Express Railway Disaster in Amagasaki: A Review of Urban Disaster Response Capacity in Japan

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Abbreviations:
EMS = emergency medical service
ICS = incident command system
IIC = information and instruction center

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Abstract

Introduction: On the morning of 25 April 2005, a Japan Railway express train derailed in an urban area of Amagasaki, Japan. The crash was Japan's worst rail disaster in 40 years. This study chronicles the rescue efforts and highlights the capacity of Japan's urban disaster response.
Methods: Public reports were gathered from the media, Internet, government, fire department, and railway company. Four key informants, who were close to the disaster response, were interviewed to corroborate public data and highlight challenges facing the response.
Results: The crash left 107 passengers dead and 549 injured. First responders, most of whom were volunteers, were helpful in the rescue effort, and no lives were lost due to transport delays or faulty triage. Responders criticized an early decision to withdraw rescue efforts, a delay in heliport set-up, the inefficiency of the information and instruction center, and emphasized the need for training in confined space medicine. Communication and chain-of-command problems created confusion at the scene.
Conclusions: The urban disaster response to the train crash in Amagasaki was rapid and effective. The Kobe Earthquake and other incidents sparked changes that improved disaster preparedness in Amagasaki. However, communication and cooperation among responders were hampered, as in previous disasters, by the lack of a structured command system. Application of an incident command system may improve disaster coordination in Japan.

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Introduction

Amagasaki (population 460,000) is an industrial city located along a 10-mile stretch between Kobe and Osaka, 360 km (240 mi) southwest of Tokyo. On the morning of Monday, 25 April 2005, an express train derailed into an apartment building in an urban area of Amagasaki (Figure 1). The crash ultimately resulted in 107 deaths and 549 injuries. In the four days following the crash, >100 doctors and nurses, >1,000 firefighters and EMS workers, and >7,000 police officers were involved in rescue operations. This paper chronicles the events of the Amagasaki derailment and highlights the urban response capacity of Japan's local and regional providers.

The Event

The Japan Railway commuter train derailed into the parking garage of an apartment building at 09:18 hours (h) Japan Standard Time (JST) on 25 April 2005.[1–6] Conductor error was a major factor in the crash. The 23-year-old train conductor overshot the previous station, losing 90 seconds from the schedule. The rail company is strict about punctuality, and such a delay is subject to a penalty of 50,000 yen (US $425) plus participation in remedial courses. This conductor already had earned three delay penalties and was under pressure to avoid a fourth; he sped to make up time before the next stop at Amagasaki.

The recommended speed on the curved track at the site of the crash is 60 kph (35 mph), but the train's speed at the time of the derailment is estimated

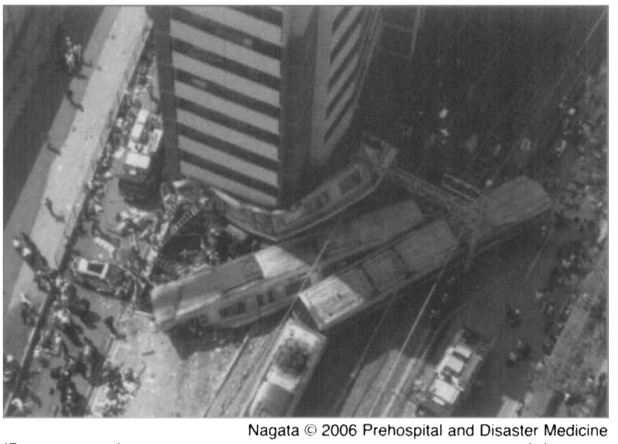

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Figure 1—The scene 30 minutes after the crash. The first train car plunged completely into the basement garage of the apartment building and cannot be seen in this photo.
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at >120 kph (75 mph). The exact cause of the crash has yet to be confirmed.

Methods

This study is based on the public and official reports of the train crash by central and local government agencies and hospitals. Approximately 90% of this information was validated via open-source documents, including newspaper and television reports.[1–6] These sources generally were consistent with one another as to the details of the responses. There were few variations in the data collected from these sources of information. Reports on the crash were found through personal communication, Internet search engines, and hospital and government record keepers.

Key interviews also were conducted with disaster response commanders. A convenience sample of four key informants from major rescue agencies was chosen from a roster of responders based on their availability to speak candidly and authoritatively about the response. These informants provided information about the rescue efforts and reactions to the quality of the response. The responses of the four key informants were mostly consistent. The informants will remain anonymous in order to preserve confidentiality.

Results

A chronology of rescue efforts is presented below and summarized in Table 1.

The First Hour

After the crash was reported, the Fire Department Command dispatched five Emergency Medical Service (EMS) teams and several fire engines. The first team to arrive on-scene predicted 20–30 casualties, but this estimate increased to >100. Local residents employed in nearby factories and shops left work to help rescue survivors. One factory manager sent his entire staff of 230 workers.

An Amagasaki Fire Department Command Post was established 100 m (328 feet) from the crash site (Figures 2 and 3). Two rescue teams were needed because the body of the train bisected the incident site, limiting coordination and communication across the train's axis. "East" and "West" staging areas were set up on either side of the body of the train. The West Rescue Team entered the crashed train at 09:26 h, immediately recognized that the first train car was fully submerged in the building's basement, and began extrication attempts. The East Team entered the train at 09:31 h and also discovered the condition of the first car. Although they used several radio frequency bands, communication between the two areas was difficult. Information was not shared properly by all of the frontline rescue members. Gasoline leaks from vehicles in the garage created a high fire risk, precluding the use of metal cutters and heavy machines. Therefore, the Rescue Teams were forced to work by hand.

The Fire Department activated the information and instruction center (IIC), a bed registry, and an information clearinghouse that Internet-links >150 hospitals in the Kobe area. The hospitals provide bed availability information to the IIC, where it is made available to medical facilities and Fire Department Command in the Dispatch Center.[5] The IIC is located at Hyogo Emergency Medical Center, a Level-1 Trauma Center, established in 2003.

Within the first hour after the crash, casualties were transferred to >20 hospitals within a 25 km (15.5 miles) radius of the crash site. Due to a technical malfunction, IIC information was not available on-scene, and medical and fire department commanders had to guess which hospitals could support incoming patients. Patients triaged with yellow and red tags were transferred to the closest facility (Amagasaki Chuo Hospital), and to two highly equipped nearby hospitals (Hyogo Medical School Hospital and Kansai Labor Hospital).

Patients with minor injuries were triaged with green tags and initially transferred to Amagasaki Chuo Hospital, but this small, 200-bed facility soon became inundated. The IIC recognized the problem, and ordered medical teams there to help and divert green-tag casualties to other community hospitals. Table 2 describes the profile and location of the hospitals in the area and the distribution of patients.

The first medical team (two physicians, two nurses, two paramedics, and one driver) arrived from Hyogo Emergency Medical Center 40 minutes after the crash. The team split up to begin triage in Fire Department tents, but was overwhelmed with casualties.

Hours 2–5

One hundred minutes after the crash, five more medical teams from five additional hospitals arrived to help triage and perform advanced treatments such as tracheal intubation, rapid fluid infusion, and needle decompression of tension pneumothorax.

Twenty minutes later, the first patient was transported by helicopter from the makeshift heliport at a junior high school 200 m (650 ft) from the crash site (Figures 2 and 3). Media helicopters hovering over the scene occasionally were ordered down so rescue workers were not distracted.

Three hours after the crash, the numbers of patients dwindled, and the focus turned to the recovery of bodies. After three people trapped by the train were evacuated at 14:00 h, all the rescue members stepped outside the train, and listened for sounds from additional survivors silently. Because

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Time (h)	Event
April 25	
09:18	Train derailed
09:22	First call to fire department; five ambulances and a few fire engines sent; local residents began rescue
09:24	The fire engines and ambulances arrived on scene
09:33	First command post established
09:40	Information and Instruction Center activated
09:45	National Government Management Office set up on-scene
10:00	First medical team arrived and to began triage at the fire tent
10:30	Four additional medical teams arrive
10:48	First patient transported by helicopter
11:04	Hyogo Prefecture requested help from Japan Self-Defense Force (JSDF)
11:30	More medical teams arrived
12:00	Number of injured patients decreased; medical teams gradually sent home; recovery of bodies began
13:00	JSDF unit arrives on scene
13:56	Three injured patients were found
14:48	All the rescue teams looked for survivors in a silent condition
16:00	Rescue teams found three more survivors; one doctor team started confined spaced medicine
17:30	One doctor team called back to the scene
20:29	One more doctor team arrived
April 26	
00:06	First survivor extricated
02:44	Second survivor extricated
07:08	Last survivor extricated
08:33	Disaster mode inactivated
09:30	All medical teams dismissed

Table 1—Chronicle of events after the Amagasaki Train derailment

they thought there were no more injured people in the train, all but one medical team decided to withdraw before 16:00 h.

Hours 6–24
At 16:00 h, four survivors trapped by dead bodies were discovered near the conductor's compartment of the smashed first car. One of these four died within minutes of discovery, after which rescue activities for the remaining three survivors restarted. Three doctor teams used confined space medical techniques on the trapped survivors. The doctors secured intravenous lines in a tight space and gave fluids to prevent crush syndrome. The first victim (a 46-year-old woman) was extricated 14 hours after the crash, the second (a 19-year-old man) 16.5 hours after, and the third (an 18-year-old man) 22 hours after. All three had crush syndrome and underwent emergent hemodialysis; the woman later died.

The next morning, a careful search was conducted by silencing the area and calling out for survivors along the length of the train. When it was clear there would be no more survivors, the last doctor team was dismissed.

Days 2–4
On the second day following the crash, teams continued to recover bodies using remote sensors. Police and government inspectors began the crash investigation, and the railway company resumed normal activity. Four days after the crash, the front car of the train was removed from the apartment building using a crane. After the last of the bodies were removed from that car, the Rescue Teams were sent home.

Summary of the Event and Disaster
The crash left 107 passengers dead (59 male, 48 female) and 549 injured (139 severe, 410 moderate). No one inside of the apartment building was injured. The causes of death, according to Hyogo Prefecture police, are summarized in Figure 4. The causes of death were: (1) 39% from severe head injury; (2) 20% from chest and abdominal hemorrhage; (3) 19% from traumatic asphyxia; (4) 14% from neck fractures; and (5)8% from pelvic fractures. The victims sustained a 900 kg (2,000 lb) force on impact, and most died within minutes of the impact.[6]

The Fire Department transported 240 casualties, the police 135, and local volunteers 137. Patients were transported by ambulances, police and fire buses, delivery trucks, and private motor vehicles; very few went to a hospital on-foot. In the four days of rescue activities, 6,800 police officers, 250 police rescue workers, and 34 Japan Self-Defense Force troops aided in the recovery effort (the Japan Self-Defense Force, established at the end of World War II, ensures domestic security only). Fire Departments provided a total of 75 Amagasaki city teams (328 members), 65 Hyogo Prefecture Teams (249 members), and 70 rescue teams (252 members). In addition, 20 medical teams from 19 hospitals participated.

Discussion
The 2005 train derailment was not the Amagasaki's first experience with disaster response. First responders in the area are among Japan's best prepared. The Amagasaki train crash provides key lessons about the capacity of Japanese disaster response.

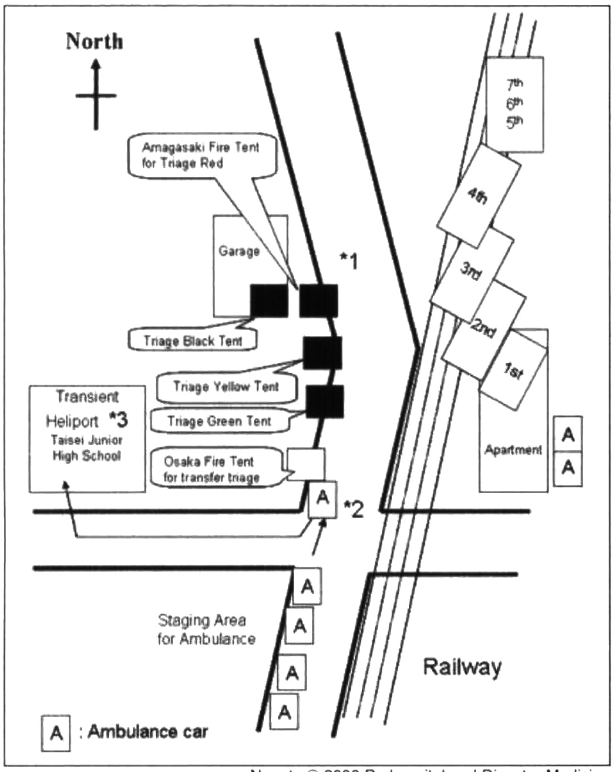

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Figure 2—Rescue activities two hours after the crash
*1. Doctors triaged casualties on-scene and requested helicopter transport from the air coordinator (Kobe Fire Department) for severely injured victims.
*2. Ambulances loaded casualties here for transport to the heliport or nearby hospitals.
*3. The Kobe Fire Department assigned pilots for helicopter transfer. Other medical teams stayed at the makeshift heliport to manage patients awaiting air transport.

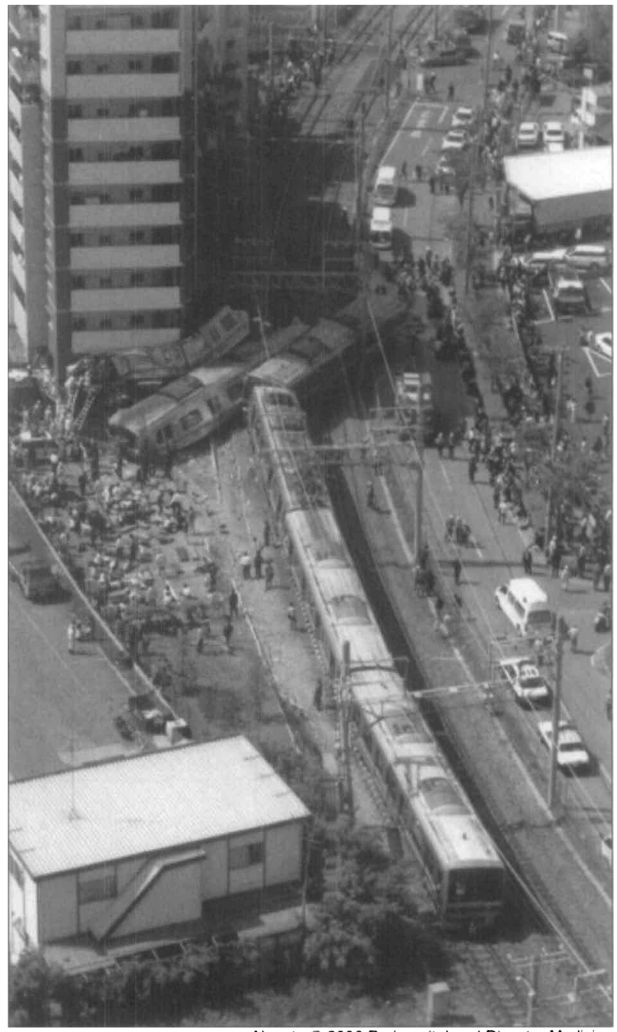

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Figure 3—The overview of the Amagasaki crash site (Copyright © 2005 The Asahi Shimbun Company)

Rail Disasters in Japan

The Amagasaki train crash was the fourth worst disaster in Japanese rail history and the worst in the last 40 years. The next most consequential, recent rail crash in Japan was in 1991. A Shigaraki Railway local train and a Japan Railway express train, both full of passengers traveling to a large festival, collided head-on after a signal malfunction. Forty-two passengers died and 614 were injured.[7] The rural setting of the crash hampered rescue efforts. Nearby hospitals were small, inexperienced with mass-casualties, and were overrun with casualties. During this unorganized response, no triage or effective helicopter evacuations were performed. The 1991 train crash was chaotic in comparison with the Amagasaki response, which was not in a rural location and not attended by inexperienced providers.

Urban Disasters in Japan

Recent urban events in Japan prompted changes in disaster response protocols and provided the responders with important experience. Four of these events were most relevant to the Amagasaki response: (1) the Kobe Earthquake in January 1995; (2) the Tokyo subway sarin gas attack in March 1995; (3) the Akashi Fire Festival in 2001; (4) and the Ikeda Elementary School disaster in 2001. The most significant of these events was the Kobe Earthquake.

In the 1995 Tokyo sarin gas attack, Aum Shinrikyo cult members released sarin gas on five different subway trains.[7–12] Twelve people died, and 5,500 presented to hospitals for treatment; >700 patients to Saint Luke's Hospital. Problems identified in the response included: (1) confused first responder efforts; (2) sluggish information-gathering; (3) delayed government intervention; (4) poor inter-agency cooperation; and (5) failure to share information.

At the 2001 Akashi Fire Festival, members of a crowd packed tightly onto a small bridge began to fall over like dominoes, crushing people underfoot. Eleven people died and 247 were injured.[13] At the Ikeda Elementary School that same year, a man wielding a knife assaulted 23 students and teachers, killing eight and wounding 15.[14] During both incidents, police and fire agencies worked in unison, and subsequent debriefings helped to improve techniques used for inter-agency cooperation. Some of the Amagasaki responders were part of these improvements.

Hospital	Distance from Crash Site km (mile)	Number of Casualties	Number of Beds	Number of Doctors	ED facility	Tertiary medical facility
Amagasaki Chuo Hospital	1.0 (0.6)	97	199	23	Yes	
Hyogo Prefecture Tsukaguchi Hospital	1.1 (0.7)	53	400	58	Yes	
Goshi Hospital	1.5 (0.9)	17	92	10		
Ando Hospital	2.2 (1.4)	15	153	8		
Kondo Hospital	2.4 (1.5)	5	92	4	Yes	
Hyogo Prefecture Amagasaki Hospital	2.5 (1.6)	10	500	100	Yes	
Kansai Labor Hospital	3.7 (2.3)	62	670	133	Yes	
The Hospital of Hyogo College of Medicine	5.0 (3.1)	113	1,195	428	Yes	Yes
Hyogo Prefecture Nishinomiya Hospital	7.7 (4.8)	13	400	84	Yes	
Hyogo Prefecture Takarazuka Hospital	7.2 (4.5)	15	480	68		
Osaka City Hospital	10 (6.3)	2	1,063	153	Yes	Yes
National Hospital Organization Osaka National Hospital	11 (6.9)	2	698	122	Yes	Yes
Senri Critical Care Medical Center	12 (7.5)	2	43	11	Yes	Yes
Osaka General Hospital	14 (8.8)	2	662	98	Yes	Yes
Osaka University Hospital	15 (9.3)	4	1,076	489	Yes	Yes
Nakakawachi Medical Center of Acute Medicine	18 (11.3)	2	30	15	Yes	Yes
Hyogo Emergency Medical Center	20 (12.5)	1	30	18	Yes	Yes
Kobe Red Cross Hospital	20 (12.5)	3	310	86	Yes	
Kobe University Hospital	23 (14.3)	3	1,004	178	Yes	Yes
Kobe City Hospital	22 (13.8)	1	912	153	Yes	Yes

Table 2—Hospital profiles in the Amagasaki Response (ED = emergency department)

In the years following these crises, a crisis management system was established that includes police, hospitals, fire departments, academic institutions, and national and local government agencies. Japan's original disaster management system was based on a number of laws including the Disaster Countermeasures Basic Act, passed in 1961 after a major typhoon impacted Japan. More recently, disaster preparedness again became a top priority when the government announced a 70% probability that a large earthquake will strike Tokyo in the next 30 years.[15] But the most influential factor prompting disaster preparedness in Japan was one of the worst natural disasters in the nation's recent memory—the Kobe Earthquake.

The Kobe Earthquake

On an early morning in January 1995, Amagasaki was awakened by a powerful earthquake measuring 7.3 on the Richter scale. Despite Japan's seismic susceptibility, the area was ill-prepared.[16–18] Thousands of local residents and rescue work-

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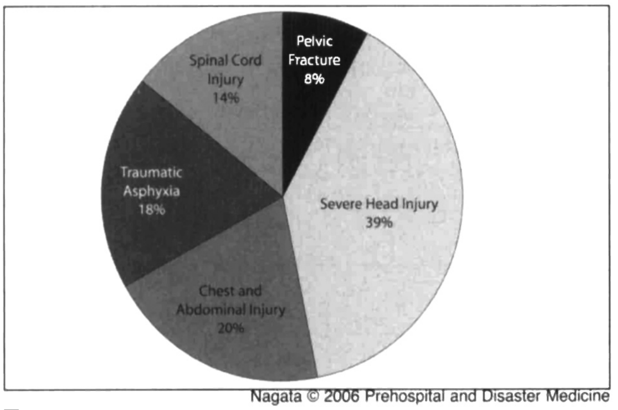

Figure 4—Causes of deaths

ers responded, but the response was plagued by scarce information, the lack of an incident command system (ICS), and poor interagency cooperation. With little communication between teams, redundant building searches grew as fire and police agencies independently hunted for survivors. Japan Self Defense Forces arrived too late to offer much help. The Kobe Earthquake—known in Japan as the Great Hanshin-Awaji Earthquake—killed 6,443 people, injured 43,792 others, and caused 240,956 buildings to collapse.[15–20]

The Kobe Earthquake was a turning point for Japanese disaster management.[20–23] After this tragedy, Japan invested heavily in the improvement of its emergency, fire, police, and medical responses. Kobe officials searched for weaknesses in their four-phase emergency management, which included: (1) mitigation; (2) preparedness; (3) response; and (4) recovery. Mitigation was a top priority, and buildings were modified to be more earthquake resistant. The Kobe Government also reformed its first response system by organizing training, computer, and communication networks among its police, hospitals, fire agencies, and Self-Defense Forces. In the Hyogo Prefecture, home to both Kobe and Amagasaki, a major overhaul of disaster preparedness served as the example for the rest of Japan. As a result, the Prefecture's Disaster Response Teams are among the nation's best. When the Amagasaki train derailment occurred, these Teams were ready.

Strengths of the Amagasaki Response

The response to the derailment was quick, thorough, and organized. A few aspects of the response are particularly noteworthy, including: (1) on-site triage; (2) provider training; and (3) the involvement of local residents.

The Amagasaki derailment marked the first use of on-site mass triage in a Japanese crisis. The quality of triage was high, and preventable deaths were few.[6] Initial paramedic triage was performed using the Simple Triage and Rapid Treatment (START©) method. The same method was reused by on-scene doctors and at the local hospitals.[24–26] Only seven severely injured patients died after transport to a hospital, and no one died awaiting transfer to a hospital. Casualties with black tags (dead) were not transported, thus saving hospital resources for treatment of the survivors. However, it was impossible to assign green tags to all of the hundreds of mildly injured victims.

After the Kobe Earthquake, many EMS workers and emergency physicians were certified in trauma care through participating in the Japan Prehospital Trauma Evaluation and Care (JPTEC, equivalent to Basic Trauma Life Support) course or the Japan Advanced Trauma Evaluation and Care (JATEC™, similar to Advanced Trauma Life Support) course. In Amagasaki, on-scene and hospital-based medical teams used the same protocols and terminology. This standardization streamlined care and helped prevent confusion.[27–29]

In the past, local residents were a barrier to effective emergency response.[29] But in Amagasaki, lay volunteers were surprisingly helpful and efficient. According to professionals on-site, this was due to the laymen's experience with rescue efforts after the Kobe Earthquake, when >70% of the buried victims were extricated by local residents.[18] In Amagasaki, volunteers from >30 companies provided first aid and rescued survivors until the activities of the official police and fire units were established. When asked what compelled them to act, many volunteers recounted their experiences during the Kobe Earthquake.[18]

Despite their laudable efforts, local residents could not properly triage or care for trauma-injured patients.[29] In earthquake-prone areas like Amagasaki, where local residents will be an important part of the response to large-scale disasters, potential lay volunteers should be offered instruction in basic response techniques.[15,17]

Responder Concerns After the Amagasaki Rescue Effort

The Amagasaki rescue raised four important questions in the minds of responders.

1. Was the initial decision to withdraw appropriate?
2. Was the IIC effective?
3. Was heliport set-up delayed?
4. Is more training needed in confined space medicine?

For the first question, key informants thought that the decision to stop rescue efforts six hours after the crash was premature because three more survivors were found later. Since a unified command structure was not established, information was not shared properly on the front line. As a result, the Medical Teams decided to withdraw by themselves. This misjudgment reflected the degree of confusion during the rescue. While it often is impossible to predict the outcome of rescue efforts, withdrawal decisions should be made carefully. Key informants recommend that at least one Medical Team should stay at the scene for the first 24 hours, even if the rescue of additional survivors seems unlikely.

Concerning the second question, the data collected by the IIC helped the Center's Commander respond to developing problems. For example, he recognized that Amagasaki Chuo Hospital was over-run with casualties, and sent two Medical Teams there to assist.[4] On the other hand, it took >1 hour after the system was activated to collect complete information about available hospital beds. Also, technical problems prevented access to IIC data by on-site firefighters, EMS, and Medical Teams. As a result, they were forced to choose receiving hospitals without adequate information. The IIC only was partly successful in Amagasaki—it could warn nearby hospitals, but not protect them from receiving overwhelming patient loads.

In regards to the third question, initially, the heliport was to be built on a playground 1.5 km (0.9 mi) from the scene. However, the likelihood of traffic jams forced the location to change to the grounds of Taisei Junior High School, only 150 m (500 ft) from the site. Negotiations on the location change took 20–30 minutes. The first patient was transported by helicopter 90 minutes after the crash, and only 10 helicopter transfers took place during the entire rescue. More than 15 high-level hospitals are located within 20 km (15 mi) from the site. Transport time via ambulance to these facilities is <20 minutes and about five minutes by helicopter. Helicopter use did not save much transfer time. Despite the responders' concern, injury data indicate that only a few severely injured people required this service, and that use of the large-capacity helicopters of the Japan Self-Defense Force was unnecessary.

As for the final question, confined-space medical care allows the rescuer to conduct a medical evaluation and institute appropriate medical therapy while the patient still is entrapped, and to provide interventions that expedite the victim's safe extrication from the confined space. Confined-space medical techniques are vital in situations that render simple medical procedures difficult. These techniques effectively prevent crush syndrome resulting from prolonged entrapment.[31] The critical role of confined-space medicine was recognized during the Kobe Earthquake, when hundreds of deaths were caused by crush syndrome.[20] After the Earthquake, a number of emergency physicians in the Kobe and Amagasaki areas were trained in confined-space medicine. Some of these same physicians were present at the Amagasaki crash site. Without this training, all three of the last survivors rescued probably would have died before they reached the hospitals.

Problems with the Amagasaki Response

With >100 fatalities, the scene in Amagasaki was chaotic. The various rescue agencies tried to work together, but the overall rescue effort was not smoothly coordinated among fire, police, and medical groups. There were two major problems in the Amagasaki response: (1) poor communication; and (2) fragmented command structures. Each agency had its own communication system and chain of command that worked well within the agency, but there was no overarching response plan.

In Japan, the EMS and rescue crews are a part of the Fire Department, so communication between these groups generally is good. However, even within the Fire Department, there was poor communication between the East and West Rescue Teams on either side of the train. Police officers worked with the Fire Department to transport mildly injured people. The Police Command Post was established next to the Fire Command Center, so the two occasionally shared information during the response. However, coordinating transports was difficult, and some hospitals were overburdened with transfers by the two agencies. Also, when it was recognized that the IIC hospital information was not available automatically on-scene, there was no single contact person within the rescue command structure to whom bed availability information could be provided manually.

Each agency's chain of command was organized and quickly established. However, a lack of a unified command structure led to disparate rescue activities and confusion among groups. Amagasaki Fire Department officials arrived first and began organizing the response. When more experienced Kobe and Osaka Fire Department officials arrived later, there was no conflict among the leadership—the Kobe and Osaka officials provided advice and support to the Amagasaki Fire Department Commander. Even so, each city's Fire Department unit was managed by its own commander. On the medical front, the ranking physician in the first Medical Team from Hyogo Emergency Medical Center became the on-site Medical Commander, and other Medical Teams worked under his direction. This physician made an effort to work with Fire Department EMS Teams, but did not have the authority to coordinate the EMS response or assign EMS workers to specific areas. Railway technicians and local residents also worked with officials in the rescue, but there was no direct oversight of their activities.

Recommendations: Incident Command System

In addition to the issues of communication, the lack of a proper ICS in the Amagasaki response led to several problems. There was confusion at first about whether the Police or Fire Departments should lead the rescue effort. Also, cars from the Fire and Police Departments were placed randomly about the scene, some blocking the narrow road. Too many Medical Teams went to the crash site simultaneously rather than being called in for shifts as they would have been under an ICS system. As a result, at least six of the 20 teams could not be used on the first day.

Instinctively recognizing the need for a unified command system, Amagasaki responders made spontaneous attempts at better integration. Fire and police agencies set up adjacent Command Posts near the site in order to be able to share information and logistics. Doctors and EMS workers triaged patients together. Local responders followed the lead of the professional rescuers. However, ICS training could have made the process quicker and more effective.

In the US, the use of an ICS is standard in all emergencies.[31,32] An ICS is characterized by a unified command structure, modular organization and flexibility, and common terminology among providers. It was developed in response to the poor coordination of planning and use of resources during the 1970 California Wildfires. The ICS centralizes the command of fire and police departments, EMS, hospitals, and other disaster responders, and its effectiveness has been shown in several studies.[31,33,34] A variation of ICS for medical institutions, the Hospital Emergency Incident Command System (HEICS), also is widely accepted in the US.[35–39]

Amagasaki's relatively organized response cannot be expected in other parts of Japan. As noted earlier, Amagasaki was experienced in responding to disasters. Yet, even the nation's best responders had problems with communication and command. Disaster response experience varies widely across Japan. In some areas, fire, police, and hospital-based personnel do not communicate regularly. To make a lasting improvement in disaster response, Japan should introduce ICS into its training protocols nationwide.[39]

Barriers to ICS

Several barriers stand in the way of implementing ICS in Japan. First, it is a new concept in Japan. Several standard Japanese textbooks of disaster medicine do not even mention ICS. Language also is a barrier—ICS teaching materials currently do not exist in Japanese. Each disaster response agency in Japan has a separate type of command base. Fire departments are managed by the municipal government, police by

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the prefecture government, Japanese Self-Defense Force by the national government, and hospitals usually are independent. Integrating these different systems is difficult.[38]

Cultural barriers to ICS also are a problem. Decision-making in Japanese organizations traditionally involves circulating a draft proposal until a consensus is reached. Japanese society values a method that avoids confrontation and allows for saving face within rigid, age-based hierarchies. Incident command system decision-making creates a different paradigm. In ICS, the incident commander steers the response efforts, and other team captains are expected to follow suit with minimal negotiation. Extensive education will be necessary to implement the ICS in Japan.

Limitations

This study is based on data from public reports and key informant interviews. Crash details still are under investigation in Japan. It will be a long time until final reports are released, and information from the early investigations may change. The key informant interviews were done anonymously, and therefore, may be less prone to bias.

Conclusion

The overall response to the train crash in Amagasaki was rapid and generally effective. Other recent urban disasters in Japan have provided an impetus for preparedness, and those experiences were critical for an effective rescue effort in Amagasaki. The Hyogo Information and Instruction Center, Hyogo Emergency Medical Center, and the efforts of local residents were helpful. However, the Amagasaki response suffered from communication gaps and poor integration of interagency command structures. Japan disaster response should consider the inclusion of an ICS as part of its standard training protocols.

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