arabian S, Biddinger P *et al.* The initial response to the Boston marathon bombing: lessons learned to prepare for the next disaster. *Ann. Surg.* 2014; 260: 960–6.
- Hirsch M, Carli P, Nizard R *et al.* The medical response to multisite terrorist attacks in Paris. *Lancet.* 2015; 386: 2535–8.
- Haug CJ. Report from Paris. *N. Engl. J. Med.* 2015; 373: 2589–93.
- Borrow R. Meningococcal disease and prevention at the Hajj. *Travel Med. Infect. Dis.* 2009; 7: 219–25.
- Tezer H, Gülhan B, Simge Gişi A *et al.* The impact of meningococcal conjugate vaccine (MenACWY-TT) on meningococcal carriage in Hajj Pilgrims returning to Turkey. *Hum. Vaccin. Immunother.* 2020; 16: 1268–71.
- European Centre for Disease Prevention and Control, Rapid Risk Assessment. Outbreak of invasive meningococcal disease in the EU associated with a mass gathering event, the 23rd World Scout Jamboree in Japan. 21 August 2015 <http://ecdc.europa.eu/en/publications/Publications/Meningococcal-disease-scouts-EU-August-2015.pdf> (accessed Aug 17, 2020).
- Meningococcal disease in Scouts returning from international Jamboree HPS Weekly Report, 18 August 2015, Volume 49 No 2015/33. <http://www.hps.scot.nhs.uk/documents/ewr/pdf/2015/1533.pdf> (accessed Aug 17, 2020).
- Kim K, Jang JY, Moon G *et al.* Experiences of the emergency department at the pyeongchang polyclinic during the 2018 PyeongChang Winter Olympic Games. *Yonsei Med. J.* 2019; 60: 474–80.
- Lund A, Turrís SA, Bowles R *et al.* Mass-gathering health research foundational theory: part 1 - population models for

- mass gatherings. *Prehosp. Disaster Med.* 2014; 29: 1–7.
- 22 Turris SA, Lund A, Hutton A *et al.* Mass-gathering health research foundational theory: part 2 - event modeling for mass gatherings. *Prehosp. Disaster Med.* 2014; 29: 1–9.
- 23 Ohashi N. Ideal state of the rear hospital at a mass gathering event—from the actual situation of emergency medical care at the Science Expo. *J. J. Acute Med.* 1987; 11: 213–8.(in Japanese).
- 24 Okudera T. Emergency medical services system at the Nagano Olympic Winter Games. *J. J. Acute Med.* 2002; 26: 195–7.(in Japanese).
- 25 Miyagi Y, Maeshiro Y. Emergency medical services system at the time of the summit. *J. J. Acute Med.* 2002; 26: 198–204.(in Japanese).
- 26 Morimura N, Katsumi A, Koido Y *et al.* Monitoring system for the information of emergency patients related to the 2002 FIFA World Cup Games in Japan via Internet Mailing List. *Jpn. J. Disaster Med.* 2004; 8: 249–57.(in Japanese).
- 27 Academic Consortium one emergency medical services and disaster medical response plan during 2020. Olympic and Paralympic Games in Tokyo. 2020. <http://2020ac.com/> (accessed Oct 14, 2020).
- 28 Zastrow M. Why Japan imported Ebola ahead of the 2020 Olympics. *Nature* 2019; 574: 306–7.
- 29 Sugishita Y, Sugawara T, Ohkusa Y *et al.* Syndromic surveillance using ambulance transfer data in Tokyo, Japan. *J Infect Chemother.* 2020; 26: 8–12.
- 30 McCloskey B, Zumla A, Ippolito G *et al.* Mass gathering events and reducing further global spread of COVID-19: a political and public health dilemma. *Lancet.* 2020; 395: 1096–9.
- 31 WHO. WHO mass gathering COVID-19 risk assessment tool – Generic events. <https://www.who.int/publications/i/item/10665-333185> July 10, 2020. (accessed Oct 14, 2020).

SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Appendix S1. Brief summary of the activities of each academic society.