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SOCIETY FOR DISASTER MEDICINE & PUBLIC HEALTH

Bottom-Up Approach to Establish Coordination Mechanisms for Disaster Preparedness Among Largely Private Health-Care Providers in Central Tokyo

Minato Disaster Medical Care System Study Group*

Abstract

In Japan, despite its private-dominant and disjointed health-care system, national initiatives to coordinate various types of health-care facilities are lacking. Municipal governments manage this task with limited resources. This study describes a successful example of a bottom-up approach to create city-wide collaboration for disaster preparedness. In Minato City, located in central Tokyo, a group of physicians created a project involving a city-wide disaster medical care drill. The city Public Health Center, in charge of health-care systems including disaster medicine, helped the group to increase proponents of the project. The city-wide disaster drill started in November 2017; thereafter, the drills were held every year. Participation in drills by various health-care personnel helped establish a city-wide system for disaster medical care, coordination mechanisms among stakeholders, increased motivation among health-care personnel, and development of in-hospital systems. This approach is flexible and applicable to various forms of health-care systems in other areas.

To deal with surges in patient numbers arising from disasters and public health emergencies, which single hospitals cannot manage on their own, highly integrated and coordinated disaster medical care systems are critical. Public-dominant health-care systems require well-organized command-and-control mechanisms, and private-dominant systems require close and well-planned sector-wide partnerships. "Health care coalitions" (HCCs) in the United States are an example of partnerships among largely private health-care providers and other stakeholders. They are voluntary coordination mechanisms between hospitals, public health agencies, and emergency management agencies, supported by and invested in by the federal government.[1,2]

In Japan, similar coordination mechanisms are required for disaster preparedness because of the country's private-dominant health-care system and frequent natural disasters, including earthquakes and floods.[3,4] However, such mechanisms are underorganized in Japan for 2 main reasons: first, the national government has no specific initiatives or funds for this purpose, and municipal governments are in charge of disaster medical care and may allocate their own small budgets; second, a large number of small-sized private organizations provide health care throughout the country, contributing to good health-care access under the public health insurance system. However, this complicates area-wide collaborations because the organizations sometimes compete economically in the same area.[4]

Nonetheless, a city-wide disaster medical care drill project in central Tokyo has succeeded in forming collaborations between various health-care providers and the municipal government, although it is still in the early stage of coalition development. It was initiated as a voluntary endeavor by physicians in the private sector without government funding. This case study describes the bottom-up approach of this project and demonstrates its potential for coordinating stakeholders with limited resources to prepare for disasters in health-care systems dominated by small private organizations.

Organizational Context

Minato City (Minato-ku), 1 of 23 sub-divisions (wards) in the special administrative district of central Tokyo, is located in a core business area with many commercial facilities and office complexes. It has an area of 20.37 km^2, a residential population of 259,893, and a daytime population of approximately 970,000 (as of October 1, 2020).[5] Like other ordinary municipalities, the 23 sub-divisions are autonomous and have their own assembly, executive branch, and elected mayor. However, their relationship with the prefectural government (the Tokyo Metropolitan Government) differs from that between other municipalities and prefectures. The Tokyo Metropolitan Government is responsible for area-wide tasks including water supply and fire services, usually undertaken by municipalities.[6] The Minato City Government has its

Table 1. Framework and organizations for disaster management in Minato City

Framework and organizations	Explanation
Legislations and plans • Basic Act on Disaster Management (a national law) • Metropolitan Regional Disaster Management Plan • Metropolitan Disaster Medical Care Guidelines • Minato Ordinance for Disaster Management • Minato Disaster Management Plan	According to these regulations and plans, municipalities take responsibility for disaster management and the provision of medical care during disasters in their jurisdictions. Minato City has developed its Disaster Management Plan according to its Ordinance for Disaster Management. The plan includes the provision of disaster medical care, which is guided by the Tokyo Metropolitan Regional Disaster Management Plan and the Metropolitan Disaster Medical Care Guidelines. In Minato City, the Public Health Center would serve as the headquarters for disaster medical care.
Hospitals • Disaster base hospitals • Base-affiliated hospitals • Supporting hospitals (As of January 2021, Minato City has 4 base hospitals, 2 base-affiliated hospitals, and 6 supporting hospitals)	In Tokyo, all hospitals fall into one of these categories. The base hospitals treat severely injured or ill patients, affiliated hospitals treat moderate cases, and supporting hospitals treat non-emergent cases.
Minato Committee for Disaster Management (Members are city government officers)	This committee deals with disaster management issues in general.
Minato Coordination Council for Disaster Medical Care (Members are representatives of the city government, public health center, police, fire services, medical association, dental association, pharmaceutical association, and all hospitals in the city, as well as disaster medical care coordinators)	This council coordinates all health-care stakeholders in the city to ensure their effective and smooth collaboration for the provision of necessary medical care in disasters. The following disaster-related issues are discussed by the committee: • Management of disaster medical care provision • Collaboration and communication between stakeholders • Transportation of patients • Joint disaster medical care drills • Storage and supply of drugs
Hospital Section subcommittee of Minato Coordination Council for Disaster Medical Care (Members are representatives of the public health center and hospitals in the city, as well as disaster medical coordinators)	This subcommittee deals with practical and specific collaboration and coordination between the public health center, hospitals, and disaster medical coordinators.
Municipal Disaster Medical Coordinator (Minato City has appointed three coordinators: one from a disaster base hospital and two from the city medical association) *Tokyo Metropolitan Government has assigned Metropolitan Disaster Medical Coordinators who cover the whole Tokyo area and Regional Disaster Medical Coordinators who cover medical districts.	Municipal Disaster Medical Coordinators are appointed from experts in disaster medicine working in the city. Their roles are to identify the health-care needs in the affected areas and support the Public Health Center, which serves as the headquarters for disaster medical care, for the purposes of appropriately allocating health-care resources. They also coordinate between remaining resources in the city and external assistance (eg, equipment and assistance teams from outside the affected areas) in cooperation with Regional and Metropolitan Coordinators.
Central Tokyo Medical District* Regional Coordination Council for Disaster Medical Care (Members are representatives of local medical associations, local dental associations, local pharmaceutical associations, disaster base hospitals, municipalities, and municipal public health centers) *Medical districts, referred to as *Niji-Iryo-Ken* or secondary health-care areas, are units for health-care service planning within which most health-care needs are expected to be fulfilled. Usually, a medical district consists of several municipalities.	Area-wide issues in disaster medical care that cannot be resolved within each municipality are managed at medical district level. As the medical districts have no administrative organizations, the metropolitan government set up the Medical District Regional Coordination Council for Disaster Medical Care to coordinate the municipalities. Minato City, together with four neighboring municipalities, belongs to the Central Tokyo Medical District, which is located in the center of the special administrative area of Tokyo. The committee holds a meeting once or twice a year to discuss management plans and exchange information.
Health Professional Associations • Minato Medical Association • Azabu-Akasaka Dental Association • Shiba Dental Association • Minato Pharmaceutical Association	These associations support medical care in first-aid stations, hospitals, and shelters responding to the requests from the Disaster Medical Coordinators. Their members (mostly private practitioners working at clinics or pharmacies) are dispatched to the first-aid stations to support triage, treatment, and to dispense drugs.
Shelters	Minato City plans to set up shelters for the city's residents: 57 for the general public and 21 for those in need of special support (eg, elderly people, those with diseases or disabilities, expectant mothers, and infants).
First-aid stations	These stations are to be set up adjacent to hospitals during the immediate phase (within 72 h) of disasters with triage and first aid functions. Severely injured or ill patients would be transferred to tertiary care hospitals.
In-shelter medical care stations	These stations are to be setup in the disaster shelters in the sub-acute phase (after 72 h) of disasters to meet chronic medical care needs.

Note: "Hospitals" are defined as medical care facilities with 20 or more beds.

own public health center, which manages and supervises health services including disaster medical care.

In Japan, municipalities mainly take charge of disaster management in their jurisdictions under the Basic Act on Disaster Management (Table 1). Guided by national and prefectural policies, municipalities develop community disaster management plans, which include disaster medical care. In Tokyo, the Metropolitan Regional Disaster Management Plan and Disaster

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Table 2. Nationwide disaster medical system

System	Description
Medical assistance teams	Various other medical organizations, including DMATs, are dispatched to the affected area from outside to provide medical assistance. The DMATs are medical teams with specialized training to operate in the acute phase of a disaster, which emphasize mobility and usually consist of a small group of four to five members (doctors, nurses, and co-medical staff). Their roles are medical assistance during the first 48-72 h of the disaster, including support for base hospitals, medical administration, information collection, triage, treatments, intra-regional transportation, and wide-area transportation. They belong to DMAT designated hospitals among the disaster base hospitals and are dispatched based on requests from governors of the affected prefectures. Prefecture governments are responsible for DMAT operations. The MHLW formulates guidelines, standardizes training, certifies and registers DMAT personnel, and provides support to prefectures. Similar assistance teams such as Japan Medical Association Team (belonging to Japan Medical Association), Disaster Psychiatric Assistance Team (specialized in psychiatric assistance), and Japan Rehabilitation Assistance Team (specialized in rehabilitation) are also dispatched.
Disaster base hospitals	The prefectural government designates disaster base hospitals. They should be able to maintain their functions in the event of a major disaster (especially in terms of building earthquake resistance) and have facilities to treat large numbers of injured and sick patients and to transport patients to and from distant regions (a helipad is required). In addition to serving as a base for medical care within the affected areas, it will also provide support to the affected area from unaffected areas. Some base hospitals are DMAT designated hospitals and have DMATs, which are dispatched upon request. When evacuating patients from affected areas, base hospitals outside the areas will mainly accept patients.
Wider-regional air transport system	A system will be established to transport critically injured or ill patients from within the affected area to outside the area by air. By using a fixed-wing aircraft, patients can be transported to anywhere throughout the country. Patients will be temporarily accommodated and stabilized in the SCU, which is a wide-area transport base within the disaster area, and then transported by air to SCU outside the affected area, from where they will be transported via an ambulance to the disaster base hospital near the SCU.
Emergency Medical Information System	Emergency Medical Information System is an Internet-based system managed by MHLW to provide up-to-date medical resource information to stakeholders in the event of a disaster (MHLW, local governments, medical institutions, health professional associations, public health centers, and fire departments). Each prefecture operates its own system to collect the following information: the disaster status of each medical facility, the availability of patient beds, and the status of DMAT activities. The information in the prefectural system is shared throughout the country with two backup centers in the east and west forming a robust system.

Abbreviations: DMAT, Disaster Medical Assistance Team; MHLW, Ministry of Health, Labour and Welfare; SCU, staging care unit.

Medical Care Guidelines stipulate the roles of health-care providers and municipal governments. All hospitals are assigned roles for disasters, and municipalities should have their own community disaster management plans to prepare shelters and first-aid stations and coordinate with hospitals. In Minato City, the Coordination Council for Disaster Medical Care—consisting of representatives from the city government, public health center, police, fire services, and health-care providers—advises on specific disaster medical care plans.[7,8] The Council includes municipal disaster medical care coordinators, who are appointed from among physicians working in the city to support the public health center to manage disaster medical care. The Council has a Hospital Section sub-committee that focuses on collaborations and coordination between hospitals. The Minato Public Health Center serves as the headquarters for disaster medical care management and coordination. In Tokyo, area-wide issues regarding disaster medical care, which cannot be resolved within each municipality, are managed at the medical district level, consisting of several municipalities. Minato City belongs to the Central Tokyo Medical District, which has a Regional Coordination Council for Disaster.

The municipal disaster medical systems should function in collaboration with the nationwide disaster management system that allocates resources to disaster-affected areas (Table 2).[9,10] The municipal disaster medical care coordinators, in cooperation with the regional and metropolitan coordinators, allocate the ward's remaining medical resources and external assistance. The disaster base hospitals designated throughout the country to lead medical care in disaster-affected areas also provide assistance to affected areas despite being situated in an unaffected area. In large-scale disasters, various assistance teams enter the affected area from unaffected areas throughout the country. For example, disaster medical assistance teams (DMATs) are dispatched from disaster base hospitals. In addition, a wider-regional air transport system is established to mitigate the excess medical demands in affected areas; critical patients are transported to disaster base hospitals outside the affected area. The Emergency Medical Information System (EMIS) is an Internet-based system that collects and shares disaster-related information nationwide; it gathers information such as the available medical resources and demands as well as DMAT activities in the affected areas to expedite the aforementioned coordination.

Problem

The Great East Japan Earthquake that took place in March 2011, and subsequent consecutive disasters that struck Japan, triggered the enhancement of disaster management plans, including medical care. The 2012 and 2014 amendments of the Tokyo Metropolitan Regional Disaster Management Plan and subsequent Tokyo Metropolitan Disaster Medical Care Guidelines[7] specified the municipalities' responsibilities and assigned roles to all hospitals depending on their capacities and characteristics. The 2012 amendment introduced "First-aid stations" that should be set up adjacent to hospitals to provide triage and first aid, in addition to medical care stations in disaster shelters. It also introduced municipality level disaster medical care coordinators. On the advice of the disaster medical care coordinators, municipalities should delegate station management to the hospitals and coordinate their functions. Materializing these specifications requires

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negotiation, collaboration, and agreement with stakeholders, as well as effective disaster drills.

When the city-wide drill project was proposed, Minato City was yet to effectively administer the responsibilities specified by the regional and community disaster management plans and guidelines, with many issues still to be addressed. The hospitals in the city, except for the disaster base hospitals, had no experience, plans, or exercises to manage the first-aid stations. Thus, initial requirements to substantiate the disaster management plans involved negotiations with the hospitals for setting up of the stations adjacent to or even in the hospital premises; securing resources for the station management, such as tents, equipment, and drugs; developing concrete plans for the station management; and conducting practical drills. Particularly important were triage and coordination among hospitals to transfer patients to appropriate hospitals.

In addition, mechanisms to coordinate disaster medical system had not existed in Minato City. City-wide large-scale disaster management drills had not been conducted to assess and improve the logistics of resources and coordination abilities among stakeholders; however, there had been small-scale communication exercises among disaster base hospitals and the Minato Public Health Center, or in-hospital management training in individual hospitals. The Tokyo Metropolitan government had conducted large-scale disaster management drills every year, which experts from Minato City also attended. However, such drills were just an exhibition of equipment and skills without practical exercises in each of the organizations and coordination among them. No collaboration or communication had existed between hospitals and surrounding facilities or communities that may have had medical needs and could provide disaster management support.

Solution

Leading Stakeholders

Physicians involved in disaster medical care planning in Minato City (physicians in tertiary care hospitals and directors of city medical associations, who were members of the Coordination Council) shared their perception that effective collaboration mechanisms and disaster drills were lacking and that disaster plans needed to be realized to address issues revealed in the frequent disasters of the early 2010s. They were well acquainted with each other as most of them were emergency physicians who had attended local meetings related to emergency medical care, which facilitated their collaboration. They found opportunities to discuss the future directions of the city's disaster management and formed a team to propose a project plan for city-wide disaster medical care drills.

The director of the Minato Public Health Center agreed with the physicians' perceptions, accepted the proposal, and supported the team. The Public Health Center provided a venue for preparatory meetings that took place every 1 or 2 mo, recorded meeting minutes, and provided advice so that the project suited the city's Minato Disaster Management Plan. This support greatly assisted the project team, which started as a small group consisting of a few physicians, and gradually expanded to include proponents from various health-care facilities.

Establishing the Hospital Section

To respond to the specifications in the Tokyo Metropolitan Disaster Medical Care Guidelines regarding the roles of hospitals and to emphasize their coordination mechanisms in the provision of disaster medical care, Minato City established the Hospital Section sub-committee under its Coordination Council for Disaster Medical Care in 2015. The Hospital Section facilitated the discussion about city-wide disaster medical care drills.

City-Wide Joint Disaster Medical Care Drills

In 2016, the physicians' project team started to develop a city-wide disaster medical care drill that involved all health-care providers in the city. To facilitate participation from various types of hospitals, they limited the drill contents to essential practices, such as setting up a first-aid station and triage, and communication exercises. Their first goal was to create a city-wide joint drill that covered all health facilities and personnel in the city to establish coordination mechanisms, and to gradually raise the level of practice in the drill to develop each hospital's abilities. To include not only hospital staff but also health-care personnel in their private practices, the project integrated local medical, dental, and pharmaceutical associations (as most private practitioners belonged to such organizations).

The first city-wide joint disaster medical care drill was held in November 2017. Subsequently, it was held every year until and including 2019, and was canceled in 2020 due to the novel coronavirus pandemic (Table 3). The drills mainly consisted of setting up first-aid stations, triage exercises, communication exercises, and operation tests of facilities and equipment in the participating hospitals. The medical, dental, and pharmaceutical associations dispatched their members to the hospitals to support the management of the stations, particularly the triage, and the hospitals issued temporary staff IDs for them to expedite their activities in the hospitals. The dispatch destinations of the medical association members changed every year so that they could observe activities in various hospitals. Pharmaceutical associations conducted drug dispensary exercises in a hospital in 2019. The number of participants increased and the drill contents progressed year by year, with all hospitals participating in 2019. In 2018, interhospital patient transfer exercises were conducted, and in 2019, a drug dispensary appeared for the first time in 1 venue, and digital radio apparatus was introduced.

Agreement Between the City Government and Hospitals

Reflecting the coordination mechanisms and collaborations among stakeholders developed over the past few years, the city government and all hospitals in Minato City concluded an agreement regarding the management of first-aid stations. According to this agreement, the Minato Public Health Center would allocate necessary resources to all hospitals to facilitate prompt establishment of the first-aid stations after the disaster base hospital had already received the resource allocation. The resources included tents, lights, generators, and drugs. Hospitals were expected to store and maintain the allocated resources in their premises to manage first-aid stations. It was also agreed that the hospitals could set up the stations based on their own judgment without waiting for instructions from the Public Health Center (ordinarily, instructions from the Public Health Center were required before the agreement).

Obstacles to Be Overcome

Some obstacles had to be overcome to achieve these collaborations. As most hospital staff were indifferent to disaster preparedness, which is not directly related to their daily tasks, their support

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Table 3. City-wide joint disaster medical care drills in Minato City

	Participants	Contents
2017 November	• 12 out of 13 hospitals • Public health center (*n*=21) • Medical Association (*n*=42) • Azabu-Akasaka Dental Association (*n*=1) • Shiba Dental Association (*n*=7) • Pharmaceutical Association (*n*=24) Total participants (*n*=721)	• Setting up first-aid stations (arranging a venue for the station and erecting a tent) and triage drills in 8 hospitals • Communication drills (situation report to the headquarters and radio communication exercises) in 12 hospitals • Dispatch of public health center staff to the 12 hospitals
2018 September	Joint program with Tokyo Metropolis and Chuo City[a] • 4 hospitals (*n*=25) • Public health center (*n*=26) • Medical Association (*n*=10) • Azabu-Akasaka Dental Associations (*n*=2) • Shiba Dental Association (*n*=2) • Pharmaceutical Association (n=13) • Judo Therapist Association (*n*=4) Total participants (*n*=334)[a]	• Disaster emergency medical care drills • Transporting medical staff and patients by ship
2018 November	• 10 out of 13 hospitals • Public health center (*n*=6) • Medical Association (*n*=21) • Azabu-Akasaka Dental Association (*n*=7) • Shiba Dental Association (*n*=11) • Pharmaceutical Association (*n*=3) Total participants (*n*=598)	• Setting up first-aid stations (arranging a venue for the station and erecting a tent) and triage drills in 6 hospitals • Communication drills (situation report to the headquarters and radio communication exercises) in 10 hospitals • Inter-hospital transfer drills using hospital ambulance vehicles • Observation of other hospitals
2019 November	• 12 hospitals out of 12[b] • Public health center (*n*=31) • Medical Association (*n*=37) • Azabu-Akasaka Dental Association (*n*=16) • Shiba Dental Association (*n*=17) • Pharmaceutical Association (*n*=19) Total participants (*n*= 914)	• Nighttime drills (operation test of electric lights and generators[c]) • Setting up first-aid stations (arranging a venue for the station and erecting a tent) and triage drills in 10 hospitals • Setting up a drug dispensary post in one hospital • Communication drills (situation reports to the headquarters and radio communication exercises[d]) in 10 hospitals • Dispatch of public health center staff to the 12 hospitals

[a]The total number of participants included those from outside Minato City because this was a joint program with Tokyo Metropolis and Chuo City.
[b]One of the 13 hospitals discontinued their practice.
[c]The public health center distributed lights and generators.
[d]Digital radio apparatus was introduced in 2019.

for the drills was minimal at the beginning. Some of them (particularly nurses) participated in the drills as part of their duties; thus, shift work scheduling became irregular and extra payments were made for overtime work with respect to the night-time drills. Ensuring the participation of all hospitals requires very careful scheduling. As some of the hospital directors were reluctant to agree with the city government, the Public Health Center director visited every hospital to discuss disaster preparedness with them and to persuade them to participate.

Outputs

Collaborations in the city-wide joint disaster medical care drills have yielded various effects. Opinions about the effects of the Coordination Council members (the authors of this study) were summarized and categorized (Supplementary Material). The indicted effects were summarized into 28 items, rated by the council members based on their importance, and categorized into 4 groups: city-wide system development, coordination mechanisms among the stakeholders, increased awareness and motivations, and development of in-hospital system and manual (Table 4). Of these effects, those that were highly rated (mean scores of 4 points or higher) were related to city-wide system development and collaboration among the stakeholders, including the agreement between the city government and the hospitals. Although not highly rated, effects that are beneficial to the expansion of collaboration to non-health sectors or nondisaster issues were also indicated.

The drills could identify various practical issues that need to be addressed. Some hospitals require reconsideration of venue arrangements for first-aid stations and drug dispensaries (location, layout, and access routes). In particular, hospitals with small land areas should carefully plan the location of triage and waiting zones that should accommodate a large number of people. Different considerations are required for different disaster occurrence timing (staff availability is low at night and on holidays; heat and cold weather should be considered in the venue arrangements). The need for resources has become clear (more radio apparatus, lights, helmets, and reporting forms are needed) and improvements in drill contents have been suggested (skill training, role clarification, and reallocation; procurement of human and material resources; standardization of drill contents; consideration of electric, water, or system failure; manual development; enhancing communication and collaboration among hospitals; and consideration of continuing usual tasks).

Discussion

Keys to Success

Collaborative activities to prepare for disaster medical care in Minato City have successfully been voluntarily formed without governmental initiatives or funding, although further development is required. This success is attributable to the bottom-up approach led by a group of physicians engaged in emergency and disaster

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Table 4. Effects of the collaborations and joint disaster medical care drills in Minato City

Descriptions of the effects	Mean score
City-wide system development	
Collaboration between the hospitals and the city medical association resulted in a system in which private practitioners (members of the medical association) support disaster medical care management in hospitals (disaster assistance physicians).	3.8
Introduction of digital radio apparatus, as an alternative to conventional communication methods, has contributed to the development of communication systems that enable real-time information gathering at the time of a disaster.	3.8
Collaborations between local government, hospitals, and health professional (medical, dental, and pharmaceutical) associations evolved into the specific and feasible city-wide disaster medical care system.	4.1
Roles of the stakeholders (hospitals, medical association, dental association, pharmaceutical association, public health center, city office, shelter, and community residents) could be specified and clarified.	3.8
It was confirmed that the city disaster medical care system can function to some extent during the daytime on weekdays when hospitals carry out regular functions.	3.7
The agreement between the city government and the hospitals has enabled efficient resource allocation for disaster management (resources to manage the first-aid stations are stored in the hospitals).	4.1
Each organization's available resources and capacities have become clear.	4.0
The drills identified practical issues to be addressed to improve the management of the first-aid stations (eg, rearranging the evacuation site to improve access from the road to the hospital and improved allocation of drugs and equipment).	3.5
The drills could include exercises to use transport modes other than the emergency medical services provided by the Tokyo Fire Department.	3.4
Collaboration with clinics providing home care enabled the drill planning team to obtain information about those with special needs (eg, elderly people living alone, those with disabilities, those receiving home medical care, dialysis patients) including their locations and conditions.	2.8
Coordination mechanisms among the stakeholders	
Collaborations have been consolidated between the city government, hospitals, and health professional associations through the preparatory meetings for, participation in, and debriefing after the drills.	4.4
The collaboration yielded the agreement between Minato city and the hospitals.	4.4
The strengthening of the collaboration on disaster management also favorably influenced collaborations in other respects: consultation with the public health center and inter-hospital patient transfers have become smooth.	3.6
The collaboration enabled rapid and coordinated response to the COVID-19 pandemic by creating the Minato City Liaison Committee for COVID-19.	3.4
Development of disaster medical care collaboration in the city facilitated communications with surrounding business entities regarding their urban development plans: there are future possibilities of contributions from health sectors to stranded-commuter issues and collaborations with the developers.	2.9
Increased awareness and motivations	
The collaboration and drills raised awareness and motivation among participants in all hospitals, including those whose staff were reluctant to participate.	4.1
It could be demonstrated to hospital staff how they would provide disaster medical care to the communities in addition to the continuity of the hospitals' regular functions through the drills (disaster management resources were allocated by the government and the drills included an exercise of setting up a triage area).	3.8
Participation from various departments in the hospital created good in-hospital teamwork.	3.3
Participation in the drills created a sense of belonging to the city-wide disaster medical care system.	4.0
Participants in the drills could learn from the exercise contents of other facilities, which yielded synergistic effects to raise awareness and motivation toward disaster medical care.	4.1
Participation in the drills raised awareness and motivation among the staff within each hospital.	3.1
Development of in-hospital system and manual	
Participation in the drills prompted all hospitals to prepare a manual for initial disaster management, which specifies what to do.	3.6
Participation in the joint drills has standardized the technical terms.	3.3
The collaboration framework including the city government, all hospitals in the city, and health professional associations legitimized the drills, which facilitated the attainment of support within each hospital for disaster preparedness and for the drills.	3.7
Through participation in the drills, the hospital staff could learn and become familiar with the storage places, types, and amounts of machinery and equipment for disaster management (tents, lights, and generators).	3.6
Through participation in the drills, the hospital staff could learn and become familiar with the use of machinery, equipment for disaster management (tents, lights, and generators), and systems (EMIS and BCPortal® [a]).	3.9
Through participation in the drills, the hospital staff could learn and become familiar with the action plans in disaster management, which improved their skills.	3.7
In the joint drills, participants could learn from the exercise contents of other facilities, which yielded synergistic effects to improve practices in each hospital.	3.8

Abbreviations: COVID-19, coronavirus disease 2019; EMIS, Emergency Medical Information System.
[a]An information sharing and communication tool to support implementation of business continuity plans for crisis management.

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Table 5. Future challenge

Providing care to those with special needs Those with special needs in disaster situations include elderly people, those with disabilities, those receiving home medical care, dialysis patients, expectant mothers, and infants. They tend to delay their evacuation and have poor access to health care in disaster situations. Providing appropriate medical care to such people requires: • The development of plans to provide care to this group and perform exercises. • Facilitation of participation in the drills by health-care facilities and personnel routinely providing care to this group (eg, home medical care clinics, dialysis centers, and nursing homes). Currently, the drills do not fully cover such facilities (only hospitals are covered). • Setting up special medical care stations for this group. • Collaboration with the relevant departments of the city office (eg, welfare department, elderly support department, and disaster management department).
Sector-wide and area-wide collaboration The collaboration activities do not cover all health-care facilities and personnel in the city, other sectors, or entities outside the city. Wider collaboration with such organizations requires: • Facilitation of participation in the drills by private general practitioners, who are not members of Minato Medical Association. General practitioners participate in the drills through the association's arrangements (some practitioners who provide home medical care are not members). • Collaboration with commercial facilities, business entities, schools, and community residents in the city. The disaster drills may include first aid training and dispatch of medical teams for these facilities that accommodate large numbers of workers, customers, and students in large spaces. Their large facilities may be used to accommodate minor cases after triage or people having difficulty in returning home (stranded commuters). Collaboration with the Council for the Stranded-commuter Issue should be considered. • Collaboration with other surrounding municipalities and their health facilities. Whereas collaboration mechanisms exist among municipalities within the Central Tokyo Medical District, no such mechanisms exist with surrounding municipalities outside the medical district. However, from a geographical viewpoint, Minato City is more connected to municipalities outside than those within the medical district. For example, in an earthquake, more injured victims may come into Minato City from municipalities outside than from those within the medical district. • Collaboration with external assistance. In a large-scale disaster, dealing with patient surge requires collaboration with disaster assistance teams from outside Tokyo and transfer of severely injured or ill patients to distant unaffected areas by wider-regional air transport system. Simulation training in this regard should be integrated into the drills.
Elaboration of plan and drills Each organization's role should be clearly defined, all stakeholders should appropriately serve their function in coordinated ways, and the current collaboration and drills should evolve into a regional business continuity management system. This requires: • Determination of the roles of hospitals, health professional (eg, medical, dental, and pharmacist) associations, and other organizations in the disaster medical care system depending on their scale, characteristics, structure, and abilities. For example, the roles of rehabilitation hospitals and dentists in the immediate phase should be specified. • Optimization of arrangement of personnel from outside the hospital to support the operations of the first-aid stations (eg, members of medical, dental, and pharmaceutical associations). • Strengthening of the capacities of each organization and minimizing inter-organization variation through standardized and coordinated drills. • Introducing evaluation mechanisms to assess drill achievements of each organization. Based on the evaluation, improvement plans should be developed. • Strengthening the command-and-control functions of the Public Health Center as the headquarters of the city's disaster medical care system. • Strengthening the referral network specific to disaster situations. As the ambulance system cannot be relied on in disasters, securing communications and transport means among the hospitals is crucial. • Expanding the drill contents. In addition to immediate phase management in the case of earthquakes, sub-acute phase management and other types of incidents should be included in the drills and disaster management plans (eg, provision of chronic medical care to people in the shelters and surge management in pandemics). • Expansion of the collaboration to non-health sectors (commercial facilities, business entities, schools, and community residents) in order to develop a specific regional business continuity management system.

medicine and clinical practices ranging from the primary to tertiary level. Ideas about coordination mechanisms in disasters took shape as a city-wide drill plan reflecting the group's knowledge and know-how fostered by their varied clinical experiences. This led to practical and feasible (let us start from where we can) rather than idealistic and dogmatic (disaster medicine should be like this) exercise programs so that various types of health-care facilities (from primary to tertiary and from acute to chronic care) could participate.

Another key to success is close collaboration between physicians and the Minato Public Health Center staff. While the physicians led the actual planning of the drills (determining the drill contents and scheduling), the Public Health Center provided substantial support for the planning procedures (providing venues, taking meeting minutes, and advising regarding government policies). In addition, support from the Public Health Centers contributed to the expansion of participation in drills. The involvement of the Public Health Center somewhat legitimized the planning activities, and collaboration efforts were finally realized by a formal agreement between hospitals and the city government.

Applicability Outside Organizations

Due to its flexibility, the bottom-up approach adopted in Minato City is applicable to various forms of health-care systems in other regions. Most municipalities in Japan have health-care systems largely served by various compositions of small- to middle-sized private sectors mixed with the public sector.[4] The top-down approach based on a publicly established strict command system would not work as each municipality may require its own form of collaboration while maintaining the autonomy of the private sector. In addition, the fact that strong initiatives or large funding support are unnecessary makes it affordable for small municipalities with scarce resources.

Challenges

Collaboration activities and joint drills are still in an early stage, and there are many challenges that need to be addressed (Table 5). First, the disaster drills conducted so far did not include sufficient exercises that took into account those with special needs (elderly people; those living alone, with disabilities, and receiving home

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medical care; dialysis patients; expectant mothers; and infants), who tend to have difficulties in accessing medical care during disasters.[11] The latest drill included private physicians providing home medical care to such people, which informed the drill planning team of the locations and conditions of such people. Integrating such information into Minato City's disaster planning would enable the development of specific evacuation and care plans for those with special needs, the number of whom is rapidly increasing in the Japanese super-aged society.

Second, sector-wide collaborations are still insufficient for a wider impact on disaster management. So far, the drills did not involve collaboration with clinics not affiliated with the Medical Association or with the Judo Therapist (Japanese traditional osteopathists/bonesetters) Association due to competing interests among the stakeholders, and did not cover facilities such as nursing homes because the main focus of the drills was the management of first-aid stations. These organizations may be integrated in future activities. Collaborations with surrounding commercial facilities, business entities, and schools should be developed given the large number of workers, customers, and students accommodated in these facilities in the daytime. During disasters, many of these people would stay in these facilities owing to difficulties in returning home or their medical needs.[12] Disaster drills that involve first aid training and dispatch of medical teams to these facilities may enable them to accommodate minor cases after triage at the first-aid stations.

To address area-wide medical needs that may exceed the available resources within the city, collaborations and communications with medical facilities and personnel outside the city, including those in remote areas, should be strengthened in the management plans and drills. During a large-scale earthquake, more injured victims would come into Minato City from municipalities outside than from those within the medical district. Excess demands should be managed through area-wide patient transfer, including wider-regional air transport to remote unaffected areas, and accepting external assistance teams (e.g., DMATs).[9,10] Additionally, training that involves sharing of information through the EMIS and simulation of area-wide transfer should be included.

Third, disaster management plans and drills should be expanded to incorporate regional business continuity management.[13] The current Minato City disaster medical care system still seems to be an assortment of each hospital's individual functions with great variations, and a lack of strong referral functions in disaster situations. We completed the first goal of doing something together. Each organization should specify its roles and improve its abilities and then, they should work in coordinated ways. To this end, inter-hospital variations in ability should be minimized, role allocation should be clearly described, and headquarter functions should be strengthened. Therefore, drill contents should be converted from "independently determined and conducted" to be more coordinated and standardized.

Conclusions

The collaborations and coordination mechanisms to prepare for disaster medical care in Minato City have been formed based on physicians' voluntary endeavors without governmental initiatives or funding, although the mechanisms are still in an early stage and many challenges have to be addressed. The bottom-up approach adopted in Minato City is flexible and may be applicable to various forms of health-care systems in other areas.

Supplementary Material. To view supplementary material for this article, please visit https://doi.org/10.1017/dmp.2021.326

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Conflict(s) of interest. None declared.

Ethical clearance. This was waived because consensus building was done among the authors, and human subjects were not included.

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Appendix 1

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