



Study Report on Emergency Medical Care in Cambodia

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Abbreviations

AIS	abbreviated injury scale
CAMA	Christian and Missionary Alliance (*NGO)
DMAT	Disaster Medical Assistance Team
EF	equity fund
ETCG	essential trauma care guidelines
FR	first responder
HIB	Handicap International Belgium (*NGO)
ICRC	International Committee of the Red Cross
JICA	Japan International Cooperation Agency
JPR	Japan Paramedical Rescue (*NGO)
MA	medical assistant
NGO	non-governmental organization
OD	operational district
ODA	official development assistance
RH	referral hospital
SAMU	Service Aide Medicale Urgente (*French)
SBSI	Side By Side International (*NGO)
SNCTC	Secretariat of the National Counter Terrorism Committee
TBS	traditional bone setter
TH	traditional healer
TICO	Tokushima International Cooperation (*NGO)
TRISS	trauma and injury severity score
VERS	village emergency referral system
VHV	village health volunteer
4WD	four-wheel drive

Summary

The Sasakawa Peace Foundation has supported human resource development in Cambodia through various projects including *Journalist Training in Cambodia* and *Capacity Building for Cambodian Public Officials*. As a result of numerous interactions with local counterparts since 2009, the Foundation conducted a basic study for “Support to Cambodian Government for Development of Master Plan for Emergency Medical Care System,” one of the Sasakawa Pan Asia Fund’s development programs. It included the possibility of starting a new program for human resource development in the field.

The focus of the field study was on pre-hospital care and examined the following issues.

- Current status and analysis of the emergency medical system in Cambodia
- Roles and coordination between government and private sectors in the emergency medical system
- Status of emergency transport system development and ambulance crew training
- Methodology necessary to develop emergency medical system in Cambodia

In the field, the study team visited 14 medical institutions in Phnom Penh City, Kompong Cham Province, and Sihanoukville Province in addition to the Secretariat of National Counter Terrorism Committee (SNCTC) and the Ministry of Health to conduct hearings from provincial government’s head of the health department and hospital directors about the current status of the emergency medical system. The team also directly checked usage conditions of ambulances and medical equipment.

Within the city of Phnom Penh, there is some form of an emergency transport system functioning though imperfect thanks to the work of Side By Side International (SBSI), a government-approved NGO, which provides a First Responder (FR) team and an ambulance crew registered with the 119 emergency system. However, their scope of activity is limited and is small-scale.

Some of the public hospitals in Sihanoukville and Kompong Cham have ambulances but are often dispatched to sites several dozen kilometers away due to their wide coverage in areas with low population density. Such dispatches may take few hours roundtrip, causing ineffectiveness in responding to degrading patient conditions.

In rural areas surrounding local cities, ambulance crews which act according to a set standard are effectively non-existent. Often, emergency patients use a taxi or motorbike to transport themselves to a hospital.

Based on the above study results, the study team presented recommendations for the emergency medical system in Cambodia from two perspectives: measures for the current situation (within 3 years) and mid-to-long term measures (within 6 years). These recommendations are not a description of specific

support to be provided to Cambodia from the Sasakawa Peace Foundation but were developed as material to be used by the Cambodian Government in developing their emergency medical system master plan as was the original purpose of this study team. The recommendations cover an emergency transport system, which was most needed in the field, and collection, storage, and use of patient data, which was an analysis result of the field study.

1. Recommendations for Emergency Transport System

Due to the regional variance in the medical system in Cambodia, the study team made separate recommendations for Phnom Penh, local cities, and rural areas.

▪ Short Term (within 3 years)

In Phnom Penh, it is most practical to start with reinforcing existing SBSI FR and hospital ambulance crews. First, the government should develop a “Basic Conduct of Ambulance Crews” and plan a refresher education and training programs to improve skills of individual ambulance crew members. However, it is clear that all possible hypothetical situations cannot be covered by reinforcing the current organization alone, thus the government should aim to increase the number of FR and ambulance teams, dependent on the possibility of acquiring new equipment. It is crucial to develop disciplined leaders who can take action along with developing the system.

The local city emergency transport system should be improved at the initiative of the Cambodian government to match local conditions, referring to the Phnom Penh case. The Ministry of Health is moving forward with a plan to allocate several ambulances to public hospitals in local cities, so the ambulance personnel at each hospital should receive training on emergency measures and ambulance management to coincide with such ambulance allocation. Focus at local city public hospitals should be particularly placed on transport of patients injured in motor vehicle crashes and improving first-aid practice.

It is difficult to apply urban emergency transport systems directly to rural areas. A completely different model from an urban model needs to be considered and the method must be especially low in cost for developing the system. Therefore, the study team made recommendation to the Cambodian government focusing on improvement of the four elements of access to transport method, triage, inter-institution cooperation and communication, and pre-hospital care.

▪ Mid-to-Long Term (within 6 years)

The Cambodian government should assess activities to determine whether the efforts up to the third year have been effective, and set specific targets to improve operation of the emergency transport system. One way to verify these objectives is to conduct joint comprehensive on-site training designed by the Cambodian government, with involvement of related organizations. Follow-up activities should be

conducted as needed to improve skills of ambulance crew members and other individuals, or training should be planned to resolve issues.

The Cambodian government should expand emergency transport systems in local cities gradually across the nation to other public hospitals in local cities based on the analysis results of the previous three years. In conjunction, training within and outside Cambodia should be conducted for mid-level management of provincial government health departments and public hospitals to deepen their understanding of emergency transport systems.

In rural areas, the Cambodian government should assess third year achievement levels using performance indicators (see p.25), and reinforce or revise activities depending on achievement levels and changes in conditions.

2. Collection, storage, and use of patient data

- Short Term (within 3 years)

Though format and methods of collecting and storing patient data differ depending on the hospital, these activities were generally conducted. However, most hospitals in Cambodia do not acknowledge the importance of using patient data. In all institutions, patient records are not yet utilized as material to improve quality of pre-hospital care or as data indicating status of injuries or illness.

Therefore, it is on the initiative of the Cambodian government to start developing a practical database in the first year, pilot use of such data while training ambulance crews, and identify improvements to be made. For records that require scoring (such as AIS or TRISS which are trauma criticality scores), workshop sessions should be held to develop human resources to enter data into the database, thereby aiming for full-scale implementation from the second year onward.

- Mid-to-Long Term (within 6 years)

Improvement in data collection and storage can be expected early on, but usage of data requires some advanced analysis skills, requiring mid-to-long term efforts to improve such skills. It is preferable for the Cambodian government to develop a plan involving national medical university researchers in addition to hospital doctors and the Ministry of Health staff. The TRISS method based on AIS is widely used in developed countries as the standard indicator for quality assessment of trauma treatment.

However, AIS coding involves a complicated procedure and requires expensive training, pointing to the necessity for research and development of methods suited to Cambodia. Cooperation of national medical university researchers is imperative here as well. The mid-to-long term objective is to improve analysis and research capabilities of hospital doctors, Ministry of Health staff, and national medical university researchers to conduct the above R&D.

1. Overview of the Study

1.1 Background and Objective of the Study

Since conflicts concluded in 1992, Cambodia has made steady progress in its nation-building efforts, but it still lags significantly behind other neighboring countries in its development of social infrastructure. Recently, the rapid economic growth of Cambodia has created a huge increase of motorbikes and cars, resulting in a drastic surge of casualties from motor vehicle crashes¹.

Furthermore, Cambodia ranks as the worst country in Asia in terms of its infant mortality rate under the age of five per 1,000 people². Because of the limited capability of local hospitals, many pregnant women requiring operations (including Caesarean sections) are transferred to city hospitals, but many die due to excessive blood loss during transportation.

Given such medical conditions, institutional emergency transport systems and pre-hospital care systems were almost non-existent in Cambodia. Urgent illness or trauma patients either took themselves to the hospital with personal cars or taxis or used private ambulances. However, it had become the norm for such private ambulances to charge patients of an enormous fee. It is not too far from the truth to say that ambulances themselves were not trusted by the Cambodian people.

As described, emergency medical system in Cambodia was undeveloped; lives that could have been saved were lost. To improve such conditions, the Cambodian government took the lead in allocating fully equipped ambulances at public hospitals, introducing a 119 emergency system, and providing technical training to ambulance crews with the cooperation of foreign governments and NGOs. As a result, the trust of the public on emergency medical systems and in emergency transport systems in particular has been slowly growing.

However, emergency transport systems are still limited to the capital area of Phnom Penh, and ambulance crew members' skill levels are still low. In local areas, there are few ambulances, and the emergency medical system itself is near non-existent. It still remains that "development of life-saving lifelines" is an urgent matter for Cambodia. There is a strong need to comprehensively develop emergency transportation, rescue, firefighting, and disaster crisis management systems and to train human resources for such systems in order to save lives that can be saved.

Given such background, based on discussions with local stakeholders, the Sasakawa Peace Foundation recognized that, first, a nationwide basic policy is necessary to develop an emergency medical system in Cambodia.

Therefore, the Sasakawa Peace Foundation decided to conduct a basic study for "Support to Cambodian Government for Development of Master Plan for Emergency Medical Care System" as part

¹ Nationwide deaths due to traffic injuries in Cambodia were 1,717 (in 2009). It has also been reported that annual economic loss reached 250 million USD. (HIB, 2010).

² The worst is Cambodia at 138 deaths, followed by Myanmar (109), Laos (100), Bangladesh (77), and Vietnam (39). Japan is at 5 deaths.

of Sasakawa Pan Asia Fund development project with possibilities for new program development.

1.2 Field Study

The field study was conducted from Monday, January 17, 2011 to Friday, January 21, 2011 with the cooperation of the following five external experts.

- Dr. Hideharu Tanaka (Professor, Department of Sport and Medical Science, Faculty of Physical Education, Kokushikan University) *Team Leader
- Dr. Shinji Nakahara (Lecturer, Preventive Medicine, St. Marianna University School of Medicine)
*Assistant Team Leader
- Mr. Tomonori Nakayama (Lecturer, Department of Sport and Medical Science, Faculty of Physical Education, Kokushikan University)
- Mr. Takunori Sato (Medical Staff, Department of Emergency Medicine & Critical Care, National Center for Global Health and Medicine)
- Mr. Hitoshi Igarashi (Consultant, experience with NGO activities that developed emergency medical system in Phnom Penh)

The field study targeted the capital area of Phnom Penh, as well as areas of provinces Kompong Cham and Sihanoukville along national roads Highway 4 and Highway 6 where the site has numerous accidents, based on the requests of Cambodian counterparts. The study team visited 14 medical institutions in these three areas to conduct hearings about the emergency medical system from hospital directors and other members. The team also verified the use of ambulances and medical equipment.

Table 1. Medical Institutions Studied

Hospital name	Location
Calmette Hospital (national)	Phnom Penh
Khmer-Soviet Hospital (national)	Phnom Penh
National Pediatric Hospital (national)	Phnom Penh
Teuk Thla Clinic (private)	Phnom Penh
Pochentong Referral Hospital (city)	Phnom Penh
Royal Rattanak Hospital (private)	Phnom Penh
Kompong Cham Referral Hospital (provincial)	Kompong Cham
Chamkar Leu Referral Hospital (provincial)	Kompong Cham
Kompong Speu Referral Hospital (provincial)	Sihanoukville
Prey Chnor Referral Hospital (provincial)	Kompong Cham
Tak Wir Health Center (provincial)	Sihanoukville
Graphis Clinic (NGO)	Sihanoukville
Preah Kossamak Hospital (national)	Phnom Penh
National Maternal and Child Health Center (national)	Phnom Penh

The field study focused on pre-hospital care and examined the following issues.

- Current status and analysis of the emergency medical system in Cambodia
- Roles and coordination between government and private sectors in emergency medical system
- Ways of emergency transport system development and ambulance crew training
- Methodology necessary to develop emergency medical system in Cambodia

At the central government, the study team made honorary visits to Dr. OM Yientheng, Senior Minister and Dr. Heng Tay Kry, Director of the Ministry of Health to verify issues and requests related to the emergency medical system in Cambodia.

1.3. Limitations of the Study

There were only five days to conduct this study, making it extremely difficult to verify with a substantial collection of data. Therefore, it is not the intention of this report to provide scientific proof but to present proposals based on objective field observations.

Furthermore, the study team mainly interviewed government and medical personnel; research into communities and the people who are the beneficiaries were withdrawn due to time constraints. However, the team asked in detail about living conditions of the people and conditions of emergency patients from government and medical personnel to reflect proposals that would save people's lives as much as possible.

Many of the institutions studied were located in relatively convenient areas in terms of transportation and communication. However, road infrastructure in Cambodia has yet to be fully developed, which, unfortunately, did not allow the team to conduct sufficient research on how to transport and save village patients. The prior research of Dr. Nakahara (a member of the study team) who is familiar with the medical situation in Cambodia and other publicly available government documents were used to supplement the field study on this point.

1.4. Structure of the Report

Section 2 presents current status and issues of the emergency transport system and ambulance crew activities by first looking back on the history of the emergency medical system in Cambodia. In Section 3, short term (within 3 years) and mid-to-long term (within 6 years) proposals to develop an appropriate emergency medical system in Cambodia is presented based on the conditions described in the preceding section.

2. Current Status and Issues of the Emergency Medical System in Cambodia

2.1 History of the Emergency Medical System in Cambodia

In its initial phases when Cambodia was taking its first steps as a new state in 1993 as a constitutional monarchy, Red Cross organizations, which had been engaged in Cambodia since the pre- and post-war turmoil, played a central role in providing emergency medical care.

The International Committee of the Red Cross (ICRC) and the International Federation of Red Cross and Red Crescent Societies gradually reinforced the function of the Cambodian Red Cross (CRC). The CRC used its own vehicles to provide interim transportation for sick or injured people, provided emergency relief during floods, and took action to prevent dengue fever epidemics. Furthermore, the CRC promoted its “Community Based First Aid Program” to develop human resources capable of providing first aid treatment.

In 1997, with the cooperation of the French Red Cross, CRC started to provide ambulance services for sick and injured people focusing on the Phnom Penh area. This ambulance was referred to as SAMU (French: Service d'Aide Médicale Urgente) and was made available in two locations: the Calmette Hospital and the Kossamak Hospital. Though there were still many constraints with the domestic emergency medical system, people were now at least provided with some form of emergency transport service. To request an ambulance, people could either call the Cambodian Red Cross's dedicated line (023-881511) or either of the two national hospitals listed above, or go to the hospitals directly.

In 2000, the Government of Japan conducted an ODA project “The Project for Providing Ambulances in Phnom Penh” based on the request of the French Red Cross which was supporting the CRC to reinforce the emergency transport system in Cambodia. However, the conclusion of such funding from foreign governments and aid organizations in 2003 almost resulted in the termination of emergency transport services by the CRC.

Given the situation, the Ministry of Health of Cambodia decided to place the CRC ambulances introduced with the support of the Japanese government under the control of the ministry in order to effectively utilize them. These ambulances were distributed to national and charity hospitals in Phnom Penh (such as Khmer-Soviet Hospital and Sihanouk Hospital). The ministry instructed the hospitals receiving ambulances to use them effectively and to respond individually to emergency cases in surrounding areas. This is when the history of government-led emergency medical system began.

Meanwhile, emergency transport services were also emerging up in the private sector. When the CRC's services were suspended, 114 private clinics and hospitals were opened nationwide with the approval of the Ministry of Health (2001). Seeing the increased need for emergency patient transportation, some of such private clinics in Phnom Penh launched a transportation business for sick and injured people using vehicles with almost the same functions as an ambulance but without acquiring official permits from the Ministry of Health.

The ministry introduced a permit system after seeing that such private ambulances were popping up, but the related laws and regulations were only interim measures at that time, which enabled some unlicensed private clinics to remain active under the radar. One major problem with private ambulances was that most of the crew members had no knowledge of emergency measures and would only function as couriers that would transport the injured or sick to the hospital. The other problem was that they charged a fee. Because private ambulances transported patients indiscriminately without considering the patients' wishes and billed an enormous transport fee, low-income patients were forced to bear huge debts to pay for treatment and transportation, which became a social issue.

Under such circumstances, in 2003, the Calmette Hospital, under the initiative of Director Dr. Heng Tay Khy, introduced a simple system where people could request an ambulance with a telephone call. This included a 24-hour "ambulance crew" to be on call as well. The dedicated dispatcher of the Calmette Hospital receiving the 119 call mobilizes the SAMU ambulance belonging to the hospital via radio. This was the very foundation of the 119 emergency system later built. However, there was only one phone line in the dispatch room at that time, and 119 calls would not connect when there were many emergency requests at the same time. The dispatch room itself was a small room about 90cm² with constraints with functionality.

In other hospitals, such as the national hospitals that received CRC ambulances, prepared standby areas for ambulance crews, and developed their own radio communication system so the hospitals and ambulances could interact. As a result, there was a mixture of emergency number 119 for the Calmette Hospital and various phone numbers to request ambulances for respective hospitals in Phnom Penh. Since national hospitals managed ambulances and provided emergency transport independently, there were frequent requests of ambulances far away from the accident site.

As described above, as the Cambodian government progressed the development of the emergency medical system, there was growing widespread international NGO activities in the area of medicine and health³. To take one example among the many projects, the Christian and Missionary Alliance (CAMA) started to use a pick-up truck to transport sick and injured patients in the rural areas of Meanchey since around 1995. In 2004, the international NGO Handicap International Belgium (HIB) started to advocate the need for a fair emergency transport system as part of their traffic accident program. Recently, HIB has grown into a leader in preventive activities to improve traffic safety in Cambodia. In 2005, Global Medic, an NGO from Canada, dispatched Canadian emergency medical technicians, firefighters, and police to the northwestern provinces of Cambodia to provide guidance on first-aid treatment including CPR to 41 Cambodians members of an organization handling injuries and emergencies caused by landmines. Medical Teams International, a US-based NGO that visits Asian countries and trains ambulance crews, has visited Cambodia intermittently and has programs such as developing emergency measures manuals for ambulance crews. Emergency, a US/European international NGO, built a trauma treatment center in

³ Description of NGO activities in Cambodia were referenced from respective NGO websites.

Battambang and has been engaged in reinforcing the emergency medical treatment sector. Finally, Ratnak International is an NGO noted for its unique activities. It opened a floating clinic (boat clinic) on the Tonle Sap Lake around 1997 to provide simple health services to low-income fishing communities in the vicinity. In 2000, they also opened another boat clinic along the Mekong River about 90km south of Phnom Penh.

In terms of Japanese NGOs, the certified NPO headquartered in Tokyo, Side by Side International (SBSI) has supported emergency transportation such as by providing ambulances to organizations including the Khmer-Soviet Hospital, National Pediatric Hospital, and Sobbhana Foundation since 1999. Also in 2008, TICO, an NPO headquartered in Tokushima, and Kagawa-based Second Hand started a three-year program for developing emergency transport systems and pre-hospital care systems supported by grass roots level JICA Partnership Program, *Life Safety Network for the Social and Economical Disadvantaged People in West Phnom Penh*. The reasons why Phnom Penh OD West was chosen was because of the high poverty rate, a foreseen population boom due to rapid progress of factory construction due to foreign capital, and its location as being the most distant from a national hospital which is the final transport medical institution in Phnom Penh.

In the project, OD West's health office acted as the counterpart to accept long and short term dispatch of emergency physicians, emergency nurses, and project management personnel from Japan via TICO. Ancillary to this project, a used ambulance (2B model) from Japan which allowed emergency care to be provided onboard was provided to transfer critical condition patients who cannot walk. This was a first for Cambodia.

Small dispatch rooms were opened at the five health centers managed by the OD West health office (Toul Kork, Teuk Thla, Khmuonh, Samraong Krom, Pontok). This connected the five health centers with the health office via radio 24-hours a day, creating a system to quickly dispatch ambulances. Afterwards, the radios managed by the OD West health office were integrated with Calmette Hospital's 119 emergency system. However, this did not lead to more opportunities for coordination between Calmette Hospital and health office ambulance crews; they continued to act independently.

What brought drastic change to the emergency medical system in Phnom Penh was due to statements made by Prime Minister Hun Sen. In a speech delivered at the medical university, the Prime Minister strongly criticized saying, "Private ambulances do not help people at all. They are actually causing harm." The background to this was that private ambulances were fighting over emergency patients. It was a major problem that could not be overlooked; they treated patients like



Photo 1: Ambulance introduced at OD West Health Office



Photo 2: Dispatch Room at OD West Health Office

objects, threw them into ambulances, and drove them to private clinics without providing emergency measures.

Given the Prime Minister's comments, the Ministry of Health established a special commission to consider reinforcing the emergency medical system, focusing on pre-hospital care. Two experts from TICO who were jointly promoting projects with OD West's health office were also contracted to serve as commission members.

Based on the commission's deliberation results, the health ministry integrated the three activities of ambulance crews of OD West health office, the 119 emergency system of Calmette Hospital, and emergency and lifesaving activities that had been conducted independently by other public hospitals. In other words, it shifted to a system where the 119 dispatch room took the lead and called up and mobilized the ambulance crew closest to the accident site. Furthermore, this room (hereafter called the "emergency call center & dispatch room") located at the Calmette Hospital was refurbished and functions were reinforced with the support of TICO and SBSI. The ambulances at the Kossamak Hospital and Khmer-Soviet Hospital were retrofitted to allow basic emergency measures (maintenance



Photo 3: Emergency Call Center & Dispatch Room

of airway, ventilation, hemostasis) during transportation. In addition, all ambulances affiliated with the Phnom Penh Municipal Hospital and the Khmer-Soviet Hospital were equipped with radios to allow them to take part in the Calmette Hospital's 119 emergency system. As a result, by February 2009, the five ambulance crews (divisions) consisting of the three national hospital teams in Phnom Penh, the Municipal Hospital's emergency division, and the team from OD West health office were integrated under one system and one rule. SBSI's First Responder (FR)⁴ took command and controlled this system.



Photo 4: FR vehicle

Before such management of public ambulances, the Ministry of Health developed new regulations for private ambulances in November 2008. Though it allowed private ambulances to transport patients from health centers to hospitals or residences, it prohibited them from transporting emergency patients from public places under any circumstances. It was defined that private ambulances must have qualified nurses onboard and that sirens can only be used when emergency patients were being transported. These changes determined that public ambulance crews were the only ones that could transport emergency patients "to their preferred hospital" "free of charge."

While private ambulances were subject to regulation, the Ministry of Health appointed SBSI as the

⁴ The FR's mission is to monitor whether 119 emergency system ambulance crews are acting appropriately and to provide advice. They have equipment to listen to Calmette Hospital 119 emergency system radios and general and traffic police radios, enabling them to quickly go to the site while collecting information.

organization to promote nationwide development of an emergency medical system. This indicated the Cambodian government's recognition of SBSI as a comprehensive coordinator for nationwide deployment of disaster and emergency related support activities. As a result, SBSI proactively deliberated with other NGOs and related organizations involved in these areas and began to play a coordination role for more efficient aid.

Through such coordination, the NPO Japan Heart based in Tokyo was appointed to provide intermittent technical advice to ambulance crews at the Khmer-Soviet Hospital. The Japan International Paramedical Rescue Technical Cooperation Corps (JPR, headquartered in Kobe), a voluntary group of active firefighters and other professionals, dispatched instructors through SBSI to improve ambulance crew skills for emergency measures.

As shown above, the Ministry of Health has led the development of emergency transport system and pre-hospital care system in Phnom Penh. However, after the SNCTC was established as the organization reporting to the Prime Minister for catastrophic disasters and significant accidents (including terrorism) in 2008, it was decided that the SNCTC would take primary responsibility for emergency and lifesaving activities of the people⁵. In 2011, SNCTC established the Coordination Services of SNCTC under the Department of Infrastructure Protection (DIP) to launch full-scale development of an emergency medical system.

⁵ A body directly under the Prime Minister established in January 2008. Its mission is to plan and respond to catastrophic disasters and significant accidents including terrorism, and has jurisdiction over the Ministry of Interior, Ministry of National Defense, Ministry of Health, and others.

SNCTC-related legislation is as follows. (<http://www.interior.gov.kh/news-1.html> accessed on 23 March, 2011.)

- 29 January 2008, the Sub-decree 09: This Sub-Decree has determined a structure and establishment of Departments under the supervision of the Secretariat of the National Committee for Leading, Ordering, Fighting, and Preventing Terrorism, briefly named the National Committee for Combating Terrorism (NCCT)).

The Secretariat of the NCCT shall have five Departments as follows:

1. Department of Administration & Finance (DAF);
2. Department of Information Technology (DIT);
3. Department of Intelligence & Investigation (DII);
4. Department of Infrastructure Protection (DIP); and
5. Special Department (SD).

- 29 January 2008, Prakas 18/08 : The Royal Government of Cambodia established offices under the Departments of the Secretariat of the National Committee for Combating Terrorism to command, to combat and to prevent terrorism.
- 27 February 2008, Royal Decree 0208/172 : The Royal Government of Cambodia amended the National Committee for Counter Terrorism (NCCT), equipped with well-crafted mechanism for national strategies in preventing and suppressing terrorist activities. It is in processing plan of action and readiness to promptly responding to the potential national security threats.

2.2 Current Status and Issues of the Emergency Transport System

2.2.1. Phnom Penh

The following institutions were members of the 119 emergency system as of November 2009, but ambulance crews that the team actually verified in this study are the crews affiliated with the five medical institutions indicated with asterisk in Table 2 below.

Table 2. Institution Members in 119 Emergency System

Calmette Hospital*
Preah Kossamak Hospital*
Khmer-Soviet Hospital*
Phnom Penh Municipal Hospital*
Phnom Penh OD West Health Office
Army 70th Division Community Hospital
SBSI First Responder (FR)
National Counterterrorism Committee (NCTC)⁶ directly under SNCTC

It is recommended that each medical institution has one ambulance crew on 24-hour standby. Some national hospitals may have several ambulances; however, there is generally only one ambulance crew that can be mobilized 24-hours a day. If several ambulance crews are necessary in disaster situations, medical professionals working at hospitals would ride the ambulance as necessary to go to the disaster site. The ambulance is equipped with radios that can communicate with the emergency call center & dispatch room. The crew leader also has a portable radio so that they can respond to dispatch calls when responding to situations outside of the ambulance. However, the portable radio often does not work in the city area with its many concrete buildings. The radio in the ambulance can communicate with the emergency call center & dispatch room up to about a 20km radius, but also goes out of range in low level areas or near buildings.

Other than the hospitals above, the study team verified that the following hospitals have their own ambulances though they are not a part of the 119 emergency system.

Table 3. Hospitals with Own Ambulances

National Pediatric Hospital
National Maternal and Child Health Center
Phnom Penh Health Department Headquarters
Phnom Penh Health Department Chom Kamon Hospital

⁶ NCTC only responds to large-scale accidents and catastrophic disasters and are not mobilized for normal emergencies.

Locations of hospital ambulance crews in Table 2 and hospitals in Table 3 in Phnom Penh are as shown in the Figure “Hospitals with Ambulance Crews and Ambulances in Phnom Penh” (page 29). As shown in the map, crews are focused in the center of Phnom Penh. However, there are none allocated in the southeastern, southwestern, and northwestern part of the city as well as near the strip of land between Tonle Sap and Mekong rivers. This is because there are no national or public hospitals with ambulance crews in these areas. Because the Ministry of Health is responsible for operating ambulance crews in Cambodia, crews are generally affiliated with hospitals. Therefore, ambulances are allocated to national hospitals, and crew members are employed as hospital staff. This is very different from Japan in which emergency medical technicians are under the Fire and Disaster Management Agency and they are actually allocated at fire stations.

If ambulance crew allocation standards regulated by the Fire Service Act of Japan were to be applied directly to Phnom Penh, about 27 crews would be required⁷. However, as of January 2011, there are only five crews operating under the 119 emergency system as mentioned above. In order to alleviate the lack of ambulance crews, hospitals in Phnom Penh have tried a “flexible allocation” system in the past. In June 2009, the Khmer-Soviet Hospital ambulance crew was put on standby on roads and gas stations outside of the hospital during specified times. However, with the fact that the original idea of allocating and operating “one hospital, one ambulance crew” is the most effective in terms of cost-benefit, this “flexible allocation” format did not come through for its financial burden placed on the crew.

2.2.2. Kompong Cham Province

Highway 6 connecting Phnom Penh and Kompong Cham Province is a major roadway for Cambodia that also leads to Siem Reap where Angkor Wat, the world heritage site, is located. This study investigated medical institutions along the route from Highway 6 to Highway 7 into Kompong Cham Province.

To go from Phnom Penh to Kompong Cham Province, there are several provincial roads and other highways that can be taken other than Highways 6 and 7; however, they are the only roads that are being paved under aid from foreign governments. There are numerous deaths caused by motor vehicle crashes in the area around the national highways; such area has required immediate response by the Ministry of Health, the National Police Agency, Ministry of Rural Development, and Ministry of Public Works and Transport. The crashes are caused by over speeding and drunk driving. Motor vehicle crash fatalities are mostly motorbike drivers, their passengers, or pedestrians, or, in other words, socially vulnerable people who have become victims of the “traffic war.” This trend can be observed in motor vehicle crashes throughout Cambodia.

⁷ Shoboryoku no Seibi Shishin Kenkyukai. *Policy for Firefighting Capability Development and Water Source Standards*. Gyosei. January 2006: 99-101.

From Phnom Penh to Kompong Cham Province provincial border, there are some private ambulances along the route, though not sufficient in numbers. However, there were no ambulances in Prey Chhor where National Highway 7, provincial roads No.62 and No.70 intersect. If ambulances in Phnom Penh were to cover these zones, they would have to cover an area of over 50km, burdening their capacity.

In Kompong Cham and along the national highways, the study team visited three hospitals: Prey Chhor Referral Hospital (RH), Kompong Cham RH, and Chamkar Leu RH. First, Prey Chhor RH had one Japanese ambulance (2B model) donated by SBSI. Medical equipment onboard included a ventilator, vital sign monitor, and automatic ventilator PneuPac, but there was no radio transmitter. When people requested an ambulance, they would either directly call hospital staff or the ambulance driver. It was explained to the team that the ambulance generally covers a 25km radius from the hospital, and onboard staff have received basic training.

Kompong Cham RH owned four ambulances but one was inoperable due to breakdown. All vehicles were not equipped with any accessories for emergency measures. They also did not have any radio communication system linking the ambulance and hospital. Kompong Cham RH also employs the method of using phones to request ambulances similar to Prey Chhor RH.

The final hospital visited was Chamkar Leu RH which also had one high-spec ambulance donated from Japan via SBSI equipped with a ventilator and vital sign monitor. Like other hospitals, it did not have radio transmitters, but used phones to call ambulances. The most distant location the ambulance was dispatched to was about 70km radius from the hospital. Onboard members have received basic training, according to staff.

2.2.3. Sihanoukville Province

National Highway 4 connecting Phnom Penh and Sihanoukville is considered one of the major transportation arteries with significant impact on social and economic developments in Cambodia. The only international port in Cambodia, built with aid from Japan, is located in Sihanoukville. Therefore, the Cambodian government is also expediting infrastructure development for this key port for international trade with pavement repairs for Highway 4 nearing completion. Road conditions are relatively good on Highway 4 which is an 8 to 12m wide one lane/ two direction road to Phnom Penh.

The team studied in the field in order from Kompong Speu RH, Tak Wir Health Center, to Graphis Clinic located along Highway 4 to Sihanoukville. The first hospital, Kompong Speu RH, is located along Highway 4 about 55km from Phnom Penh. Briefings described that two ambulances were affiliated with the hospital, but the team could only verify one Land Cruiser 4WD type ambulance during the visit. This vehicle was not equipped with any equipment or medical facilities, indicating that almost no emergency measures were provided en route. Because it is located along Highway 4, this hospital responds to motor vehicle crashes, as some seriously injured people are directly transported to national hospitals in Phnom

Penh. If motor vehicle crashes occur near Sihanoukville, Kompong Speu RH coordinates with Graphis Clinic located 75km southwest from it. They have future plans to introduce a radio system, and to function as an intermediate hospital between clinics for injuries and hospitals in Phnom Penh (about 125km distance). This area also has one private clinic ambulance in operation as well.

The Tak Wir Health Center is about 60km from Sihanoukville towards Phnom Penh along Highway 4. It is difficult for the Health Center to cope with basic trauma cases including maternal emergencies, so the center uses its ambulance to transport emergency patients to Sihanoukville RH (unvisited hospital). The ambulance has no equipment to provide emergency measures and no wireless communication devices. However, it still strives to respond to motor vehicle crashes and tries to coordinate with a clinic for injuries that was opened in the vicinity.

The last institution the study team visited was Graphis Clinic. It is a clinic capable of providing trauma care and was opened with the aid of a Japanese NGO (GRAPHIS) in August 2010. The Clinic is located in Kompong Seila district and is operated by SBSI. In addition to promoting ambulance crews in Phnom Penh, SBSI has also conducted projects to allocate ambulance crews along Highway 4 as a measure to take for crashes and as a way to improve access to medical institutions for emergency patients in rural areas. Graphis Clinic can be described as their final effort of such programs.

2.2.4. Local Emergency Transport System

In the previous sections, the report discussed emergency transport systems focusing mainly on transport methods (ambulances), but an emergency transport system is a comprehensive concept that encompasses access to transportation methods (communication methods, cost, distance), triage, coordination/communication between organizations, and pre-hospital care. From this perspective, the final section points out issues with the emergency transport system in local and in particular, rural areas, from various perspectives.

First is access to transport methods. Methods to request an ambulance, though different among organizations, are mostly through police, village heads, or Village Health Volunteers (VHV) rather than direct request by the residents. There are also many emergency patients that visit the hospitals on their own via taxis or motorbikes rather than using ambulances because there is not enough awareness on how to use ambulances (contact method, when to use them). Possible reasons could include poor convenience (too much waiting time) and difficulty to directly contact (consult with village heads or VHVs to contact). Especially in Kompong Cham, at all institutions, most requests are from the police while almost none are from health centers or the residents, and ambulances seemed to be used almost entirely for traffic injuries.

Meanwhile, Pochentong RH conducts awareness-raising activities such as distributing cards with contact information for ambulance requests, and almost all emergency patients use ambulances to go to the hospital. Patients or their families directly called and requested the ambulance or requested it through their nearest health center. Some RHs in Kompong Cham have provided their contact information to

VHVs.

The study team did not have any opportunity to directly interview people about their awareness, but there may be misunderstandings that only traffic injuries can use ambulances or that it is embarrassing to ride in them. If VHVs or village heads are consulted before going to the hospital on their own or requesting an ambulance, it may presumably take a considerable amount of time to secure transportation methods.

In areas with a low population density, ambulances owned by institutions must cover a wide area and may be dispatched several dozen kilometers away. Depending on the road conditions, it could take several hours, leading to degrading patient conditions or inability to respond to other requests. In such areas, it is not feasible to substantially increase the number of ambulances or to use helicopters to help with efficiency, which points to the need for Cambodia to develop a transportation system that fits their actual conditions.

Whether it is transportation by taxi or ambulance, patients must pay for fuel costs. Long travel distances amount to a considerable sum that villagers with no cash income find difficult to pay. Equity Fund (EF) is a risk sharing scheme for the poor established in various areas. Members (impoverished communities) can receive payment for travel expenses, but further information needs to be collected on the actual status because there seems to be areas with no EF organization or some EFs that do not provide travel expenses.

Secondly, in terms of triage, RH (excluding provincial hospitals) and health center ambulance crews must decide at the site whether the patient condition can be treated at their own institution or not and determine a destination hospital. In contrast, all national hospital ambulance crews in Phnom Penh can take all their patients to their own institution. However, there is no clear protocol on hospital selection or criteria to decide for referrals and is based on on-site decision-making from past experience.

Hospital selection (including referrals) may also be affected by patient and family preference in addition to criticality. Even when criticality is low or a referral is not applicable, if there is a strong request (by the patient or family) to be transferred to a provincial hospital or Phnom Penh, the patient and their family apparently are unable to decline this request. Information on the actual conditions of such “self-referral” and “self-triage” and how much of a burden it presents to the emergency medical system needs to be collected. Presumably, this must be causing problems such as delaying treatment due to unnecessary long distance travel or long absence of ambulances.

Thirdly, in terms of coordination and communication between institutions, ambulance team staff provide a completed referral letter but hardly ever contact the receiving institutions when referring patients. According to past research, it seems that in many cases referral letters may also be omitted⁸. The receiving institution does not feel that no contact is an issue either. It seems that they see the reason for being contacting as checking whether the patient can be accepted, but because there are no other receiving

⁸ Nakahara et al., 2010.

hospitals, giving them no reason to reject the patient, they feel that there is no need to communicate. However, in critical patient referrals, necessary preparations for surgery or transfusions are delayed if there is no advance communication, creating more waiting time and lowering the survival rate. By checking patient conditions before transportation, it may also be possible for the receiving hospital to instruct on stabilization treatment.

Finally is about pre-hospital care. There is insufficient training on pre-hospital care provided to staff engaged in emergency transportation. There were only simple emergency measures training conducted. At Tak Wir Health Center first-aid training was conducted to VHVs but was not provided to the residents. VHVs are appropriate as first responders because they are the individuals that residents consult first, but there are only two VHVs per village in the area around Tak Wir Health Center, which is not enough. In particular, there should be more first responders in low population density areas remotely located from health centers.

2.3. Current Status and Issues of Ambulance Crew Activities

2.3.1. Overall Assessment of Ambulance Crews

If ambulance crews in Phnom Penh are to be assessed from the points of operation method, crew skill level, and equipment, they can be described as following.

Currently, ambulance crew activities in Cambodia are mainly focused on motor vehicle crashes and only function to transport the injured and sick to medical institutions. Therefore, lack of clear rules on acute illness or crew members' lack of medical knowledge is not seen as a problem. However, in the near future, it can be easily foreseen that the number of motor vehicle crashes will increase, requiring more ambulance dispatches, thus causing a complete collapse of the entire emergency medical system (emergency call center & dispatch room, ambulance crews, emergency hospitals). Furthermore, if there is a large-scale accident or catastrophic disaster (including terrorist attacks), the current system will not allow for immediate response.

Ambulance crews generally consist of three members: a physician, a medical assistant (MA) or nurse, and the driver. However, when dispatched to motor vehicle crashes and such, they only place the injured on a stretcher and transport him/her to a hospital, and do not perform any homeostasis treatment. There is also no division of roles, so there is no understanding among the ambulance crew why a physician, MA or nurse would go to the site. Therefore, although a system to dispatch physicians and MAs or nurses to the site is taking shape, the urgent mission is for emergency measures to spread widely.

In terms of crew skill levels, there seems to be good coordination among crew members of the Khmer-Soviet Hospital who have received training in the past, but they do not display medically-based behavior. On the other hand, skill levels of ambulance crew members at other national hospitals are low and require re-training. Fortunately, members are highly motivated and ambitious, so if they are provided

opportunity for appropriate training, they are likely to acquire an appropriate skill set.

Currently, the ambulance team conducts lifesaving activities using the equipment that is currently available, which is not entirely sufficient. However, this is due to the fact that ambulance crews are currently operated as being dedicated to transporting the injured and sick to medical institutions, and have no need for equipment other than scoop stretchers and normal stretchers. If simple care including medical treatment is to be provided in the future, ambulance crews will also require medical equipment.

2.3.2. Verification of Activity Records

Patient records have great importance on improvement of examination quality, basic information on regional injury/illness status and prevention, as well as confirmation of pre-hospital care activities. In terms of the current conditions of patient data collection and use in the emergency medical system of Cambodia, the team studied the collection, storage, and use of ambulance crew activity records.

First, in terms of patient data collection, almost all emergency transport systems including local ones are recording activities for pre-hospital emergency transport and referral transport. The format varies by region, but the content is almost equivalent which includes date, place, patient attributes, condition/illness, and care provided.

National hospitals in Phnom Penh (Calmette, Khmer-Soviet, and Kossamak) use a common check sheet format. Pochentong RH also uses the same format as the national hospitals, but expands to collect more detailed information for injury mechanisms. The Tak Wir Health Center of Sihanoukville requires that the same content be filled in twice on one sheet on the left and right side. The information listed was the same, but was a free-statement format (Sihanoukville format). Because there are only 70 or so transportation cases by Tak Wir Health Center each year, it seems that filling out the same information twice by hand was not a problem in terms of labor.

The recording sheet used in Phnom Penh has very many items to complete, and much information was missing. It may be necessary to delete some items. As a reference, pre-hospital care in Thailand only uses four items for assessment.

The Sihanoukville format is an open-statement style which may lead to inconsistent content depending on the writer. There was also no space to log the chronology (such as departure, arrival, arrival at hospital). Ambulance crews can collect much information on injuries, but many of the items recorded about the injury conditions do not match at all with the hospital's injury surveillance system format, so ambulance crew activity records cannot be directly transferred to injury surveillance and used.

Next is regarding storage conditions of patient data. Ambulance crew records are provided to the receiving hospital's doctor taking the patient and are used as pre-hospital information during examination. The crew also needs to store the records, but the study team could not locate a stored activity record sheet at any of the national hospitals. The crews responded that they kept such records, but it seems that they only record the number of people and do not maintain the actual sheets. In contrast, Pochentong RH

stored their activity records, and the team also verified that they entered the data in an Excel spreadsheet. At Tak Wir Health Center, the sheet was cut in half with one half going with the patient to the doctor and the other stored at the Health Center.

Finally, in terms of using patient data, it seems that the importance of using records is not recognized in Cambodia. In all institutions, the records are not being used at all to assess activity content to improve the quality of pre-hospital care. Furthermore, they are not used as data indicating injury/illness occurrence either.

3. Future Vision for the Emergency Medical System in Cambodia (Recommendations)

3.1. Basic Approach to Recommendations

The Sasakawa Peace Foundation has conducted various projects in Cambodia through Sasakawa Pan Asia Fund projects. Some examples include *Exchange program for Young Cambodian Parliamentarians*, *Capacity Building for Cambodian Public Officials*, a program targeting mid-level administrative civil servants and government-related research civil servants, and the *Journalist Training in Cambodia* to support development of journalist who understand the responsibility inherit in free press and who have strong ethics to protect such principles. As can be readily identified by the project names and objectives, the Sasakawa Peace Foundation has focused on human resource development and interpersonal exchange in Cambodia. Therefore, the support the Foundation can provide in building an emergency medical system in Cambodia is not in terms of providing tangible objects such as constructing buildings or providing equipment, but will be centered on activities such as ambulance crew leadership training, dispatching experts to help improve crew member skills, training in Japan, local training support, or helping to organize seminars and workshops.

This section presents the study team's recommendations for the emergency medical system in Cambodia from the two perspectives of current measures (within 3 years) and mid-to-long term measures (within 6 years), focusing on human resource development and interpersonal exchange. These recommendations are not explicit explanations of specific support to be provided by the Sasakawa Peace Foundation in its cooperation with Cambodia, but is a collection of several options that can be used as material for the Cambodian government to create its emergency medical system development master plan as was the original purpose of the study team.

Recommendations center on the emergency transport system, which was a strong need in the field, and patient data collection, storage, and use, which was identified through analysis results of the field study. There were other various needs and medical problems, but the study team focused on these two issues due to factors such as infrastructure conditions, social welfare system, and community structure (families and other communities), as well as the urgency of coping with motor vehicle crashes which is posing a huge issue for Cambodia currently. However, due to the significant regional gap in medical care between the capital city of Phnom Penh and local areas, the team proposed visions for the future of emergency medical system separately for these two groups, thus naturally leading to separate recommendations.

3.2. Emergency Transport System

3.2.1. Short Term (within 3 years)

(1) Emergency Transport System in Phnom Penh

Within the city of Phnom Penh, there is some form of an emergency transport system functioning though imperfect through the work of Side By Side International (SBSI), which provides a First Responder (FR) team, and ambulance crews registered with the 119 emergency system. However, their scope of activity is limited and on a small-scale, thus requiring further expansion to save lives that can be saved. In particular, the following organizations should be developed under the responsibility of the Cambodian government to meet the urgent need to develop a blueprint for an emergency transport system.

1) Increase FR

FR crews go to the site before ambulance crews arrive for large-scale accidents and catastrophic disasters and provide basic first-aid treatment in advance as necessary while commanding the chaotic scene based on appropriate judgment. It is not possible to respond to all probable scenarios with only the SBSI FR. Therefore, the Cambodian government should establish new FR under situation control organizations such as the National Counter Terrorism Center (NCTC) directly under SNCTC, traffic police, and firefighting police. They should also establish a higher organization (or higher level personnel) to be the one-point of command of these FR. If this higher organization (or higher level personnel) also supervises the following ambulance crews as well, it would lead to a stronger management organization for the emergency transport system.

2) Development of New Ambulance Crews

The present 119 emergency system registered ambulance crews (see Table 2, p.9) not only cover all of Phnom Penh city but also some provincial capitals along National Highways 6 and 7, and are overstretched in terms of their capability. To improve this situation, the Cambodian government should newly develop ambulance crews at RHs under the Ministry of Health that will be receiving ambulance vehicles and the like from foreign aid, and organize such crews so that they coordinate with the current ambulance crews registered with the 119 emergency system.

FR and ambulance crews' activities have a supplementary relationship. Hospital ambulance crew's operational and management costs are paid by each hospital's general income. In other words, ambulance crew activities are maintained through the voluntary initiative of hospitals. However, emergency patients in public areas including motor vehicle crashes have to be transported at no charge, so as the number of dispatches increases, this structure places a heavy burden on the hospitals in terms of operational cost of the crews. In fact, free-of-charge ambulance transportations are increasing each year, and many hospitals are having difficulty with maintenance and operational costs. Increasing the number of FR who cooperates with ambulance crews is extremely important to improve such conditions and keep protecting the lives of the people.

With the expansion of FR, training will become necessary for new crew members to acquire skills such as first-aid treatment, transportation of the injured and sick, and command and supervisory skills. In

particular, it is important to develop personnel who can act on their own initiative and display leadership skills that will positively impact his/her surroundings. In addition, new ambulance crews need training to acquire skills such as lifesaving techniques, ambulance maintenance and management, report writing, basic activity data management, and safe operations.

That being said, it takes time to build a new organization and is not a task that can be completed immediately. Therefore, it is on the initiative of the Cambodian government to reinforce the functions of the existing SBSI FR and ambulance crews while continuing with preparatory activities. First, re-training programs should be planned to increase the skill level of individual active ambulance crew members. When doing so, it is important to provide training under a common curriculum for all hospital ambulance crews. The Khmer-Soviet Hospital has already conducted coordination and crew activity training. This can be used to create a “Basic Conduct of Ambulance Crews” and used to provide training to crews at other hospitals.

Next, SBSI FR should be strengthened. The role expected from FR is to provide patrol instruction and management support to ensure that hospital ambulance crews registered with 119 emergency system are conducting activities within a fixed set of rules and that a certain level of medical service is being provided. In order to strengthen the activities of SBSI FR which are directly involved in quality improvement of ambulance crew activities, it is imperative to secure high performing crew members. One effective method to secure such members may be to solicit significant citizens interested in emergency medical care, have them participate in training programs, and engage them as volunteers.

Common training for SBSI FR and existing ambulance crews should cover radio reporting procedures among emergency call center & dispatch room, FR and ambulance crews, including information collection procedures for 119 calls. It should especially focus on improving skills for immediate and adequate radio reporting and radio command skills. In order to conduct such training, a Khmer-language text must be prepared first.

(2) Local Emergency Transport System

Local emergency transport systems are much more fragile than those in Phnom Penh, leaving local people in medical desolate conditions. Furthermore, medical conditions are different among various local regions such as between local cities visited by the study team (ex. Kompong Cham and Sihanoukville) and surrounding village areas. Described concisely, there is significant regional variance of medical services in Cambodia.

In general, most local cities have no developed ambulance crew that provides emergency transportation under a certain set of rules. Currently, their public hospitals are struggling on how to respond to patients injured in motor vehicle crashes. In particular, National Highways 6, 6A and 7 connecting Phnom Penh and Kompong Cham have the worst traffic fatality rate in Cambodia according to a report by the Cambodian government published in 2009. Ambulance crews from public hospitals in local cities are also dispatched to motor vehicle crash scenes along the national highway that connects each provincial capital.

Often times the scene is very far from the hospital. Due to the shortage of ambulances, when one is dispatched to a remote location, they cannot provide emergency transportation until that ambulance returns.

Highway 4 is also referred to as the major roadway for economy and logistics that connects the capital, Phnom Penh and Sihanoukville, but oversized vehicle crashes could cause secondary disasters such as spillage of hazardous materials including chemicals, or fires caused by gasoline or other flammables. There is no organization to respond to such situations as of yet.

To resolve or to at least alleviate such problems, the Cambodian government should modify local city emergency transport systems by referencing the lessons learned in Phnom Penh but tailored to local conditions. According to Ministry of Health policies, several ambulances are to be allocated to public hospitals in local cities. The government should also provide with basic first-aid practices and ambulance management training to transportation personnel at hospitals as ambulances are allocated to them. It may also be possible for them to participate in ambulance crew training held in Phnom Penh.

What is currently most needed by public hospitals in local cities, as described above, is the transportation and treatment of patients injured in motor vehicle crashes. Even though emergency transportation needs are high, the public hospitals in local cities are unable to sufficiently cope with it, forcing Phnom Penh ambulance crews to handle such needs. The Cambodian government should newly establish ambulance crews at local public hospitals so as to allow effective response to motor vehicle crashes along national highways. They should also decide on meeting points of such crews and Phnom Penh crews. If there are health centers or police stations near such meeting points, the government may also establish FR in view of the possibility to acquire equipment.

On the other hand, it is difficult to apply urban emergency transport systems to rural areas. A completely different model needs to be considered, but the method used must be low in cost to develop.

Therefore, the study made recommendation to the Cambodian government focusing on improvement of the four elements of access to transport method, triage, inter-institution cooperation and communication, and pre-hospital care, as following:

1) Improved Access to Transportation Methods

To improve access to transportation methods it is necessary to consider developing an emergency transportation plan, informing residents, and building a risk sharing scheme.

a) Securing Emergency Transportation Methods

The Cambodian government should develop an emergency transportation plan for each region. It is appropriate to use ambulances in areas near institution with ambulances, but, they may not always be necessary for regions remote from such institutions. Depending on the distance from the institution, it may be more rational to use locally available transportation methods to the medical facility or up to the meeting point determined in advance and to transfer to an ambulance, rather than going roundtrip on an ambulance for the entire duration.

The plan should identify methods available in the area and provide for patient transportation to medical facilities as quickly as possible. In areas where there are no public transport methods, the local authority should consider using commercial vehicles (taxis or trucks) or personal passenger vehicles. They should decide on an arrangement (communication method, costs) for emergency use in advance with the vehicle owner. Costs should be kept as low as possible. For example, if a taxi is to be used, it should set at lower prices than normal. The government also needs to secure communication methods in regions where mobile phones are not widely used. Possible arrangements include requesting cooperation from households or stores with telephones or to establish communication methods via village heads or VHVs.

b) Informing Residents

It is not enough for emergency transport systems to just exist. The local authority should inform residents who would use such services, of the existence of such system and when and how to use the service (contact information and costs). Referring to the Phnom Penh OD West case, the government should distribute pamphlets or cards to all residents informing them about the existence of such a system, contact methods, and other information, or may plan information communication training and informative activities through VHVs.

c) Building a Risk Sharing Scheme

Risk sharing schemes like medical insurance (collecting funds for medical fees) called EF are established in some regions, but they may not cover transportation fees. The local authority or community should have such EFs change items to be paid (to include travel fees). In areas with no such organization, they should establish some type of risk sharing scheme.

2) Improved Triage

The Cambodian government should develop triage protocol for ambulance crews in the field and protocols to determine referral transportation at health centers and RHs, and conduct trainings for staffs. To eliminate unnecessary self-referrals and self-triage, the government should inform residents of the risks of meaningless long-distance transportation. By improving the quality of medical care in the long term, it may be possible to reduce the number of self-referrals and self-triage.

3) Improvement of Inter-institutional Coordination and Communication

The Cambodian government should educate medical staff such as to always contact the receiving hospital when transporting patients to notify them of the patient conditions and planned arrival time, and to provide instruction on patient treatment to the receiving ambulance crews or the medical staff of referring institution. The triage protocol and referral transportation protocol should include “Pre-transport contact”.

4) Improvement of Pre-hospital Care

In order to improve emergency measures and ambulance services before arriving at the hospital from the scene (including treatment at the health center), the Cambodian government should consider protocols related to rescue, triage, and inter-institutional coordination, development of training material, and training methods. Khmer text material for pre-hospital care, health center level emergency medical care, and first-aid treatment for VHVs and residents have already been made available, so video material should also be developed. Medical staff, VHV, and residents should receive trainings on first-aid treatment. It may also be necessary to create special programs for remote areas because first responders need more advanced capabilities in such areas where transportation takes more time. Though this was not sufficiently studied in detail this time, it is clear that health centers are lacking inexpensive necessities⁹, so it is necessary to develop plans to check and procure equipment. Training on fabrication methods should be conducted for backboards and splints that can be made from readily available materials.

Integrating traditional Healers (TH) and Traditional Bone Setters (TBS) into pre-hospital care systems might also be beneficial because many patients prefer traditional treatments rather than modern medicine and their cheaper prices. It has been pointed out that trauma treatment by THs and especially bone fracture treatment complications (ischemia due to excessively tight settings, leading to amputation) are problematic, however, it has also been indicated that such complications can be reduced through some short-term training¹⁰. Rather than completely excluding THs from the emergency medical system, delay of treatment due to choosing to see a TH may be minimized by recognizing simple trauma treatment by THs, clarifying criteria for THs to refer patients to hospitals, and by integrating them into the system.

In summary, for local emergency transport systems, the Annex “Emergency Transportation Plan Development Guideline” at the end of this report may be useful. Experience of Kaoh Kong Province which developed systems by village called “Village Emergency Referral System (VERS)”¹¹ may also be of value.

Annex “Emergency Transportation Plan Development Guideline”

3.2.2. Mid-to-long Term (within 6 years)

(1) Emergency Transport System for Phnom Penh

The Cambodian government should assess activities to determine whether the efforts up to the third year have been effective, and set specific targets to improve operation of the emergency transport system,. In particular, they should define measures to take during catastrophic disasters and large-scale accidents when numerous fatalities and injuries may occur. One way to verify this target is to conduct joint

⁹ Nakahara et al., 2009.

¹⁰ Lavy et al., 2011.

¹¹ MoH, 2009.

comprehensive on-site training with NCTC (under SNCTC), traffic and firefighting police and other situation management organizations. The government should plan further skill improvement follow-up sessions for ambulance crew members as necessary or re-training for solving problems. Based on the successful case of Phnom Penh, ambulance crews in local cities along national highways should gradually expand. What is important in this process is to nurture Cambodian leaders in the areas of lifesaving and rescue. Increasing the number of Cambodians with knowledge on emergency medical care will likely lead to more independent development of the emergency transport system .

Based on the above approach, the study team recommends the following two points.

1) Conducting Joint Comprehensive On-site Training by Related Organizations

Even if FR and ambulance crews increase in number, it will not function effectively as an emergency transport system if they act individually. In particular, for catastrophic disasters and large-scale accidents, advance coordination of information with related organizations is necessary to act promptly and appropriately in conducting lifesaving and rescue activities. To this end, the Cambodian government should periodically plan and execute a comprehensive on-site training to consolidate each emergency organization's capability and organizational capacity. Through this training, individual organizations such as NCTC, traffic and firefighting police can organically utilize their own knowledge and skills. This training can also be used to identify the weakness of the emergency transport system in Phnom Penh and be used as an opportunity to gain common awareness of issues with related organizations (strengthen coordination with related organizations). The government should correct the weak points and conduct follow-up and refresher training to raise skill levels of FR and ambulance crews.

2) Strengthening the 119 Emergency System

As part of strengthening the 119 emergency system, the Cambodian government should conduct trainings for mid-level management officers managing ambulance and FR within SNCTC, police, firefighting, the Ministry of Health and other related organizations to enhance the crisis management organization. There should also be opportunities to visit emergency systems and disaster preparedness systems in other countries.

In addition, the government should introduce initiatives to develop disaster volunteers so as to allow for quick response during catastrophic disasters and large-scale accidents that cannot be adequately handled by the normal 119 emergency system. At national or public hospitals, there should be consideration of development training to acquire necessary skills for Disaster Medical Assistance Team (DMAT) activities for workers who have intention to participate in DMAT. However, there should be research on hospital budget conditions in advance to determine the feasibility of DMAT establishment since it may also be maintained and operated on each national or public hospital's budget, similar to ambulance crews.

(2) Local Emergency Transport System

The Cambodian government should gradually spread local city emergency transport systems to public hospitals in local cities nationwide based on the assessment results for the previous three years. In conjunction, there should be training for mid-level management of provincial government health departments and public hospitals so they can have a deeper understanding of the emergency transport system.

As for the emergency transport system in rural areas, the government should assess level of achievement in the previous three years using the performance indicators shown below to reinforce and revise the content according to achievements and changes in the conditions.

1) Improved Access to Transportation Methods

Because available transportation methods change gradually, emergency transport systems that have been developed are not permanent and must be reviewed periodically. If there are any changes including allocation of new ambulances, newly built or paved roadways, or development of new transportation methods, it is highly probable that the best transportation method would change and would require revision of the transportation plan. When the government revises the plan, they should inform residents of the changes.

2) Improved Triage

Institution's treatment capabilities also change due to staff movement or increase in personnel. Division of roles among institutions may also change due to opening of new medical institutions. Protocols must also be revised to adapt to such changes. When there are more possible destinations for transport, the triage protocol becomes more complicated and requires appropriate training. Even if there are no changes, there should be a post verification system using activity records as described below to maintain skills.

3) Improvement of Inter-institutional Coordination and Communication

The Cambodian government should build a system where specialized doctors from receiving hospitals can provide advice because stabilization before transportation and timely decision for referral is important in remote areas where transportation requires time. This will enable personnel to provide advance pre-hospital care. It is safe to say that it is a form of medical control or remote medicine.

4) Improvement of Pre-hospital Care

Because the level of pre-hospital care required is different depending on regional conditions, the government should identify the required level by region, continue with activities done in the previous three years, and conduct training in remote areas that may require advance levels of care. There should be review of training levels in the future, but past cases of Advance Trauma Life Support (ATLS) training being provided to local health center staff along the Cambodian border and its benefits may be of value to

reference¹².

The performance indicators for the emergency transport system in rural areas are defined as follows. The final goal is to improve prognosis (such as reducing fatality and mortality rates, and reducing disabilities) of emergency patients (injury and maternal), but such benefits are difficult to determine in the short term. The following intermediate indicators are used to assess the benefits of activities because, though it is particularly important to adjust for criticality of injuries, such preparations have not been completed. It is preferable to collect a baseline survey before starting activities and comparing achievement levels after conducting activities.

Improvement of Access to Transportation Methods	<ul style="list-style-type: none"> • Percentage of developed emergency transportation plan (or ambulances of institutions in the vicinity) • Percentage of transportation system usage (how many emergency patients use the system) • Percentage of EF organizations that cover travel expenses
Improvement of Triage	<p>When there are multiple possible destinations, assess with percentage of under triage. Under triage will be counted as cases of referral transport after transporting, but transfer to patient preferred institutions and to Phnom Penh are excluded (decision by ambulance crew is unlikely).</p> <ul style="list-style-type: none"> • Percentage under triage
Improvement of Inter-institutional Coordination and Communication	<ul style="list-style-type: none"> • Percentage of providing advance contact to receiving hospital (including direct transport from site and referral transport) • Percentage of handing a referral letter when transferring (from health center to RH, from RH to provincial hospital) • Percentage of receiving hospital providing feedback (from RH to health center, from provincial hospital to RH)
Improvement of Pre-hospital Care	<ul style="list-style-type: none"> • Number of training participants (percentage): health center staff, VHVs, residents • Equipment procurement levels according to ETCG • Number of treatments conducted • Percentage of adequate care provided by ambulance crew • Percentage of adequate first-aid treatment provided by first responder (VHV, residents)

¹² Husum H et al. Save lives save limbs. Penang: Third World Network; 2000.

3.3. Patient Data Collection, Storage, and Use

3.3.1. Short Term (within 3 years)

In the first year, the Cambodian government should develop a database in the manner described below, and pilot data use while conducting ambulance crew training to identify improvements to be made. For records that require scoring (trauma criticality score such as ASI or TRISS), there should be a workshop for developing human resources to enter the data so the government could launch full-scale operation from the second year. However, AIS and TRISS is difficult to use as-is in Cambodia, so a simplified method must be considered.

(1) Data Collection

Though it is not necessary for all ambulance crews nationwide to use the exact same activity record format, it is preferable to have a common format with core data (used by all ambulance crews) and optional data (optional depending on conditions for each region or crew) defined. Rather than having one sheet of paper as is being used now, it should be a carbon copy, two-sheet document so that one is always stored by the ambulance crew. It is necessary to conduct training on how to create such common format.

It is also necessary to conduct training on how to correctly fill out the record sheet. The objective would be to acquire sufficient understanding on the content described in records and definition of terms in order to improve data quality.

(2) Data Storage

Instruction should be provided to store all record sheets. Institutions with computers should enter data in off-the-shelf software (such as Excel) and store as electronic data.

(3) Data Usage

Ambulance crews should receive training on post verifications using activity records. By conducting post verifications, personnel will understand the reasons for recording information and may improve activities themselves. There should be training to allow personnel to compile patient records by hospital, ambulance crew, and regions. This can be a simple summation. National hospital staff should receive training so they can use trauma treatment quality assessment methods (such as TRISS) using injured patient data collected by hospitals.

3.3.2. Mid-to-long Term (within 6 years)

Improvement in data collection and storage can be expected early on, but usage of data requires some advanced analysis skills (treatment quality assessment) and would require mid-to-long term efforts to

improve. However, having analysis conducted only by hospital doctors and Ministry of Health staff is difficult, thus it is preferable to have researchers at the national medical university involved in such analysis.

The TRISS method based on AIS is widely used in developed countries as the standard indicator for quality assessment of trauma treatment. However, AIS coding is a complicated procedure and requires expensive training, which makes sustainability a concern. Simplified alternative methods have been proposed, but its validity in developing countries has yet to be demonstrated. Therefore, research and development of a method suited to Cambodia is necessary; cooperation of national medical university researchers is imperative here as well. The mid-to-long term objective is to improve analysis and research capabilities of hospital doctors, Ministry of Health staff, and national medical university researchers to conduct the above R&D using collected/stored data.

The performance indicators have been defined as following. Similar with the emergency transport system, the final goal of collecting/storing/using data is to improve the prognosis of the injured or sick, but the team has decided to assess data collection/storage/use because it would require an extremely extended amount of time to assess prognosis improvement. For data use, the team wanted to include quality assessment of treatment at hospitals in its goal, but assessment of only pre-hospital data was possible this time due to the nature of the study which focuses on pre-hospital care.

Data collection	<ul style="list-style-type: none"> • Percentage of ambulance crews using the common format activity record sheet • Percentage of missing data
Data storage	<ul style="list-style-type: none"> • Percentage of ambulance crews storing activity records • Percentage of ambulance crews with electronic data
Data use	<ul style="list-style-type: none"> • Percentage of ambulance crews who periodically compile numbers and report • Percentage of ambulance crews who perform verifications based on activity records

4. Conclusion

In cities such as Phnom Penh and areas along the national highways, the majority of emergency patients are injured from motor vehicle crashes and increase in their numbers due to progress in road developments and increased traffic is inevitable. If current conditions persist, improved survival rates achieved through enhancements to the emergency medical system will be off-set by the increase in injured patients due to increase in traffic. The main objective of this study was to improve survival rates from the development of the emergency medical system, but in order to solve the growing health issue of traffic injuries, it is necessary to consider road safety measures in parallel.

Developing an emergency medical system for motor vehicle crashes is not just an issue of emergency medical service or education, but requires national motor vehicle crashes countermeasures, establishment of traffic regulations, improvement of traffic manners among citizens, and development of public transportation. Therefore, it is critical to reinforce the prohibition of drunk driving and compliance with traffic regulations on a national level to strive to reduce the number of motor vehicle crashes while developing an emergency medical system at the same time.

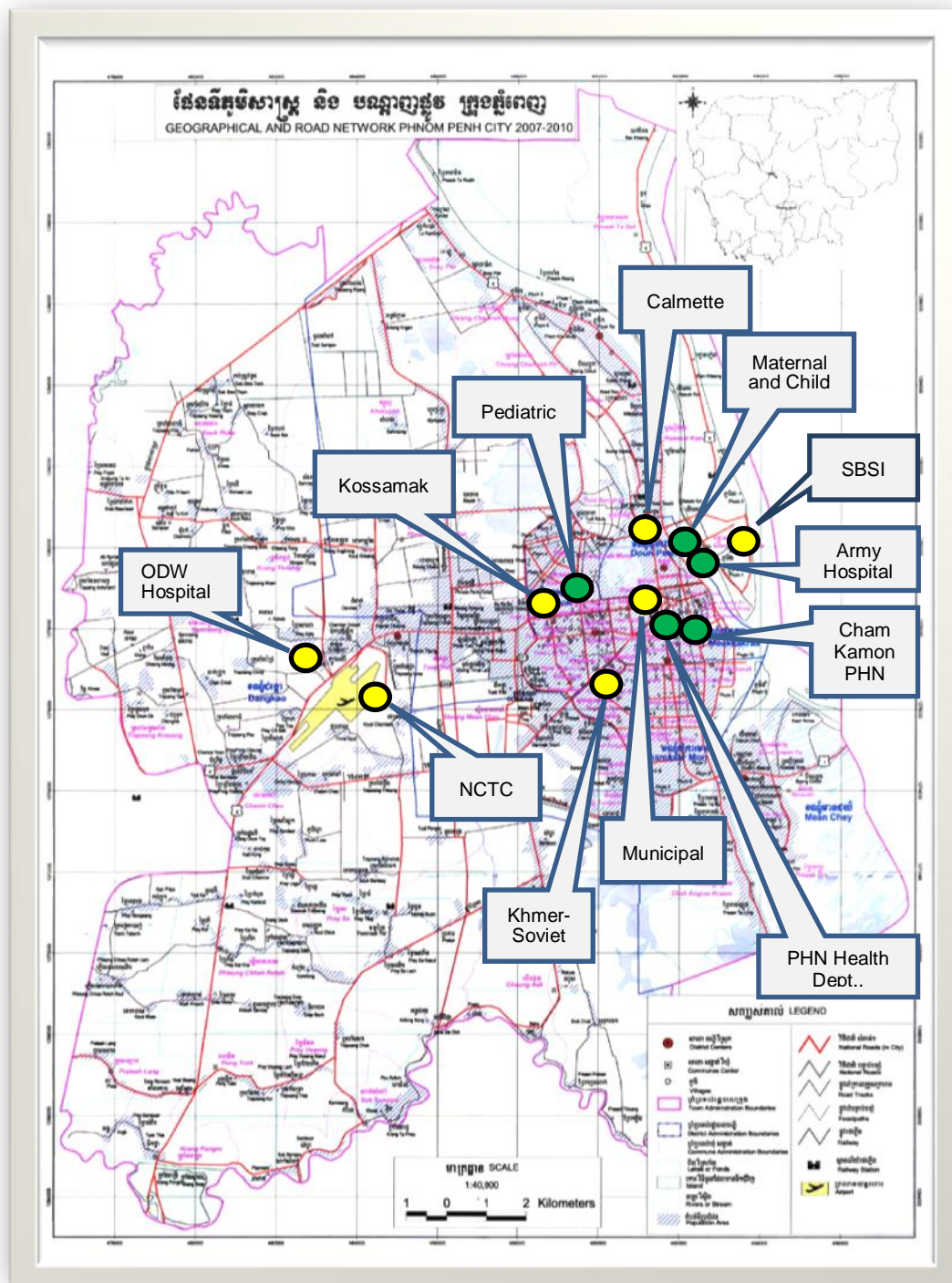
The health sector's role is to recognize traffic injuries as a health problem and to propose and promote environmental improvements to improve the overall health of people. The Cambodian government should not only prevent traffic injuries, but increase physical activities and reduce air pollution at the same time. Road environment development, traffic control, and urban planning are outside the scope of health, but there should be proposals on policies to improve road and living environments (such as safety facility development, public transportation development to reduce traffic) from the viewpoint of resolving health issues and bettering the health of people.



Photo 5 & 6: Road conditions in Cambodia

(* The study team expresses its deepest gratitude to SBSI's Dr. Peter Z. LI and Ms. Michie Nishiguchi for their support while it conducted its field study in Cambodia. Without their proactive support, the team's field study may have ended with insufficient results.)

Figure: Hospitals with Ambulance Crews and Ambulances in Phnom Penh



Emergency Transportation Plan Development Guideline

(*Excerpt and modified from Ministry of Health, Labour and Welfare International Medical Cooperation Research Commissioned Project (16 Ko 4), *Research on organizational emergency medical care and disaster medical care in developing countries*, 2006 Research Report)

Guideline for establishing pre-hospital trauma care and transport system in resource poor settings in low and middle-income countries

This manual focuses on full utilization of existing resources and mobilizing community people, rather than introducing western models of pre-hospital systems, to establish an innovative model of pre-hospital trauma care and transportation system in resource-poor settings.

1. establishing transportation system
2. establishing communication network among health facilities
3. establishing a chain of survival from community to tertiary care hospital

1. Transportation system

Its necessity: when you receive a severely injured patient you cannot treat in your facility, you should arrange a transportation to transfer him/her to a higher-level hospital. Unless your facility has its own transportation (e.g. an ambulance), you need to arrange the following preparations.

1.1. When you can use an ambulance or another type of motor vehicle owned by the higher-level facility, you should determine in advance the procedure how to call it.

You should determine:

- How to contact the facility to call its ambulance (which phone number, who is in charge)
- How much a patient should pay for the transportation?
- What if the ambulance is not available (e.g., occupied or out of order)?

1.2. When a motorized ambulance is not available in your area, you should arrange alternative ways of transportation. Unless you have some budget or external funds to buy a motorized vehicle (motorcycle, tricycle, or any other mode), you should consider the following options with the help of the communities.

Whenever possible you should find resources in the community so that you can assure the sustainability.

- Contract with commercial drivers to carry emergency cases
 - ✧ You should determine the fee in advance by negotiations with drivers. When the cost is not affordable to people, risk sharing schemes or subsidies should be included in the program. Prepayment and pooled/insurance schemes seems better than fees for service at the time of the use.¹
 - ✧ You should determine how to contact the contracted drivers. First you should know where he/she is. If he/she carries passengers or goods through the same routes every day, you can easily find him/her. If his/her routes are near the community, he/she can easily reach the patient. Second, you should determine how to call him/her. If he/she has a cell phone, it is easy to contact him/her. Otherwise, you should send a person to the place where the driver is by bicycle or motorcycle. The person should know the driver or the driver should carry a notable mark. In Nigerian program, drivers carried a sticker so that community people can identify designated drivers.²
 - ✧ Training of drivers is crucial in two ways. Drivers can give first aid to injured patients when they carry patients from the scenes.³ Drivers are wary of carrying emergency cases because of concern about damage to their vehicles and deaths en route.¹ Training may mitigate this.
 - ✧ You should determine how to find a driver at night or on holidays. This should be considered in the contract. Fees for service at night may be higher. Some drivers may not agree to carry a patient at night or on holidays.
- When motorized vehicle, whether private or public, is unavailable, you should consider alternative modes of transport. Motorcycle ambulances or tricycle ambulances are less costly than four-wheel ambulance. It may be possible to provide health centers (HCs) with such ambulance.⁴
 - ✧ Again, you should involve community people, the user, to discuss how you use it. For sustainability, you should collect user charge for fuel and repair, which should be affordable to them. Prepayment or pooled schemes should be considered.
 - ✧ When a HC runs this type of ambulance, you should determine who is in charge of the ambulance. Because a HC cannot hire a person exclusively for the ambulance, a staff member should be in charge.
 - ✧ People should be aware of the ambulance in a HC so that they can contact the HC at the time of emergency rather than arranging transportation by themselves.
- Even where motorized vehicle is not available, innovative attempts have been made. Examples are bicycles, boats, canoes, and oxcarts.^{1,5}
 - ✧ You should consider the effectiveness of the new system. In flatlands, bicycle ambulances may be faster than walking, but in other areas bicycle did not make a difference in travel time.¹

- ✧ Cultural beliefs sometimes deter people from using this type of transportation. Pregnant women did not like to be seen riding on a bicycle ambulance in Malawi.¹

1.3. People should know about the emergency transport system. Otherwise they do not use the system but rather they try to arrange transportation themselves.

- Disseminate information on the existence of the transportation system
- Disseminate information on how to use the system: how to contact (phone number), pre-payment or risk-sharing schemes, when to use etc.

2. Communication between facilities

2.1. Referral letter:

Conveying patient information is crucial when referring a patient to higher-level hospital. The information on the patient's history, treatment at the referring facility, and patient's status will ensure unimpeded initiation of appropriate treatment at the receiving facility.

- You should prepare a formal referral letter or slip. You should make the slip function as a “express ticket”, with which patients can consult a specialist without waiting in a long cue usually seen in outpatient ward of referral hospital so that emergency cases can receive timely treatment. This may also reduce self-refer among non-emergency cases.

2.2. Referral call:

The receiving hospital, if they are informed beforehand, can be prepared before the arrival of a severely injured patient. Therefore, the staff of referring facilities should contact (by phone or radio) the staff of receiving facilities before patient transfer. In this call, the information written in the referral slip should also be conveyed. Although this seems redundant, the main purpose of the call is to allow the staff of the receiving facility to prepare for prompt initiation of appropriate treatment.

2.3. Feedback:

When referred patients are sent back to referring HCs, a feedback letter should be sent to HCs. This is very important information especially the HC staff follow up the patient. In addition it has an educational effect: HC staff can know the consequences of their referral; they can learn from the results whether their referral was timely and appropriate.

2.4. Telephone-consultation network:

If specialists' advice is available for 24 h by phone it would be of great help to HC or RH staff. Specialists can give advice on whether to transfer a patient to higher level hospital, whether to perform a certain intervention, and how to perform. Before transferring a severe case to RH or national hospital, staff can receive advice on how to manage the case during the trip (if the staff can

accompany the patient). Further, staff in remote areas would not have a feeling of isolation when they have such a network.

- You should appoint specialists in referral or national hospitals who are on duty of the phone consultation from the primary or secondary care level facilities. During the night time, doctors on duty and on call can take this role. Because this would increase workload of specialists in tertiary care hospitals, discussion and pre-existing agreement should be sought.

2.5. Referral network:

Staff of all levels should know each other. HC staff should know the capacity of the nearest RH or other facilities in their areas; and sub-specialty of doctors. Such information facilitates them to make an appropriate decision. RH staff should know the capacity of HCs so that they can give appropriate advice whether to transfer a patient. It is preferable to make a written referral criteria based on the capacity of HCs and RHs.

- It is necessary to conduct a training course and communication session between HC staff and RH staff. Through such communication, they can make written referral criteria. Without knowing the capacities of all staff in the health care system, appropriate criteria cannot be developed. Such communications can also facilitate the utilization of referral letter and feedback letter.

2.6. Integration of traditional healers into the referral network

Traditional healers, especially traditional bone setters (TBSs), are not usually integrated into referral network. Some of their practices are harmful resulting in tragic consequences: for example, mismanagement of fractures by TBSs can result in gangrene and at times even amputations.⁶ Although some doctors are reluctant to integrate them into the legitimate health care system and WHO Essential Trauma Care guidelines do not mention about them probably because of these harmful consequences; because of their accessibility and acceptability by the people, we need to consider mobilization of traditional healers. Many trauma patients consult TBSs before seeking care at modern hospitals.⁷

3. Chain of survival

3.1. Community volunteer network

In remote areas of low- and middle-income countries, formal pre-hospital care is not readily available and it takes hours (or even days) to carry a patient to hospital. Trauma emergency care system is unique in that community people should constitute the first end of the system so that “chain of survival” should be continuous. Involvement of lay people in the pre-hospital system is really recommended especially in resource-poor settings.^{3,8}

- You can recruit motivated people from the community and organize a community based

pre-hospital team by giving them appropriate first-aid training and arranging transportation.^{9,10} HC staff would be appropriate trainers of the volunteer teams because they well know the community. HC staff should supervise, monitor, and evaluate the performance of the teams so that they can give advice to improve the system. When the teams bring patients to HC or hospital, feedback to the teams is important to enhance their motivation and skills.¹¹

- For the HC staff to be supervisors of the volunteer teams, they also should receive some training on trauma care. They can learn more advanced skills. To what extent they should learn depends on the local situation. In remote areas far from hospital in Cambodia, HC staff learnt even ATLS skills, which was successful in reducing mortality.¹⁰ HC staff may perform damage control laparotomy.¹¹
- You should disseminate information on who are members of the volunteer teams to the community. In village emergency referral system in Cambodia, members receive a sign to put on their house to indicate they are volunteer members.¹² Community people as well as volunteer members should know the phone number to contact the nearest HC to call for help.
- Laypeople involved in such systems, with their contribution and self-reliance, can convert their identities as passive beneficiaries to active stakeholders; and then can have influence on future plans, leading to better system responsiveness.¹³ Unlike care of other diseases, first aid for trauma is effective in reducing mortality or complications. Once they have self-reliance and an ability to identify and solve a problem, they would continue solving problems as, and when they arise, one by one, at a steady, if what, slow pace.

3.2. Chains between facilities

The “chain” should not be broken until the patient can receive a definitive care. When transferring patients to higher-level hospital, they are not usually accompanied by health care staff because staff is on duty to care for patients in the hospital.

- During the transfer, severely injured patients should receive basic care such as intravenous fluid administration and airway management. At least one person who has such skills should accompany the patients. Predetermined staff assignment and training is necessary.

References

1. Krasovec K. Auxiliary technologies related to transport and communication for obstetric emergencies. *Int J Gynaecol Obstet.* 2004;85 Suppl 1:S14-23.
2. Shehu D, Ikeh AT, Kuna MJ. Mobilizing transport for obstetric emergencies in northwestern Nigeria. The Sokoto PMM Team. *Int J Gynaecol Obstet.* 1997;59 Suppl 2:S173-80.

3. Mock CN, Tiska M, Adu-Ampofo M, Boakye G. Improvements in prehospital trauma care in an African country with no formal emergency medical services. *J Trauma*. 2002;53(1):90-7.
4. Daily F. Review of international, regional and Cambodian referral systems. UNFPA/NRHP, 2005.p14-15.
5. A bicycle for life. In: Massive change in action: stories. Available at: URL: <http://www.massivechangeinaction.virtualmuseum.ca/stories/index.html> (accessed on 1st December 2006)
6. Bickler SW, Sanno-Duanda B. Epidemiology of paediatric surgical admissions to a government referral hospital in the Gambia. *Bull World Health Organ* 2000;78(11):1330-6.
7. Macintyre K, Hotchkiss DR. Referral revisited: community financing schemes and emergency transport in rural Africa. *Soc Sci Med* 1999;49(11):1473-87.
8. Razzak JA, Kellermann AL. Emergency medical care in developing countries: is it worthwhile? *Bull World Health Organ* 2002;80(11):900-5.
9. Sassers S, Varghese M, Kellermann A, Lormand JD. *Prehospital trauma care systems*. Geneva: World Health Organization, 2005.
10. Husum H, Gilbert M, Wisborg T. Training pre-hospital trauma care in low-income countries: the 'Village University' experience. *Med Teach* 2003;25(2):142-8.
11. Husum H, Gilbert M, Wisborg T. Save lives save limbs: life support for victims of mines, wars, and accidents. Penang: Third World Network; 2000.
12. Canavan A. Development of routine and emergency referral systems. Phnom Penh: University Research Co, 2004.
13. Cornwall A, Gaventa J. *From users and choosers to makers and shapers: repositioning participation in social policy*. Sussex: Institute of Development Studies, 2001.

References

1. Bergström S. Who will do the caesareans when there is no doctor? Finding creative solutions to the human resource crisis. *BJOG*. 2005;112(9):1168-9.
2. Donovan DJ, Moquin RR, Ecklund JM. Cranial burr holes and emergency craniotomy: review of indications and technique. *Mil Med*. 2006;171(1):12-9.
3. Handicap International Belgium. *Cambodia road crash victim information system annual report 2009*. Phnom Penh: HIB; 2010.
4. Holder Y, Peden M, Krug E, et al. eds. *Injury surveillance guidelines*. Geneva: WHO; 2001.
5. Husum H, Gilbert M, Wisborg T. *Save lives save limbs: life support for victims of mines, wars, and accidents*. Penang: Third World Network; 2000.
6. Lavy C, Sauven K, Mkandawire N, Charian M, Gosselin R, Ndiokubwayo JB, Parry E. State of surgery in tropical Africa: a review. *World J Surg*. 2011;35(2):262-71.
7. Ministry of Health. *Cambodia EmONC improvement plan*. Phnom Penh: MoH; 2009.
8. Mock C, Lormand JD, Goosen J, Joshipura M, Peden M. *Guidelines for essential trauma care*. Geneva: World Health Organization; 2004.
9. Nakahara S, Chadbunchachai W, Ichikawa M, Tipsuntornsak N, Wakai S. Temporal distribution of motorcyclist injuries and risk of fatalities in relation to age, helmet use, and riding while intoxicated in Khon Kaen, Thailand. *Accid Anal Prev*. 2005;37(5):833-42.
10. Nakahara S, Saint S, Sann S, Phy R, Ichikawa M, Kimura A, Eng L, Yoshida K. Evaluation of Trauma Care Resources in Health Centers and Referral Hospitals in Cambodia. *World J Surg*. 2009;33(4):874-85.
11. Nakahara S, Saint S, Sann S, Ichikawa M, Kimura A, Eng L, Yoshida K. Exploring referral systems for injured patients in low-income countries: a case study from Cambodia. *Health Policy Plan*. 2010;25(4):319-27.
12. Nakahara S, Ichikawa M, Kimura A. Simplified Alternative to the TRISS Method for Resource-Constrained Settings. *World J Surg*. 2011a in press.
13. Nakahara S, Ichikawa M, Kimura A. Population strategies and high-risk-individual strategies for road safety in Japan. *Health Policy*. 2011b in press
14. Springer MF, Baker FJ. Cranial burr hole decompression in the emergency department. *Am J Emerg Med*. 1988;6(6):640-6.
15. Federation of Red Cross and Red Crescent Societies. *CAMBODIA Disaster Preparedness, Capacity Building*. Programme No. 01.27/98. May 1998:2.
16. Asian Development Bank. *ADB-ASEAN Regional Road Safety Program Country Report: CR 2. Road Safety in Cambodia*. 2004: 6, 14, 17, and 21.

17. Ministry of Health, Cambodia. *Annual Review: Health Policy Statement for 1999-2003*. Phnom Penh. 2001: Section 84.
18. Doctor in Charge, SAMU Team, National Khmer-Soviet Friendship Hospital. Jan. 2009. Phnom Penh. Group Meeting.
19. Handicap International, World Health Organization, et al. *Cambodia Road Crash and Victim Information System: Annual Report Executive Summary 2004*. Phnom Penh. 2005: 13.
20. National Road Safety Committee (NRSC), Handicap International Belgium, et al. *Road traffic Accident Victim Information System: Summary Report 2009*. Phnom Penh. 2010: xii
21. Japan International Cooperation Agency. *Pre-Project Implementation Evaluation Report (Technical Cooperation Project) MEDEM-2*. April 1 2009: 1: Author
22. Ministry of Health. *National Guidelines on Complementary Package of Activities for Referral Hospital Development Plan from 2006 to 2010*. Dec. 15. 2006: 4-5, 9-13, 38-40, 70, 81-89.
23. National Committee for Disaster Management in Cambodia. *Policy Document*. Phnom Penh. August 2004: 3-6.
24. National Road Safety Committee (NRSC), Handicap International Belgium, et al. *Road traffic Accident Victim Information System: Summary Report 2009*. Phnom Penh. 2010: 4.
25. Shinji Nakahara, Achala Upendra Jayatilleke. *Pre-hospital Care and Emergency Transport System in Phnom Penh, Research on Preventing Trauma and Improving Diagnostic Education in Developing Countries, 2008 Research Report, Ministry of Health, Labour and Welfare International Medical Cooperation Research Commissioned Project*. May 2009: 19.
26. Shoboryoku no Seibi Shishin Kenkyukai. *Policy for Firefighting Capability Development and Water Source Standards*. Gyosei. January 2006: 99-101.

[Referenced Websites]

- Ministry of Foreign Affairs, International Cooperation ODA Grant Aid Cooperation
<<http://www.mofa.go.jp/mofaj/gaiko/oda/index.html>>
- Japan International Cooperation
<<http://www.jica.go.jp/>>
- Christian and Missionary Alliance
<<http://www.cmalliance.org/>>
- Global Medic
<<http://globalmedic.ca/>>
- Medical Teams International
<<http://www.medicalteams.org/>>
- TICO
<<http://www.tico.or.jp/>>

- Ratnak International
 <<http://www.ratanak.org/>>
- Second Hand
 <<http://2nd-hand.main.jp/>>
- GRAPHIS
 <<http://graphis-ngo.jp/>>
- Bangkok Post
 <<http://teakdoor.com/thailand-and-asia-news/36550-bangkok-rescue-workers-shoot-each-other.html>>