

Chapter 10

Emergency Medical Care

In recent years, the provision of emergency medical services is beginning to attract attention as an important public health challenge in developing countries. Table 10-1 shows the major causes of death, and also DALYs (Disability-Adjusted Life-Years)¹, in ascending order of frequency in middle and low income countries. With early intervention, the highlighted conditions have been shown to be treatable. In other words, conditions that account for one-third of the major causes of death in developing countries (the total of the highlighted conditions is 33.8%) can be treated by emergency medical services. The issues against those diseases may differ in each developing country according to the stage of development. In

Southeast Asian Countries, the demand for trauma care and emergency care has increased dramatically, due to the increase in traffic accidents accompanying the rapid rise in population and urbanization, and the increase in lifestyle-related diseases, such as heart disease and diseases of the central nervous system, associated with lifestyle changes². For many years, selective programs in the field of maternal and child health, and pediatric infectious disease control programs, have been conducted in rural regions of low income countries as part of global public health initiatives. Most of these programs do in fact require urgent medical care for children such as diarrhoeal diseases, acute respiratory diseases and measles, besides

Table 10-1 Major Causes of Death and DALYs* in Medium and Low Income Countries

Cause of death	% of all deaths	Cause of loss of DALYs	% of all DALYs lost
1. Ischaemic heart disease	11.5	1. Lower respiratory infections	6.8
2. Cerebrovascular disease (stroke)	8.9	2. Perinatal condition	6.7
3. Lower respiratory infections	7.3	3. HIV/AIDS	6.6
4. HIV/AIDS	6.1	4. Meningitis	4.6
5. Perinatal condition	5.1	5. Diarrhoeal disease	4.6
6. Chronic obstructive pulmonary disease	4.7	6. Depression	4.0
7. Diarrhoeal disease	4.4	7. Ischaemic heart disease	3.5
8. Tuberculosis	3.4	8. Malaria	3.0
9. Traffic accident	2.4	9. Cerebrovascular disease (stroke)	2.9
10. Malaria	2.3	10. Traffic accidents	2.8
11. Hypertension	1.7	11. Tuberculosis	2.6
12. Measles	1.6	12. Congenital abnormalities	2.3
13. Lung cancer	1.6	13. Chronic obstructive pulmonary disease	2.3
14. Suicide	1.5	14. Measles	2.0
15. Hepatic cirrhosis	1.4	15. Hepatic cirrhosis	2.0

With early intervention, the highlighted conditions have been shown to be treatable.

* Disability-Adjusted Life-Years

Source: Razzak and Kellermann (2002)

¹ This is an indicator that comprehensively measures time (life-years) lost due to disease or disability, using the method of Murray et al.

² Chawla (1999)

obstetric emergencies. Because initiatives addressing these conditions have been developed as vertical programs, they have not contributed to the establishment of an emergency medical care system, providing “detection,” “transport,” and “treatment,” as part of a comprehensive public health system.

In recent years, the World Bank has included emergency medicine as one of its minimum packages of public health services³. The Integrated Management of Childhood Illness (IMCI) Strategy, jointly run by the WHO and UNICEF, also emphasizes the importance of triage⁴ and emergency care⁵. In this way, emergency medical care is rapidly being incorporated into health care systems to deal with medical conditions regularly seen in developing countries⁶.

The Japanese emergency medical system began around 1963 with reinforcement of the emergency transport system and the system of designated emergency medical facilities, in response to a rapid rise in the number of traffic accidents. This was followed by the systematization of emergency medical care, the establishment of the qualification of Emergency Medical Technician (EMT), and improvements in pre-hospital care, achieving the standards of emergency medicine of today⁷. Japanese initiatives in emergency medicine that may be applicable to developing countries in meeting their own challenges in this area include: emergency transport by the fire department; the “dial 119” emergency assistance system; the system of medical institutions accepting emergency patients; reinforcement of the pre-

hospital care system⁸; establishment of a system of “Emergency Medical Information Centers”; and nationwide expansion of designated emergency medical facilities. These initiatives will not all be applicable unchanged to the challenges in emergency care faced by developing countries today, but many of the basic ideas and systems they contain will provide useful hints in making improvements in the field of emergency medicine.

In this chapter, we first introduce the important trends in emergency medical care in Japan, and then discuss the aspects of Japan's experience that may be applicable to developing countries. Finally, we will analyze Japan's experience in terms of international cooperation with developing countries, based on the present state of emergency medicine in each developing country, according to its stage of development. In particular, we will examine emergency medical care for road trauma victims in metropolitan areas of Southeast Asia, and emergency obstetric and pediatric care in rural areas of low income countries.

1. Trends in Emergency Medical Care

1-1 Establishment and Expansion of Accident and Emergency Medical Centers (1960's~early 1970's)

Emergency medical care is often referred to as the starting point of medicine⁹. This is because it is often necessary to see patients with early symptoms, and determine whether there is a risk that they will in the future develop into a more

³ World Bank (1995)

⁴ This refers to a system of prioritizing treatment and transport for patients appropriate to the severity or degree of urgency of their illness or injury. Triage is required when a large number of casualties require assistance at the same time, such as in a natural disaster. In developed countries, triage is also used in pediatric emergency medical care, and not just in disasters.

⁵ Gove (1997)

⁶ Razzak and Kellermann (2002)

⁷ Hasegawa et al (2002) “*Kyukyu, Kyujitsu Yakan Iryo* [Emergency and Holiday Night Medical Care],” *Kokumin Eisei no Doko* [Activities in National Health], Vol. 49, No. 9, Health and Welfare Statistics Association. pp. 202–206.

⁸ Emergency treatment, either at an emergency scene or in the ambulance during transport

⁹ Okinaka et al (1976) “*Tomen Torubeki Kyukyu Iryo Taisaku Nitsuite* [The Measures against Emergency Medical Care in the Immediate Future],” *Kinkyu Iryo Kondankai Hokoku*, pp. 191–210.

serious condition, and in the case of emergency patients with severe conditions, it is often necessary to make the correct diagnosis, with no time for tests, and initiate treatment before the patient's condition worsens.

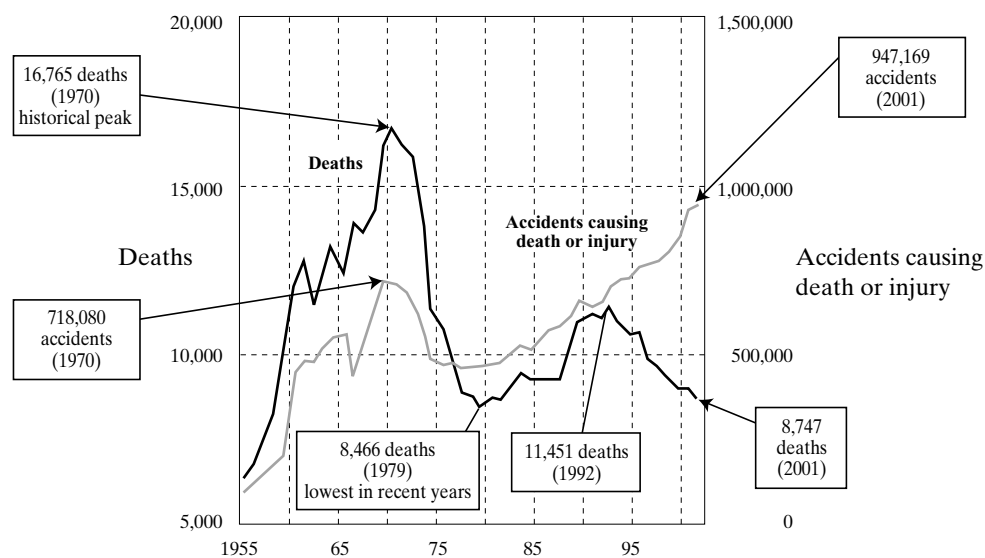
Emergency medical care in Japan was initially provided voluntarily by doctors mainly in private

practice, but controversy arose, leading to the introduction of a system to oversee the provision of emergency medicine in the early 1960s (see Table 10-2). This period corresponded to a time of advanced economic growth for Japan, a rapid increase in the rate of car ownership, and an associated jump in the number of traffic accidents

Table 10-2 Development in Emergency Medical Care in Japan

April 1964	Partial amendments Fire Defense Law make municipal fire brigades responsible for the transport of patients, such as those involved in accidents or natural disasters.
February 1964	Fire Department designated to transport emergency patients, designated emergency medical facility (emergency hospital) system commenced.
1974	Plans for a system of medical clinics offering holiday and night services (after-hours emergency centers).
July 1977	Ministry of Health and Welfare issues "Guidelines for Emergency Medical Service Strategy," establishing system of initial, secondary and tertiary emergency medical services, to which emergency patients are allocated depending on the severity of their illness or injury.
July 1982	September 9 was designated as "Emergency Day" every year, with the surrounding week (Sunday to Saturday) to be "Emergency Medicine Week."
April 1986	Fire Defense Law amended, allowing emergency patients with non-surgical conditions to be transported by ambulance.
April 1991	"Emergency Medical Technician (EMT)" program introduced, allowing emergency treatment to be given during transport under medical direction.
December 2002	The fundamental direction for a high quality and efficient emergency medical system suitable to the 21st century was announced.
December 1997	It was announced that, in order to improve pre-hospital care, the scope of action for EMT would be widened, to include defibrillation, endotracheal intubation and the administration of drugs.

Figure 10-1 Trends in Traffic Accident Deaths and Accidents Causing Death or Injury



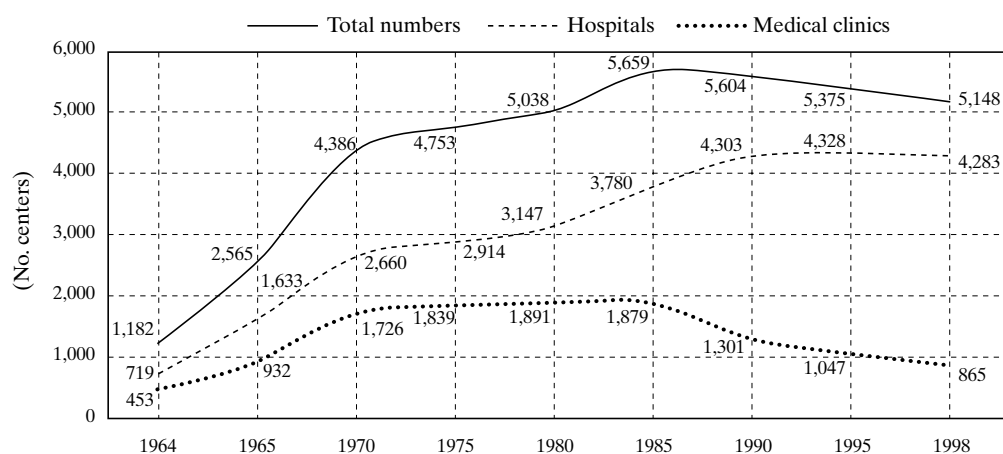
Source: Ministry of Land, Infrastructure and Transport, Road Bureau, Basic Planning Material

(see Figure 10-1). Amendments to part of the Fire Defense Law in April 1963 made municipal fire brigades responsible for the transport of patients, such as those involved in accidents or natural disasters. Accompanying this move, in order to expand the network of medical institutions able to accept emergency patients, the Ministry of Health and Welfare issued a Directive in February 1964, initiating the “Designated Emergency Medical Facilities System.”¹⁰ This allowed for hospitals and medical clinics, mainly those with full surgical

services, that fulfilled certain criteria to apply to the Prefectural Governor for registration as emergency hospitals and emergency clinics.

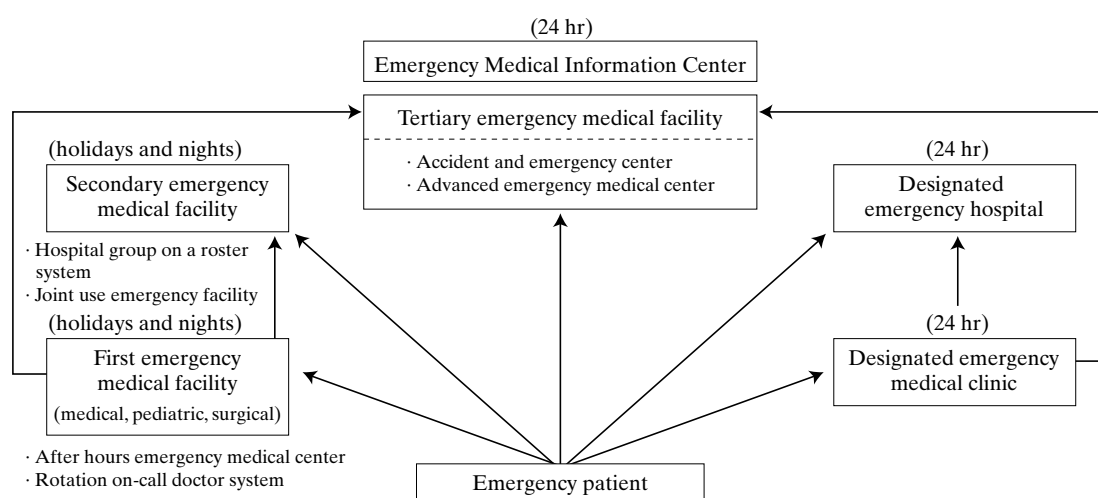
From 1967 until 1975, the establishment of “Emergency Medical Centers,” based in public medical institutions, was promoted as part of measures to deal with traffic accidents. To ensure the availability of medical care for emergency patients after hours (weekends, holidays and nights), from 1972 “After-Hours Medical Service Strategy Committees” were set up at each public health center. From 1974, a

Figure 10-2 Numbers of Emergency Medical Facilities



Source: Otsuka (1991)

Figure 10-3 The Emergency Medical Care System



Source: Otsuka (1991)

¹⁰ Otsuka, Toshifumi (1991) *Kyukyuiryo* [Emergency Medical Care] Chikuma Library 67.

system of medical clinics offering holiday and night services (after-hours emergency medical centers) in every region was commenced.

1-2 Systematization of Provision of Emergency Medical Services (Late 1970's~1980's)

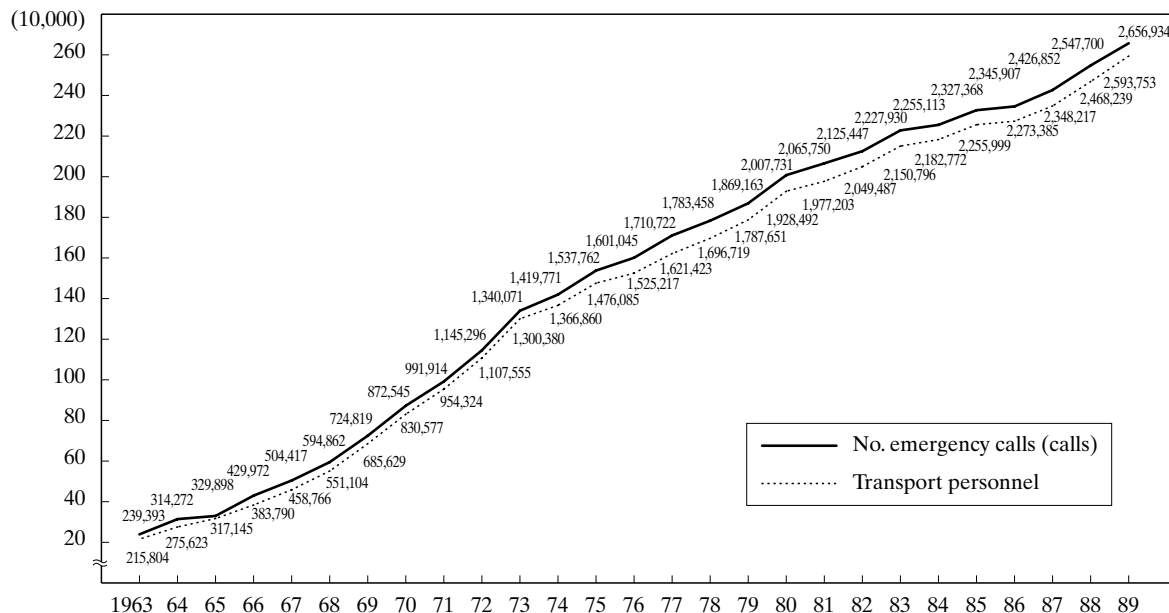
The number of designated emergency medical facilities increased steadily after its introduction (see Figure 10-2). The designated emergency medical facility has played a valuable role in emergency medical care in Japan, but the phenomenon of “emergency patients being passed from one hospital to another” developed¹¹, leading to calls for a new, more effective system.

In July 1977, the Ministry of Health and Welfare issued the “Guidelines for Emergency Medical Service Strategy,” aiming to institute effective management of emergency medical services. These guidelines instituted a three-tier system of emergency medical care, allocating patients according to the severity of their illness or

injury. Patients with mild conditions, not requiring hospital admission, received “initial emergency medical care”; patients with more severe conditions, requiring hospital admission, received “secondary emergency medical care”; and patients with serious conditions, unable to be dealt with by the second tier, received “tertiary emergency medical care” (see Figure 10-3). This systematization of the delivery of emergency medical care has led to a steady increase in the number of emergency calls and the number of emergency transport personnel (see Figure 10-4). At the same time, to ensure smooth communications between emergency medical facilities and the fire departments that undertake the transport of emergency patients, Emergency Medical Information Centers have been established in each prefecture¹².

The aging population and increase in lifestyle-related diseases has seen a marked increase in the number of emergency patients with non-surgical conditions, while the number of patients with

Figure 10-4 Trends in the Numbers of Emergency Calls and Transport Personnel



Source: Shinozaki et al. eds (1991)

¹¹ Sugimoto, Tsuyoshi (1996) “*Kyukyu Iryo to Shimin Seikatsu –Hanshin Daishinsai to Sarin Jiken ni Manabu* [Emergency Medical Care and Civilian’s Lives –Learn from great Hanshin Earthquake and Sarin Gas Incident] Herusu shuppan.

¹² Hasegawa et al (2002) “*Kyukyu, Kyujitsu Yakan Iryo* [Emergency and Holiday Night Medical Care],” *Kokumin Eisei no Doko* [Activities in National Health], Vol. 49, No. 9, Health and Welfare Statistics Association. pp. 202–206.

surgical conditions, mainly trauma, began to decline in the mid-1970s. Medical and pediatric emergencies now account for almost half of all ambulance trips. The Fire Defense Law was amended in April 1986, officially sanctioning ambulance transport for emergency patients with non-surgical conditions. The qualifying criteria for emergency hospitals and emergency medical clinics were also revised to reflect the increase in emergency patients with non-surgical conditions.

1-3 Expansion of Pre-hospital Care Provision (1990~1996)

With the introduction and acceptance of the new emergency medical system, quantitative targets were being met, but demand grew steadily for a higher quality and more accessible system of emergency medical care. Examination of the situation led the Ministry of Health and Welfare to conclude that an expansion of pre-hospital care was urgently needed, and in April 1991 the “Emergency Medical Technician (EMT) Program” was introduced, allowing emergency treatment to be given during transport under medical direction. The first national qualification examination was held in April 1992, yielding the first cohort of 3,177 EMTs¹³. Recommendations have also been made to establish an accident and emergency center in each prefecture, promote “doctor cars” (ambulances carrying medical practitioners as crew), train more doctors and nurses in emergency medical care, and increase research into emergency medicine.

As we have seen, the Japanese system of emergency medicine has undergone a gradual expansion. The rate of successful resuscitation of cardiac arrest patients has increased but little, however, and in comparison to Western countries, survival rates remain low. For survival rates

following cardiac arrest to improve, it is important that bystanders¹⁴ commence cardiopulmonary resuscitation during the interval between making the 119 emergency call and the arrival of the ambulance. Accordingly, training courses were held in each region for community residents to learn Basic Life Support (BLS, resuscitation techniques without specialized equipment). These were conducted by a first aid education and awareness network set up in 1993. The number of people attending at least the 3 hour basic resuscitation seminar has increased each year, with a total of 2,656,074 attendees over the 6 year period from 1992 to 1997¹⁵.

1-4 A New Approach to Emergency Medical Care (1997~present)

The emergency medical system in Japan has developed as a dual structure (see Figure 10-3). Firstly, based on the Fire Defense Law and the system of “Designated Emergency Medical Facilities” commenced in 1964, a system of medical institutions that will accept emergency patients brought in by ambulance was established. Secondly, the Ministry of Health and Welfare established a system of initial, secondary and tertiary emergency medical services in each region. The result was anxiety and confusion on the part of the public and ambulance staff alike, so to resolve this problem, in December 1997 the fundamental direction for a high quality and efficient emergency medical system suitable to the 21st century was announced. The new system integrated the designated emergency medical facilities based on the Fire Defense Law with the emergency medical services established with financial assistance from the Ministry of Health and Welfare. The term “designated hospital” was therefore abandoned, and replaced by emergency

¹³ Sugimoto, Tsuyoshi (1996) “*Kyukyu Iryo to Shimin Seikatsu –Hanshin Daishinsai to Sarin Jiken ni Manabu* [Emergency Medical Care and Civilian's Lives –Learn from Great Hanshin Earthquake and Sarin Gas Incident] Herusu Shuppan.

¹⁴ Family or other bystanders at an accident scene, or the scene of a sudden illness.

¹⁵ Fire and Disaster Management Agency Emergency Statistical Update Final Edition “Present State of Improvements in Emergency Services” (<http://www.fdma.go.jp/html/new/99gyoumu.html>)

hospital/emergency medical clinic (24 hour services) and hospitals on a roster system (hospitals that accept emergency patients only on their rostered days). At the same time, the system of “first, secondary and tertiary” emergency medical services within each secondary medical catchment area was finalized in the “Medical Services Plans” formulated by each prefectural government.

1-5 Future Challenges

Japan’s emergency medical system, initially developed to deal with an increase in the number of traffic accidents, subsequently met quantitative goals in establishing emergency medical facilities able to deal with any medical emergencies, and then sought to improve the quality of emergency medical care by upgrading the provision of pre-hospital care. Social changes, in particular the aging society and the falling birthrate, produce a number of challenges to the provision of high quality and efficient emergency medical care.

1-5-1 Pediatric Emergency Medical Services

Pediatric emergency medical services is an important challenge to developed and developing countries alike, and in particular has recently become a controversial issue in Japan. The demand for pediatric emergency medical services has increased due to elevated childrearing anxiety, associated with reduced birthrates and women entering the workplace. On the other hand, pediatricians in private practice are aging, and there is a shortage of pediatricians willing to work after hours. This has led to an imbalance between supply and demand, aggravated by erosion of regional emergency medical services, with persistence of small-scale emergency medical centers lacking facilities for pediatric cases. These

factors have led to pediatric patients, suitable for an initial emergency medical service, converging on the pediatric departments of regional general hospitals. This causes overwork and exhaustion in the pediatricians working at these hospitals, fuelling the social controversy¹⁶. A fundamental overhaul of the pediatric emergency medical system is required to address this situation, improving the quality of pediatric emergency medical care and correcting imbalances between regions. This should include the establishment of dedicated pediatric emergency medical centers, building medical teams with the emphasis on specialized pediatric nurses and other paramedical staff, and restoring pediatrician numbers through a revamp of undergraduate and postgraduate medical training.

1-5-2 Improvements to the Pre-hospital Care

System (Emergency Medical Technicians)

A short-term goal in this area is expansion of the treatments emergency medical technicians (EMTs) are authorized to provide¹⁷, and expansion of the clinical experience they gain during the training process. In the medium to long-term, further improvements to the pre-hospital care system will require a thorough, scientific appraisal of the EMT program (including expansion of the range of approved treatments).

1-5-3 Emergency Medical Care in Remote Areas and Outlying Islands

The first plan for medical services in remote areas and outlying islands commenced in 1956 (establishment of medical clinics in remote areas), and the ninth plan commenced in 2001. A shortage of medical and dental practitioners is the

¹⁶ Ichikawa, Kotaro (2003) “*Shoni Kyukyu Iryo no Shorai Tenbo Niokeru Shonika Gakkai no Yakuwari* [The Role of Pediatric Society for the Future Prospect of Pediatric Emergency Medical Care],” *Nihon Shonika Gakkai Zasshi* [The magazine of Japan pediatric society] Vol. 107, No. 1, pp. 125–129.

¹⁷ In order to improve the survival rate of patients who go into cardiopulmonary arrest, it was recognized that the scope of action for EMTs needed to be widened. The 3 approved treatments to be introduced will be electric shock (defibrillation) not requiring a doctor’s instruction, endotracheal intubation under a doctor’s instruction, and the administration of some drugs under a doctor’s instruction.

ever present challenge, however. A system of emergency transport using helicopters and airplanes exists for some remote areas and outlying islands, with the cooperation of the relevant authorities, but a nationwide network of such services is needed.

2. Main Initiatives in Emergency Medical Care

As outlined in “1. Trends in Emergency Medical Care,” a number of initiatives have been conducted in Japan for the purpose of developing an efficient and high quality emergency medical system. Here we will introduce some of these initiatives that may be applicable to developing countries in solving their own emergency medical care problems.

2-1 Emergency Transport by Fire Department Personnel

From around 1955, Japan experienced a rapid increase in traffic accidents, due to a plethora of cars filling the narrow streets, inadequate traffic laws, and no distinction between the road surface and the sidewalk. Victims of traffic accidents were sometimes transported by police patrol cars attending the accident scene, and if they needed to remain horizontal, sometimes hearses were used. Fire engines began to fulfill this function of patient transport for two reasons: they had sirens, and they had space for patients to lie down. It was formally decided in 1963 that fire departments would become responsible for the transport of emergency patients. The system of designated emergency medical facilities as the destination for emergency patients was established in 1964. The emergency medical system in Japan can therefore be said to have been established to deal with road trauma, and records clearly state that emergency patient transport by fire engines was for patients involved

in outdoor accidents.

Fire fighting services were originally attached to the police department in Japan, but the police department was dismantled after the war by order of General Macarthur and GHQ. For a time, each municipality had both a local government police force and a national police force¹⁸. Fire fighting services gained their independence from the local government police force in 1948, and fire fighting organizations have been attached to local government ever since. The commencement of emergency patient transport by fire trucks led to emergency systems uniquely suited to each community. This could also have caused considerable problems, with emergency transport vehicles only able to operate within the narrow confines of their own municipality. As we shall see, the introduction of Emergency Medical Information Centers in each prefecture enabled the collection and dissemination of information across municipal boundaries, and the provision of a particularly efficient overall system.

As examples of emergency patient transport services in advanced countries, in the U.S. ambulance services are provided by local governments, community volunteer organizations, and hospital groups, whereas in France, ambulance services are provided by emergency medical organizations attached to hospitals, under legislative control. Few developing countries have a national emergency medical system in place, but some regions and cities have a variety of ambulance services, some hospital-based, others provided by local government, community organizations, and volunteer groups. A method such as that adopted by Japan, first establishing emergency services at the community level (local government), then setting up a wider information network, is worth consideration by developing countries as they set up their own emergency medical systems.

¹⁸ The police subsequently found that this duplicate system severely hindered police activities such as arresting criminals within the municipal boundaries, so in 1954 the various police forces were reunited at the prefectural level, restoring the situation to its present stable form.

2-2 “Dial 119” System for Emergency Assistance

With the 1963 revisions to the Fire Defense Law in April 1963, local governments became responsible for emergency services, while emergency medical facilities underwent a program of expansion. At the same time, a system was introduced whereby anyone dialing the number 119 on the telephone, anywhere in the country, was connected to their local “emergency service dispatcher.” This system, whereby emergency services are accessible by a single telephone number nationwide, is unparalleled anywhere in the world. Two major factors in the success of the Japanese emergency medical system are that the “Dial 119” system is easy for the public to use, and facilitates response by emergency services.

2-3 Expansion of Designated Emergency Medical Facilities

The system of “Designated Emergency Medical Facilities” was initiated in 1964 in response to commencement of emergency patient transport by the fire department, to provide hospitals and medical clinics that would accept these patients. Medical institutions voluntarily applied under this system to the Prefectural Governor for registration. The system of designated emergency medical facilities, part of the response to a sudden increase in traffic accidents, applied to medical institutions that were able to accept emergency patients around the clock. It was characteristic of the establishment of Japanese emergency medical facilities that these conditions were not made compulsory, but it was expected that medical institutions would independently and voluntarily make the effort to satisfy the criteria for registration. This made possible the provision of emergency medical services suited to the capacity of the services. This capacity gradually expanded, eventually leading to the independent development seen today.

2-4 System of First, Secondary and Tertiary Emergency Medical Services

In July 1977, Ministry of Health and Welfare issued the “Guidelines for Emergency Medical Service Strategy,” establishing a new system of first, secondary and tertiary emergency medical services, to which emergency patients are allocated depending on the severity of their illness or injury (see Table 10-3).

- 1) Initial emergency medical care is appropriate for patients with mild conditions, not requiring hospital admission, and is provided by after-hours emergency centers, established and operated by regional public organizations, or by a rotation on-call doctor system, run by the local medical association.
- 2) Secondary emergency medical care is appropriate for patients with more severe conditions, requiring hospital admission, and is provided by a roster system of hospitals in a given area, or by a joint use emergency facility.
- 3) Tertiary emergency medical care is required for patients with serious conditions, such as head injuries, stroke, or myocardial infarction, and is provided by emergency medical centers established by each prefecture.

This emergency medical care system was later amalgamated with the system of designated emergency medical facilities, forming the basis for the present system. In particular, the concept of functional differentiation of emergency medical facilities, with the second tier of medical services completing the emergency medical system close to the sphere of everyday life, is an important one. Medical institutions in developing countries are also often organized in 3 tiers, with public health centers in the first tier, provincial hospitals at the second tier, and central hospitals at the third tier. The Japanese system of division of responsibilities, and referral when necessary, is therefore likely to be applicable.

2-5 Establishment of a System of “Emergency Medical Information Centers”

In order to promptly transport an emergency patient requiring urgent medical attention to the most appropriate emergency medical facility, it is important to have a wide reaching emergency medical information system. This is the most immediately effective way of avoiding the phenomenon of “emergency patients being passed from one hospital to another,” and also allows the most efficient use of existing medical resources¹⁹. With this aim in mind, since 1977 emergency medical information centers have been established, each covering an entire prefecture, and collect information across municipal boundaries. These information centers gather information around the clock from each emergency medical facility regarding their bed states, ability to perform surgery, etc., and passes

on this information to interested parties such as the fire department and medical institutions.

The existing system was expanded in 1987, and renamed the “Large-scale Disaster and Emergency Medical Information System.” As of April 2001, it is operational in 38 prefectures nationwide. In addition to the previous emergency medical information system, the new system has a disaster medical information mode, with a common data entry system. Utilizing the internet to maintain a nationwide network, this system will become important in managing the medical response in the event of a disaster.

In this way, the emergency medical information system centralizes the dispatching system for all the municipal fire departments, unifies the information from emergency medical service providers over a broad area, and provides a superior information management system.

Table 10-3 Plan and Criteria for Restructure of the Emergency Medical System

Classification	Eligibility criteria
First emergency medical care	Provide treatment for emergency patients with relatively mild illness or injury.
After hours emergency medical center	In general, cities (municipalities) with population of at least 50,000 should have 11 centers. (If the population is over 400,000, there should be one center for every 200,000 population. However, the fractional number is over 100,000 population, they should have 5 more centers.)
After hours dental clinic	Established by cities on request from the prefectural government or Governor.
On call doctor system	After-hours medical treatment is available from on-call doctors on a roster organized by the local medical association.
Secondary emergency medical care	Provide treatment for emergency patients with more severe conditions, requiring surgery and/or hospital admission, in general referred from initial emergency medical facility.
Hospital group on a roster system	In general, each secondary emergency medical care system serves a given catchment area, with several hospitals providing after hours medical care using a roster system.
Joint use emergency facility	Apart from the above system, a section of a hospital run by the local medical association can be opened at night and on holidays, with the cooperation of local medical associations.
Tertiary emergency medical care	Provide 24 hour treatment for emergency patients with serious conditions requiring high level medical care, such as stroke, myocardial infarction, or head injuries.
Accident and emergency center	At least 1 dedicated center in each prefecture (multiple centers in some prefectures due to population or geographical factors), or one center for every 1 million head of population.
Emergency medical information center	Gather information from emergency medical facilities, and relay this information to medical institutions and the fire department. One center in each prefecture, to serve the whole prefecture.

¹⁹ Hasegawa et al (2002) “*Kyukyu, Kyujitsu Yakan Iryo* [Emergency and Holiday Night Medical Care],” *Kokumin Eisei no Doko* [Activities in National Health], Vol. 49, No. 9, Health and Welfare Statistics Association. pp. 202–206.

2-6 Reinforcement of the Pre-hospital Care System

Pre-hospital care comprises emergency care provided by bystanders or volunteers in the community, at the scene of an accident or illness, and the EMT program, transporting emergency patients to hospital. It usually takes from five to six minutes from dialing 119 to the ambulance arriving at the scene. Resuscitation rates, on the other hand, drop to 50% after 4 minutes of cardiopulmonary arrest, and 25% after 5 minutes. To improve survival rates and prognoses of people who have gone into cardiopulmonary arrest, it is therefore essential that bystanders or family members at the scene of an accident or sudden illness make the emergency call and render first aid²⁰. With this in mind, resuscitation training courses for bystanders were commenced in 1993. The number of people attending these courses has steadily increased, and the proportion of patients with cardiopulmonary arrest who received BLS from bystanders is also increasing each year (13.0% in 1995, 15.1% in 1996, 16.9% in

1997, 19.7% in 1998).

Survival rates when bystanders give BLS are 1.9 times those when bystander BLS is not available, demonstrating a clear life-saving effect (see Table 10-4). First aid seminars for bystanders are therefore an essential part of improving pre-hospital care, and can be considered the support base for pre-hospital care. Community-based care activities by volunteers are also extremely important in developing countries, showing a common direction for basic activities.

The EMT program, as a profession specializing in emergency transport, commenced in 1991. EMTs undertake a 2 year course of school-based learning and clinical training following graduation from senior high school. They then obtain their qualification after passing a national qualification examination. With directions from a doctor, EMTs are therefore able to perform advanced resuscitation techniques in the ambulance during transport, including obtaining an airway, artificial respiration, defibrillation, and administering injections. At present, the “Foundation for

Table 10-4 Life-saving Effect of Bystander Emergency Care (January~December 1998)

	No. of patients with cardiopulmonary arrest	No. of patients surviving at 1 month	1 month survival rate
With first aid	15,923	830	5.2%
Without first aid	85,047	1,733	2.7%
Total	80,970	2,563	3.2%

Source: Fire and Disaster Management Agency Emergency Statistical Update Final Edition “Present State of Improvements in Emergency Services” (<http://www.fdma.go.jp/html/new/99gyomu.html>)

Table 10-5 Effects of Introduction of Emergency Life-saving Technician (January~December 2001)

	No. of patients with cardiopulmonary arrest	No. of patients surviving at 1 month	1 month survival rate
With EMT treatment	29,386	1,839	6.3%
Without EMT treatment	9,767	340	3.5%
Total	39,153	2,179	5.6%

Source: Fire and Disaster Management Agency and Ministry of Health, Labour and Welfare “Study of Widening the Range of Activities of Emergency Medical Technicians” (<http://www.zck.or.jp/activities/2405/>)

²⁰ Kouda, Hiroaki (2002) “*Bai Sutanda no Juyosei to Kyukyu Kyumeishi no Yakuwari* [The Importance of Bystander and Roles of Emergency Medical Technicians],” *Kurinishia*, Vol. 49, No. 508, pp. 211–214.

Box 10-1 Emergency Obstetric Care

Although the demand for emergency obstetric care is high in developing countries, in Japan no system has been introduced in this area. The reasons for this include: there is less demand for emergency obstetric than for emergency pediatric care; although pediatric emergencies can occur at any time, obstetric emergencies are usually associated with childbirth; antenatal care is more readily available than in developing countries; and institutional births account for almost 100% of births in Japan. Other background factors that prevent the lack of a formal emergency obstetric care system from causing problems are the ease of access to midwifery centers and medical institutions, the links between midwifery centers and medical institutions, and the system of referral from primary to secondary medical institutions.

Ambulance Service Development,” a nonprofit organization, along with training schools based in 10 designated and other cities, train 1,400 EMTs each year. As of April 1, 2001, Japan had 4,563 ambulance services, with a total of 56,557 employees. Of these, 10,497 held the EMT qualification (18.6% of all ambulance service personnel), with 9,461 in active service (16.7%). There were 2,592 ambulance services with EMTs, or 56.8% of all services, and the Fire and Disaster Management Agency is promoting their training so that every ambulance service will have EMTs on staff.

The effects of the introduction of the EMT program can be seen in Table 10-5. The 1 month survival rate for patients treated by emergency medical technicians was 6.3%, 1.8 times (or 2.8% greater than) that of 3.5% for patients treated by regular ambulance personnel. The difference between survival rates has increased over the years, from 0.7% in 1995 to 1.7% in 1999, indicating an increased effect of the introduction of the EMT program. The result of treatment by paramedics in the U.S. is said to be a 15% improvement in the 1 month survival rate, suggesting that Japanese ambulance services still fall far short of Western standards.²¹

It has been pointed out by a number of observers that further improvements in survival

rates for patients that suffer cardiopulmonary arrest will require widening the range of permitted activities by EMTs. In December 2002, it was announced that, based on a support system for all ambulance staff, including EMTs, steps would be instituted to improve the quality and raise the standards of emergency services, increasing the range of treatments allowed for EMTs. Specifically, the three approved treatments to be introduced will be: 1) defibrillation, not requiring a doctor's instruction; 2) endotracheal intubation, under a doctor's instruction; and 3) the administration of some drugs, under a doctor's instruction.

3. Emergency Medical Services in Developing Countries in the Light of Japan's Experience

The particular challenges faced by a developing country in the field of emergency medicine are influenced by the stage of development of the country. In countries with delayed development, the conditions that constitute the main demand for emergency medical services will be pediatric conditions such as acute respiratory infections, diarrheal disease, measles, malaria, and obstetric emergencies

²¹ Fire and Disaster Management Agency and Ministry of Health, Labour and Welfare “Study of Widening the Range of Activities of Emergency Life-saving Technicians” (<http://www.zck.or.jp/activities/2405/>)

associated with complicated deliveries. In countries with a higher degree of development, apart from the above, demand for emergency services will also come from an increase in traffic accidents accompanying a rise in population, and an increase in lifestyle-related diseases, such as heart disease and diseases of the central nervous system, associated with lifestyle changes. Geographical considerations will often influence provision of emergency medicine, as it is of course possible that different patterns of disease will be seen between urban and rural areas within the same country, and access to medical services is often difficult in rural areas. We will discuss below how Japan's experience can be applied in developing countries, dividing them into two broad categories according to stage of development.

3-1 Road Trauma Care Centered in Municipalities in Southeast Asia

In considering how Japan's experience in setting up an emergency medical system can be of use in meeting the challenges faced by developing countries, our attention is first drawn to road trauma care in countries that are relatively advanced in development. For example, Asian nations such as Thailand, Indonesia and India are presently experiencing major social problems due to an increase in traffic accidents and industrial disasters associated with rapid urbanization and industrial development. In these countries, the pivotal role in the provision of emergency medicine is played by hospital emergency departments, where treatment is administered for road trauma. At the same time, programs are being instituted to improve pre-hospital care. These circumstances are therefore similar to those extant when the Japanese emergency medical system was commenced, so the Japanese experience should be applicable. JICA is presently conducting a technical cooperation project, the "Thailand National Project Trauma Center Project (TRAUMA)." We will analyze the Khon Kaen National Trauma Center as an example.

Japanese cooperation in this hospital has concentrated on the following aspects: 1) hospital

care; 2) pre-hospital care; 3) prevention and harm minimization in traffic accidents; 4) training and research center; and 5) modeling. In particular, Japan's experience has been brought to bear in the areas of pre-hospital care and the prevention and harm minimization in traffic accidents. Activities related to pre-hospital care include: reports to the local community, as well as first aid training and public information sessions; establishment of an emergency dispatch center; training of paramedics and volunteer ambulance personnel; and the formulation of guidelines for emergency services and rescue groups. Activities related to the prevention and harm minimization in traffic accidents include: public awareness programs; consultation with State Safety Committees; safety education for drivers, community leaders, and schools; road safety campaigns; and the conduct of surveys related to traffic accidents.

The main problems faced at the moment are: 1) although the ambulance service was set up to deal with an increased number of traffic accidents, the number of patients with non-surgical conditions requiring emergency transport is rising steadily; 2) because all emergency patients are taken to three designated hospitals in each region, while patients with mild trauma are increasing, more patients with severe medical conditions are being transferred from other medical institutions, necessitating re-examination of collaboration between hospitals; and 3) the emergency medical system in Khon Kaen City is under the jurisdiction of the Khon Kaen Hospital, so the question of whether this "Khon Kaen Model" can be applied throughout Thailand, from the cost perspective, is of major concern. As we can see, emergency medicine in Thailand, at first established to cope with an increase in traffic accidents, is going through similar processes to Japan's. Effective solutions to the above problems can therefore be found in Japan's experience: 1) establish an emergency medical system that allows for non-surgical patients from the start; 2) establish a three-tier medical system;

3) establish a system based on local government, with close cooperation between ambulance, police and medical services, and not hospital-based.

In the future, an “Emergency Medical Information Center” system, that can coordinate information over a broad area, will become necessary, at which stage consideration should be

given to a uniform nationwide emergency call system, such as the Japanese “Dial 119.” The Japanese excel at the establishment of information management systems like this one, and cooperation from experts in public health and medical systems, information technology, and administrative services will be important in setting up such a system.

Trauma Center Project, Thailand



Information sign for Khon Kaen Emergency Medical Information Center



Emergency Medical Command Center at Khon Kaen Hospital



Accident and Emergency Room at the Khon Kaen National Trauma Center



Training in defibrillation at the Khon Kaen National Trauma Center

Box 10-2 Challenges for Developing Countries in 3 Processes of Emergency Medical Care

Three core components of emergency medical care on the provider side are: 1) care in the community; 2) care during transportation; and 3) care on arrival at the receiving medical facility. In other words, in order to achieve the greatest possible reductions in morbidity and mortality from injury and illness, prompt commencement of treatment, rapid access to a medical facility, and appropriate care at that facility, are all essential. These aspects are strongly influenced by the stage of development of a developing country, and by geographical factors.

1) Care in the Community

The outcomes of traffic accidents and acute medical conditions depend on early recognition of the severity of the injury/illness, and the need for medical attention. Important factors in emergency care in the community include whether an emergency call system exists for reporting traffic accidents, and the prompt provision of first aid by bystanders. Access to health care in obstetric and

pediatric emergencies is also a major consideration in smooth provision of care in the community. In Zimbabwe, a significant proportion of maternal deaths are caused by avoidable factors, including the failure of health workers to identify serious complications and to refer pregnant women in a serious condition to a higher level of care.

2) Care During Transportation

Problems with transportation in emergency medical systems should be considered under two headings, care during transportation and whether there is an appropriate system of emergency transport. The quality of care during transportation is important in determining outcomes in traffic accidents and acute myocardial infarction, and some developing countries have introduced programs to improve survival rates, such as “doctor cars” (ambulances carrying medical practitioners as crew), and EMT programs. In many low income countries, however, the absence of appropriate emergency medical transport is a common barrier to emergency care. This may arise because of any of several factors inhibiting access, including the lack of an appropriate vehicle to transport patients from the community to the primary health care facility, the absence or inadequacy of roads, a lack of fuel, and the inability to pay for transport services. In urban Guinea-Bissau, 25 out of 125 acutely ill children died either on their way to hospital or while waiting to be seen at an outpatient clinic.

Ambulances are often used to transport patients from a primary medical care facility to a higher level of care. Some form of communication is needed to request an ambulance from the higher medical facility and in many cases there is no electricity, and no telephone services. In Malawi, it is often the case that a family member has to make the trip to the provincial hospital by bicycle to make the request for an ambulance to be sent out. In other words, in regions with no effective means of communication, it is not enough to simply furnish an ambulance. A method of notification, such as solar-powered radio communication, is essential.

3) Care on Arrival at the Receiving Medical Facility

The availability of prompt and appropriate treatment on arrival at a medical facility is the third component of emergency medical care. A health care facility’s capacity to provide medical care is determined by both human and structural factors. Human factors include the number and type of health care workers and their level of training. Structural factors include space, medications, supplies, and specialized equipment. The level of demand placed on the facility by the surrounding population can also affect which services are offered, and whether they can be accessed at short notice in an emergency. The situation regarding “hardware” and “software” varies greatly according to the country, region, and level of facility.

Medical facilities that can only deliver poor quality care have been shown to produce poor quality outcomes. Emergency triage and treatment (ETT) is generally the weakest link in an emergency medical system. A study in Malawi revealed that the condition of many children arriving at clinics with acute conditions deteriorated while they were waiting to be seen. This resulted in deaths and disability that may have been avoidable. In Mexico, “verbal autopsies” of 132 children who died revealed that the majority had been seen by a physician within the previous three days. Inappropriate medications and delayed referral to a tertiary hospital were judged to have contributed to more than half the deaths. A project aimed at improving initial triage and treatment drew up ETT guidelines, and evaluation of these guidelines has already demonstrated that they significantly decreased the time required to assess children in need of urgent medical attention.

Source: Produced by the authors, based on Fawcus (1996), Sodemann (1997), Tamburlini (1999), and Razzak & Kellermann (2002)

3-2 Emergency Obstetric and Pediatric Care in Rural Areas in Low Income Countries

For emergency medicine in rural areas in countries with delayed development, or middle to low income countries, Japan's experience with grass roots initiative in the fields of "maternal and child health" or "community-based health" may be more applicable than the emergency medical system that has developed since 1963. Below we will discuss how these initiatives can be modified to suit emergency medical care, under the following headings: 1) Care in the community; 2) Care during transportation; and 3) Care at the receiving medical facility

3-2-1 Care in the Community

In the above mentioned regions, the greatest

demand for emergency medical care comes from obstetric emergencies and acute illnesses in children. Once again, the three core components of emergency medical care on the provider side are care in the community, care during transportation, and care on arrival at the receiving medical facility. In many developing countries, medical emergencies often develop at home, so it is necessary to develop a system of early identification in the community and prompt access to health care. Community volunteers already play an important role, so a system that provides them with training in simple but vital interventions (e.g. establishing and maintaining a patient airway, controlling external bleeding, and immobilizing fractures using available materials) will be effective.

Box 10-3 A Feasible Emergency Medical Care Model for Developing Countries

A number of initiatives are currently being trialed in developing countries to meet the challenges faced in providing emergency medical care. Countries with delayed development are severely limited in what they can do by shortages of human and material resources, and find it extremely difficult to establish a comprehensive emergency medical system such as is seen in developed countries. Apart from some disease-specific and facility-specific programs, there are no successful models for systematically improving the overall provision of emergency medical care in developing countries. Fortunately, many developing countries already have programs focused on emergency obstetric care and/or the integrated management of childhood illnesses (IMCI). Such programs may provide the necessary framework for the creation of an inclusive, all-diseases approach to emergency medical care.

Razzak & Kellermann identify the following activities necessary to meet the central challenges in establishing an emergency medical system:

- 1) Community education on accessing emergency medical care, and administering first aid.
- 2) Establishment of a simple communication system for notifying the emergency medical system of patients requiring emergency medical care.
- 3) Provision of a means of transport (preferably motorized) for moving patients to the nearest medical facility.
- 4) Establishment of triage criteria to ensure efficient and timely utilization of existing resources at every level of the health care system.
- 5) Training of health center personnel in the basic principles of emergency medical care
- 6) Preparation of basic kits of instruments, supplies and medications, enabling trained personnel to provide appropriate care at each level of the system.

They also suggest the following strategies for creating or improving emergency medical

systems in developing countries:

- 1) The private sector and non-profit organizations are playing increasing roles in the health systems of many developing countries, these groups should also be consulted before implementing emergency medical systems.
- 2) Clear minimum standards for emergency medical care should be developed through consultation with interested parties.
- 3) Established primary care centers should be used as casualty collection points for ETT, in addition to their preventive and primary care functions. This will require staff training, and the provision of a simple kit of essential equipment and supplies.
- 4) Programmes should be implemented to teach the fundamentals of first aid to large numbers of volunteers.
- 5) The training of doctors and other health care professionals should include the principles of emergency care, including triage and treatment decisions.
- 6) Studies should be conducted regarding means of reducing costs, such as the use of cost recovery (user fee) systems, emergency loan funds for financing improvements to systems, and the development of emergency medical transport at no cost through private voluntary efforts.

Source: Razzak & Kellermann (2002)

3-2-2 Care During Transportation

The prevailing models of emergency medical transport used in developed countries are extremely expensive, and would be impractical for low income countries. Severe resource constraints, roads in poor condition, and fuel shortages seen in poor developing countries force the utilization of other options. In Tanzania, for example, modes of emergency transportation include motorboats, canoes, bicycles with trailers, tricycles with platforms, tractors with trailers, reconditioned vehicles, and ox carts.

3-2-3 Care at the Receiving Medical Facility

The greatest problem with emergency medical care once the patient has reached a medical facility is emergency triage and treatment (ETT). A number of international public health projects aimed at improving ETT are under way at present. An example of Japanese cooperation is a successful pediatric medical care project run in Egypt at the Cairo University Pediatric Hospital (CUPH). This project introduced pediatric triage and flow planning (efficient waiting lines for illiterate

patients who crowd into the hospital as soon as it opens), as well as some basic measures such as thorough infection control and nutrition supplementation in the intensive care ward, and transferring patients no longer critical to regular wards. The triage and flow planning systems in particular are now well established, and the CUPH is able to fulfill its role as the only public pediatric emergency medical facility in Egypt.

As we have seen above, even without high-level medical facilities and transport systems, it is possible with a little ingenuity to ensure a reasonable level of emergency medical care. The key may be the use of existing human and material resources, and concentration on analyzing and solving existing problems. Please refer to Box 10-3 for an earlier analysis of possibilities for emergency medical care in low income countries.

An example of cooperation in IMCI (Integrated Management of Childhood Illness) is a program in Nepal involving a number of donor organizations including JICA. This project suggests ways in which an emergency medical

system may be established at the community level as part of the overall field of pediatric medical care. IMCI generally involves activities at all levels of the health system, from primary care center to tertiary hospitals, but the Nepal project, placing particular emphasis on community-based programs, was known as the Community-based IMCI Project. Female Community Health Volunteers (FCHVs) were given five days of IMCI training, improving recognition of acute respiratory infections (ARI) so that the incidence of severe pneumonia declined significantly. Possible reasons for this include the following: although medical facilities (health posts) are open limited hours, FCHVs are on call 24 hours in the villages, and are very easy to access if there is a

sudden change in a child's condition; prompt treatment of ARIs means fewer exacerbations; severe cases are promptly referred to higher level medical facilities; and the guidelines for the treatment of the individual conditions specified in IMCI are easy to understand. This shows that by basing operations in the community, IMCI projects are strongly linked to emergency medical care. Japan's experience in achieving improvements in maternal and child health without developing a specific emergency obstetric care system has been reflected in cooperation in this project, and further suggests new possibilities for low income countries for initiatives in developing their own emergency medical systems.

IMCI in Nepal



Community level IMCI training