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PRINCIPLE OF DEVELOPMENT OF EMERGENCY MEDICAL SERVICE SYSTEM 2008

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NATIONAL INSTITUTE OF EMERGENCY MEDICAL SERVICE SYSTEM
MINISTRY OF PUBLIC HEALTH
NATIONAL HEALTH SECURITY OFFICE
THAILAND

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CONTAIN

INTRODUCTION

The emergency service system in Thailand started since the establishment of Por-Tek-Tung Foundation in 1937 by Chinese immigrants which its initial public services involved only collected unidentified death bodies. The emergency system evolves gradually and systematically, however rapid expansion of delivery the services at a national scale has been done rapidly in the recent five years (since 2003) which is considered as the leap year for emergency service system development. One of the most important factors of scaling up is being promoted at both regional and central levels by many authorities e.g. the Royal Thai government, Ministry of Public Health and National Health Security Office. The other factors include

1. National policy on emergency services system
2. Institution and structure of the institute to serve the national policy
3. Strategic plan to drive the system
4. Budget for development and execution of the system
5. Design and standardization of the service system
6. Communication and line of command in the system
7. Procurement and human resource system
8. Public relations to make people aware of the system
9. Networking of the system amongst hospitals that allow patients to be transferred by trained personnel in the service system
10. Emergency medical control
11. Collection and record of information and reporting
12. Monitoring and evaluation of the system
13. Law and enforcement of the law

Up till now, the development of the system is still on the process and required supports from the mentioned factors to strengthen and make the system efficient. This needs the foresight for the desired system by policy makers to suit the Thai context which has limited resources but limitless dedicated staff to serve the sufferers

Another important factor that makes the system achieve its goal is to build up qualified-professional personnel in the system with decent attitude as the system of helping patients on site which is quite new for Thai society, many relevance stake holders still ignore and the well-trained staff are still scant which incomparable with number of volunteers that works in the field. It is, thus, important to compel for a master plan in relation to build up the team with sufficient human resources both in short- and long-term for the sustainability of the system. This handbook, thus, aims to allow the staff at every level in the system to comprehend the development of emergency services system and to have the same direction for system development

Witaya Chadbanchachai
Director of Trauma and critical care center
KhonKaen Regional hospital

FORWARD

Dr. Surachet Satidniramai

Permanent Secretary National Institute of Emergency Medical Service System

As the emergency service system was official launched on July 1, 2003 under the management of National Institute of Emergency Medical Service System with the support from the National Health Security Office. However, documents and articles that review the development of the service system never been written. I thank Trauma Center, Khon Kaen Hospital for its dedication to publish "PRINCIPLE OF DEVELOPMENT OF EMERGENCY MEDICAL SERVICE SYSTEM 2008" that contains works related to development of emergency service system and guideline for quality improvement of the system.

I hope that this book will be one of the references that benefit to many people both in academic and non-academic institute

Dr. Surached Satidniramai

Permanent Secretary National Institute of Emergency Medical Service System

Dr. Boonlert Limthonkul

General inspectorate Region 10 and 12, Ministry of Public Health

I am very delighted that Trauma Center, Khon Kaen Hospital brings out the “PRINCIPLE OF DEVELOPMENT OF EMERGENCY MEDICAL SERVICE SYSTEM 2008” handbook which incorporates the works of doctors who responsible for the emergency services system, the executives in National Institute of Emergency Medical Service System with the support from the National Health Security Office. The content in this book allows us to have the insightful perspective of the development of emergency service system in Thailand as well as the relevant rules, regulations, and laws. , Thus this is the must have reference for every institute responsible for emergency service system.

Dr. Boonlert Limthonkul

General inspectorate Region 10 and 12, Ministry of Public Health

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1. Rescue of patients in emergency situation 2007

Kamnaun Aungchoosak[1]

Kanchanee Dumnakkaew[2]

Rescue of patients in emergency situation are vital as they can save many lives if their actions are carried out promptly, accurately and comprehensively. Moreover, most of the rescues are done by emergency medical service (EMS) unit, volunteers of aid organizations, police, patients' relatives or witnesses.

Table 1: Term and definitions

Transferor	Definition
Rescue	Services that involve with transferring of patients from accidental sites to hospitals
Severely injured patients	Life-threatening patients where admission or close observation are required
Transferor	
▪ EMS unit	A unit which assigned for rescue, transfer and taking care of patients. This can be single or combination of either doctor, nurses or other medical personnel (excluding driver)
▪ Volunteer	Volunteers who work for aid organizations e.g. Por-Tek-Tung Foundation, Raumkatanyoo Foundation
▪ Police	Police officers including high-way police and traffic police
▪ Others	The others aside from what mentioned above including patients' relative and witnesses

[1] Director of Bureau of Epidemiology, Department of Disease Control, Ministry of Public Health

[2] Disease control administrator, Bureau of Epidemiology, Department of Disease Control, Ministry of Public Health

Rescue of patients in emergency situation 2007

Bureau of epidemiology, Ministry of Public Health (MOPH) has found the injury surveillance system in regional hospitals and general hospitals in 28 provinces in Thailand. Analysis of data from the system would inform causes of injuries, transferors of injured patients and the adequacy of application of first aids for those patients. In 2007, there were 66,528 patients transferred to those regional and general hospitals.

1. Severely injured patients could be categorized into four types regarding the transferors
    a. Transferred by EMS unit; there were 5,590 patients (8.4%) in this category. As many as 638 died, 210 died before arriving the hospitals, 98 died at the emergency rooms and another 330 were admitted.
    b. Transferred by volunteer; there were 16,479 patients (24.7%) transferred by the volunteers. About 1,334 died, 814 died before arriving the hospitals, 95 died at the emergency rooms and another 425 were admitted.
    c. Transferred by the police; there were 613 patients (0.9%) in this category. Approximately 127 died, 94 died before arriving the hospitals, 20 died at the emergency rooms and another 13 were admitted.
    d. Transferred by others; there were 43,846 patients (65.9%) in this category. As many as 1,089 died, 489 died before arriving the hospitals, 137 died at the emergency rooms and another 463 were admitted.

Table 2: Number of severely injured patients categorized by the transferors

Transferor	Number of patients (%)
EMS unit	5,590 (8.4)
Volunteer	16,479 (24.8)
Police	613 (0.9)
Others	43,846 (65.9)
Total	66,528

Source: 28 hospitals in the injury surveillance system

2. Severely injured patients categorized by causes of injuries

There were 19 causes; most of them were related with transportation and few were from other causes (see Table 3).

Table 3: Number of severely injured patients categorized by causes of injury

No.	Causes	Injure: N (%)	Death: N (%)
1	Traffic accident	31,148 (46.8)	1,787 (56.1)
2	Falls from the height	10,128 (15.2)	220 (6.9)
3	Mechanical injured by object	7,645 (11.5)	54 (1.7)
4	Mechanical injured by animal/human	1,510 (2.3)	10 (0.3)
5	Drowned	264 (0.4)	159 (5.0)
6	Breathing threaten injury	36 (0.1)	2 (0.1)
7	Injured by electricity, radiation, temperature	578 (0.9)	75 (2.4)
8	Injured by fire or its fume	148 (0.2)	4 (0.1)
9	Burn	300 (0.5)	1 (0.0)
10	Poisoned by animals or plants	2,693 (4.1)	6 (0.2)
11	Injured by natural energy	26 (0.0)	7 (0.2)
12	Poisoned by other sources	537 (0.8)	1 (0.0)
13	Injured by strenuous actions	109 (0.2)	0 (0.0)
14	Ill-defined sources	73 (0.1)	10 (0.3)
15	Self-injured	3,894 (5.9)	295 (9.3)
16	Unintentional injury	6,867 (10.3)	447 (14.0)
17	Accidental	162 (0.2)	21 (0.7)
18	Law enforcement and war	152 (0.2)	34 (1.1)
19	unknown	258 (0.4)	55 (1.7)

Source: 28 hospitals in the injury surveillance system

2. Adequacy of application first aids

From the overall patients who transferred to the hospitals, 66,260 required singly or in combination of first aids; taking care of the airway, bleed stopping, splint or slap or intravenous fluid giving (see Table 4).

Table 4: Number of patients and first aids given

First aids	Number of patients required first aids	Number of patients received first aids: N (%)
Taking care of airway	6,530	2,440 (37.4)
Bleed stopping	29,413	15,131 (51.4)
Splint and slap	20,009	10,154 (50.8)
Giving of intravenous fluid	10,308	2,885 (28.0)

Conclusion

From information of the surveillance system in 28 hospitals, despite the non-entire coverage of the EMS system, there are at least two issues to draw the attention to; (i) increase the coverage of EMS transferors or trained volunteers and (ii) increase the appropriateness of first-aids given before arrive the hospitals especially taking of the airway and bleed stopping.

2. History of the Thai emergency medical service system development

Anucha Sethasathian[♣]

First period: volunteers and aids organization

This was the time in the Reign of King Rama the Fifth till 1977. The origin of EMS system in Thailand was started since the foundation of "Council of Unarom-Daeng of Siam" in April 26, 1893. The council firstly aimed to give aids to those who injured outside the hospital during the event of dispute between Thailand and France over land on the left bank of Mae Khong River which later its title was changed to "The Thai Red Cross Society (TRCS)". However, it did not concentrate much on emergency medical service (EMS). Rescue and transfer of injured victims to hospitals as well as collecting of death bodies done by the other aid organization which overruled the authority of the TRCS.

Figure 1: Cover of the book "Por-Tek-Tung and the History of Thai society

The book presented above written by Dr. Kanika Tanprasert and colleague informs us about the beginning of Por-Tek-Tung Foundation in Thailand which was founded by Chinese immigrants during the Reign of King Rama the Fifth with two important reasons.

♣ Office of Emergency Medical Service System, Udon Thani

1. The epidemic of Cholera in 1873;

The epidemic caused a large amount of deaths. Without sufficient time and manpower, corpses were abandoned in the backyard of Sraket Temple and devoured by animals (see Figure 2).

Figure 2: Corpse in the backyard of Sraket Temple

The Chinese immigrants, who were waived for slave duty and later became the merchants in Thailand, wished to show their gratitude to the kindness of the King. They were then joined together to help managing those abandoned corpses as well as death bodies of the injured on roads.

Figure 3: The founder of Por-Tek-Tung Foundation

2. Faith towards Chinese monk named Tai-Hong-Jow-Saeu

Figure 4: Tai-Hong-Jow-Saeu

In the period of migration of the Chinese from China to Thailand, some of them died during travelling. They, thus, prayed for their wellbeing from their respect deities. One of them is Tai-Hong-Jow-Saeu who in Chinese history was the leader who helping collecting and managing of corpses from the capsized ships in one main river in China and helping constructing the bridge over that river till he died. He used to say that "Be helpful for underserved people with kindness without thinking of repayment, people will recognize and join your merit".

From the two reasons above, there were many non-profit aid organizations founded by Chinese merchants in Thailand at that time. One of the most important one was Por-Tek-Tung Foundation which established in 1947 from the development of Tai-Hong-Jow-Saeu Corpse Collecting Group which founded in 1909, and their activities have been carried out till present. Another important organization is Raumkatanyu Foundation which founded in 1970 which firstly aimed to give aids to accidental victims in Bangkok and in the city areas of big provinces as the incline of number of death from road traffic accidents since the enforcement of national economic and social plan in 1961. This was due to the increase number of roads in every plan without specific, qualified rescue agency to taking care of the traffic accidents.

The number of injuries and death has been rising rapidly since 1967. This has affected the function of the police which had limited manpower in rescue of the accidental victims. The expansion of volunteers from aids organization using the radio-communication under the supervision of Thai police had an important role here. However, their quality has never been assessed and standardized. This caused many problem including.

Figure 5: News related to Pilfering of victims' belongings

1. Pilfering of victims' belongings
2. Injury caused by careless driving of those volunteers
3. Poor coverage to rural areas
4. Directionless development and supervision of the government with no standardization system

However, their works caused the awareness and enhanced the EMS system in the both public and private

hospitals. Trainings were conducted for those volunteers regarding resuscitation and first aids giving. This posed the question to the MOPH and institutes that responded to public disaster and urge for the managing system for accidental victims outside the hospitals.

Second period: establishing of government rescue team in pilot provinces

This period was the time between 1977 and 1997. As the sub-standard, poor coverage to rural areas of the rescue teams by the volunteers of aids organizations and increasing number of road traffic accidents, this caused the government made an attempt to pilot the public rescue team by many sectors including.

1969: Establishment of The Princess Mother's Medical Volunteer Foundation (PMMV) which giving medical services for people in rural area (see Figure 6)

Figure 6: The Princess Mother and PMMV

1972: Foundation of Radio Medical Unit by Her Royal Highness Somdet Phra Srinagarindra Baromarajajanani (who known as Princess Mother). Its title later has been changed to "The Royal Flying Doctor Services" which comprised three working areas; (i) medical services given by health centre office who examined patients, reported of findings and took orders from doctors in hospitals via the radio, (ii) acquiring and maintaining of radio and its network, and (iii) transportation for emergent and severely ill patients from rural health stations to hospitals.

1980: Foundation of 34 on-call ambulance centres in Bangkok by the Royal Thai Police at the fire stations and in Police Hospital. This aimed to help transferring of victims to the hospital without giving first aids or on scene resuscitation. The ambulance of Police Hospital was fully equipped; patients were taken care by doctors and nurses. However, this unit was later repositioned and supervised under Bangkok Metropolis.

1986: Institution of ambulance centres by General Arthit Kamlangeak, Ministry of Defence. The centre provided 40 ambulances for giving services in the area of Bangkok with the hotline number 123. However,

the services were ceased due to political reasons.

1991: Set up the medical referral centre by Department of Aviation Medicine, the Royal Thai Air Force.

1993: The initiation of the " Traffic police aids emergency patients initiative" by His Majesty The King Bhumipol with his donation of THB 18 million under the management of Department of Metropolis Police, the Royal Thai Police. The services were provided by rapid response team of traffic police to aid victims from traffic accidents and to transfer pregnancy women to hospital. The police who joined the programme had to be trained jointly between Department of Traffic Control and the Thai Red Cross Society. The training covered the areas of first aids, taking care of unconscious patients and taking care of patients in emergency situation. Later Rajvithi Hospital, Police Hospital and Bangkok Hospital became joint training institutes. Vehicles used in this initiative including motorcycles and ambulances were equipped with first aid kit such as alcohol, gauze, dressing saline

1993: The enclosure of development plan for EMS into the Seventh National Economic and Social Development Plan and the foundation of emergency service system in Rajvithi Hospital; the process was imposed by the MOPH which intended to expand the services to cover the entire country

1994: Launching of rescue team by Vachira Hospital and its nine-hospital networking emphasized on giving aid to traffic accident victims

1995: Establishment of Narendhorn Rescue Centre, Rajvithi Hospital, Department of Medical Service, MOPH on March 1, 1995. The target of rescue team was to transfer of injures and patients in the emergency to Rajvithi Hospital within 15 minutes. In 1996, the project was jointed with Lertsin Hospital and Noparat Ratchathani Hospital. With the cooperation with Bangkok Metropolis, the service areas were divided into seven areas with two hotline numbers (1669 for Department of Medical Service and 1554 by Bangkok Metropolis). At the initial stage, the coverage and budget were limited. However, this rescue centre was one of the prototypes of hospital based EMS)

Khon Kaen Hospital

The EMS has been imposed since 1992 in Khon Kaen which is the firstly introduction of the system in its region. Dr. Witaya Chadbanchachai and his collegue have launched many projects response to traffic accidents. This requires the cooperation between provincial and MOPH authorities with subsidy from World Heath Organization (WHO)

- March 26, 1993; piloting of on scene medical treatment by Khon Kaen Samaggi Unit
- February 11, 1994; Launching the first rescue unit in the region as the hospital based EMS which is the model for many hospitals

Figure 7: Rescue Unit, Khon Kaen Hospital

- 1996, Launching of a two-year certificate programme under the cooperation of Sirinthorn Public Health College, Khon Kaen Hospital and Khon Kaen Provincial Health Office. At the initial stage, the training programme targeted on employee in Khon Kaen hospital and adjacent hospitals and later in 2001, the programme's title was changed to "Emergency Medical Technician Certificate". The graduate from this programme will be entitled as Emergency Medical Technician Intermediate, EMT-I) and will be appointed to work in rescue teams in hospitals

In this period, establishing rescue teams in both central and regional levels was created to response to the changing problem. The composition of rescue team in relation to human resources, budget, line of command, zoning, training programme and networking had been developed continuously. However, the universal working direction was not set.

Third phase: Issuing of laws and expansion to communities

In spite of increase in number of rescue teams in many hospitals both in central and regional levels, the response was inadequately serve to those victims from the traffic accidents (See Figure 8)

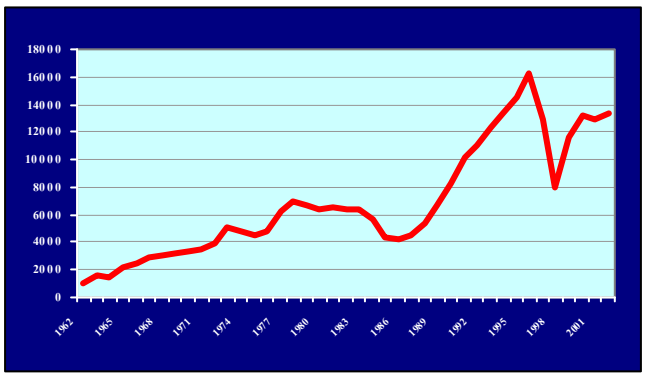

Figure 8: Statistics of victims from traffic accident (1965-2001)

In 1997, the number of death due to traffic accident exceeded 20,000 cases/year and this made WHO recognized Thailand as a country with high burden from traffic accident. Statistics from Ministry of Public Health (MOPH) in 1999 found that mostly of the victims were transferred to hospitals by their relatives or

witnesses (80.3%-99.7%), few by volunteers of aid organization (0.1%-18.4%) and very few were done by trained medical personnel (0.1%-7.4%). This shows the discrepancy between the rapid rising traffic accident problem and slow progression of EMS

In the Eight National Economic and Social Development Plan (1997-2001), MOPH included the development of medical service system into its plan. According to this, 90 regional and general hospitals had emergency medical units. However, the system lacked of support in term of budget and law. In most of the emergency rooms, patients were looked after mainly by junior doctors. It was a contrary that severely ill patients were looked after by modest skill doctor.

In 2000, Bangkok metropolis founded Erawan Centre which was the exemplar of contribution from local government to deal with the traffic accident problem. In a year later, the National Institute of EMS System was established by the Office of Permanent Secretary (Narendhorn Centre), MOPH and response for the development to EMS nation-wide. Dr. Somchai Kanjanasut was the first director of the institute (see Figure 9). Since then the national plan for EMS has been set. Plans for development such as research, allocation of budget per capita (THB 18/capita) were purposed

Figure 9: Dr. Somchai Kanjanasuth, the first Director Narendhorn Centre

In the Ninth National Economic and Social Development Plan (2002-2006), the MOPH by Narendhorn Centre declared that the EMS is one of its four core mission in 2002. According to this, the plan to make the service reach the community level was made which required the proper financial system and cooperation from the community. This was corresponded with the allocation of budget THB 10 per/capita for the development by the National Health Security Office. In 2003, National Health Security Fund also allocation budget for EMS prior to arriving hospitals for each province. This considered as the major monetary source for development of the EMS since then.

April 28, 2003, the Royal Thai Government with the purpose by Vice Prime Minister, Mr. Jaturon Chaisang, the Director of Centre for Road Safety, opted strategies to improve the standard of road safety in Thailand. The strategies included implementation of the service system throughout Thailand.

Table 1: Expansion of emergency service system in Thailand

Date	Number of province	Province
July 2003	7	Bangkok, Khon Kaen, Nakorn Rachasima, Nakorn Sawan, Petburi, Lampang and Songkra
March 2004	15	Chiang Mai, Nonthaburi, Pathumthani, Samut Prakran, Surat Thani, Udon Thani and Ubol Rachathani
April 2004	22	Cholburi, Chiang Rai, Prajinburi, Prayao, Phitsanulok, Phuket and Krabi
October 2004	16	Lampoon, Yasothorn, Angthong, Kampangpet, Utaradit, Chaiyapum, Chainat, Sakorn Nakorn, Petchaboon, Surin, Uthai Thani, Chumporn, Trang, Satul, Rayong and Nakorn Pratom
December	48	Roi-et, Nakorn Panom, Lopburi, Supanburi, Pang Nga, Chacherngsao, Prajaub Kirikhan, Chantaburi, Mookdahan and Pattani
April	62	Narathiwas, Loei, Nan, Buriram, Tak, Kanjanaburi, Pijit, Singburi, Saraburi, Nakorn Nayok, Trad, Sra Kaew and Rajburi
December	76	Samudsakorn, Samudprakarn, Mahasarakham, Nongbaulampoo, Nongkai, kalasin, Srisaket, Amnadjareon, Sukhothai, Prae, Mae Hong Son, Nakorn Sri Thammarat, Yala and Patalung

The rapid expansion of the service throughout the country was attained due to the good cooperation between the National Health Security Office, Narendhorn Centre and Inspectorates of MOPH in each region as well as the assistance from pilot hospitals. Training had been conducted continuously, qualified-trained personnel had been appointed in many hospitals and work as “Advance Emergency Medical Service Unit”. However, in the left over rural areas, the services was still unavailable

Box 1: The Heart of Pre-Hospital Care

“Selected bystanders, community volunteers and other citizens with minimal training working in concert with providers and formal medical care structures can provide effective and sustainable

Pre-Hospital Care regardless of a national level of resources"

Dr. Etienne Krug

WHO Geneva

In 2003, the Thai Medical Council approved the residency training Board of "Emergency Medicine". At the same time, Narendhorn Centre arranged the training programme for paramedic personnel such as

- Firs responder programme; covered the subject of first aids and patient transfer (16-hour programme)
- Emergency Medical Technician (EMT)
  - Basic (EMT-B) 110-hour programme
  - Intermediate (EMT-I) 2-year programme
- EMS for Nurse (40-hours programme)

Most of the budget came from the National Health Security Office

In April 7, 2004, the Thai Cabinet approved in principle for procurement of 200 ambulances by MOPH to use for service delivery in rural areas of Thailand (with the budget from the Government Lottery Office). However, this was not the cooperation from the community to deal with emergency service system like what mentioned by Dr. Etienne Krug (see Box 1). However, activities that encouraged communities to engage into the service system had been done informally in many provinces. The activities included training for community volunteers, support establishing of district emergency team and EMS rally.

December 26, 2004-the Tsunami Attack in Southern Thailand; the attack caused thousands of death of both the Thai and foreigners. Dr. Anders Lindberg, Korolinska University Hospital, Sweden had a mission to Thailand to transfer the Swedish victims back home. He did a report of the event in Thailand and point out some problems of Thai emergency services system included

- Cooperation for situational control needed strengthening at the national level.
- There was a lack of Command Control Centres at national, regional and provincial level.
- People did not recognize much of National Emergency Phone Number and the system was ineffectiveness.
- Volunteered was unskilful.
- No Pre-hospital care and no standard training
- No Helicopter sea rescue
- Inadequate of standard of emergency care

He also suggested that Thailand EMS system was not available to everyone and was insufficient in some areas.

Figure 10: Dr. Anders Lindberg and Dr. Witaya Chadbanchachai

At the same time, it was a transitional period of the Director of Narendhorn Centre that changed from Dr. Somchai Kanchanasut to Dr. Surachet Satitniramai (see Figure 11), the recommendation and suggestion from the Swedish doctor brought in many initiatives for development of EMS system. This resulted in the conducting the "Developing Plan for Emergency Medical Services in Thailand (2006-2010). The plan covers five domains, which are

1. Infrastructure
2. Management system and financial system
3. Human resource and development
4. Knowledge management
5. Networking

Figure 11 Dr. Surachet Satitniramai the Director of Narendhorn Centre

To achieve the target in 2010 which are

1. At least 50% of severely injured patients and patients at the emergency situation receive appropriate pre-hospital care
2. Reduce mortality rate of emergency patients at least 15%
3. Provide high quality of EMS
    - Make the service reach every village
    - Deliver high quality, effective services by both public and private hospitals including referral system throughout Thailand
    - Establish the management system at national and local level
    - Provide effective service with prompt response to the natural disaster
4. Adequate trained personnel
    - At least two emergency physicians for each provinces
    - Adequate number of trained of other paramedical personnel
    - Appropriate benefit for these personnel
5. Set up the information and technology system

In relation to networking development, there was a haste to train and appointed for community volunteers to be first responder and community emergency respond team as well as to conduct the advance programme training in some provinces. As on September 30, 2007, there were as many as 5,791 emergency response teams; 3,639 for community response team, 1,160 for EMT-B and 992 for advance EMT.

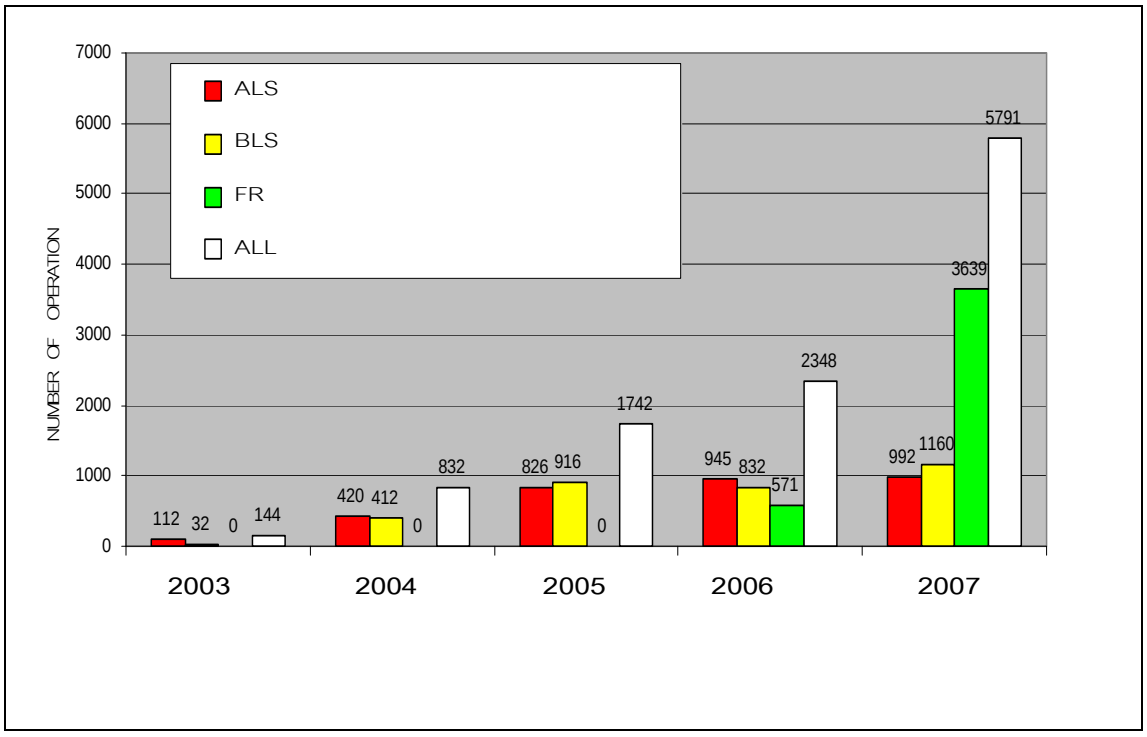

Figure 11: Number of emergency response team by year

During 2005-2007, the development to of EMS has been driven through the Bureau of General Inspectorate,

MOPH. The inspectorate in each region was assigned to follow up the given indicators and target annually to force the implementation of the plan into action. However, the methods of implementation could be varied according to contexts of the area.

Ubon Rachathani

There was cooperation between Provincial Administration Organization and Provincial Health Office. Ambulances were leased by the Provincial Administration Organization to match needs while training for EMT-B was conducted by the Provincial Health Office.

Khon Kaen, Udon Thani, Kalasin

Monthly meeting using the method of knowledge management was conducted. This resulted in rapid rising of number of dispatched services responded to the emergency events in these provinces

Bangkok

Bureau of Medicine, Bangkok Metropolis together with Department of Insurance and Office of Insurance Commission signed the memorandum of understanding (MOU) for development of EMS in the area of Bangkok

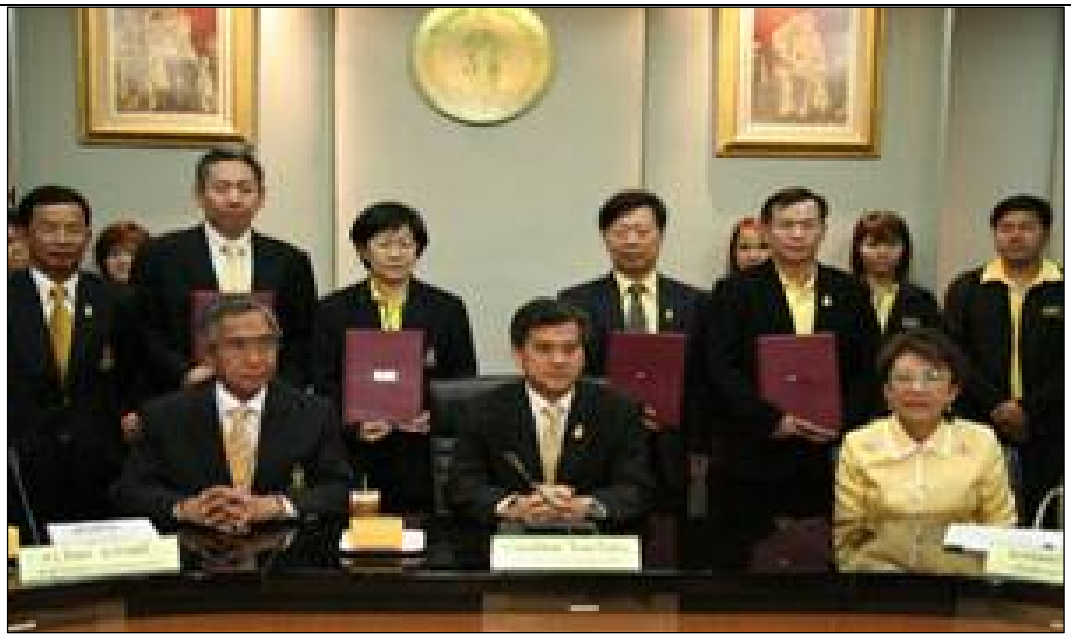

Figure 12: Multi-sectors cooperation in Bangkok Metropolis

The network of EMS had also expanded outside MOPH. For instance, National Health Security Office and Narenthron Centre had the agreement with the Royal Thai Police and the Royal Thai Army regarding the reimbursement system to cover expenses in case of using their special vehicles such as airplane and ship for giving EMS

Communication system

The communication system has also been enhanced; there was a call and command centre in each province. This was extension from the regional and national communication system. The specification of the call

centre including equipments, places and staff was set and most of the call centres utilized the resources in its own hospital. According to this, the system of "Emergency Medical Dispatcher (EMD)" had been found, with the training both at regional and central level. The information and technology (IT) of the system was also created which piloted in Health Region 10 and 12 as well as at Narendhorn Centre. Computer Aid Protocol to assist the EMD also invented by the cooperation of National Health Security Office, Narendhorn Centre, FIBO and seven piloted provinces including Phuket, Nakron Sawan, Lampang, Udon Thani, Ubon Rachatani, Khon Kaen and Nakorn Rachsrima.

Law enforcement

In the past, most of the rules and regulation for emergency services system have been issued by the National Health Security Office or MOPH. However, Since August 22, 2006, MOPH with the submission of Office of Public Development Commission drafted the "Emergency Medical Service System Act" and later proved by the Thai Cabinet in 2008 and the National Legislative Assembly in December 2007. On February 2008, the act was signed by His Majesty the King and on March 6, 2008 the Emergency Medical Service System Act was declared as the first EMS Act in Thailand which 35 years after the first EMS act in the US. The act covers the area of terms and definition, details of EMS Committee, Revenue and the foundation of EMS Fund and rights to receive the services as well as the punishment.

Conclusion

Since the firs establishment of the EMS system in Thailand during the reign of King Rama the Fifth, the system has been steadily developed. This requires the cooperation between both public sectors (e.g. MOPH, the Royal Thai Army and the Royal Thai Police) and the private sectors (e.g. aid organizations, community volunteers). The EMS knowledge has been growing side by the side the EMS system. The training for personnel including doctor and other paramedical personnel has been conducted. This results in the rapid rising in EMS personnel. Recently, the first law related to EMS system has been issue and declaration. The target for the system has been set through 2010 while the numbers of accident and emergency events are inclining. This is challenging for the EMS system and the Thai society in overall.

3. Administration and management of the EMS system

Surajit Sunthorntham[♣]

Managing to make the EMS system achieve its efficient is challenging. This entails the staff's awareness of their responsibility and cooperation amongst the relevant institutes. Most of the development of the EMS system grounds on the resources which available in its own facilities, in contrary, most of the developments cannot be built up using all new resources. Thus, the manager of the EMS system has to be able to control the budget, cooperate with the others and emanate appropriate rules and regulations.

The Office of the EMS System Committee

In each area, the efficiently EMS system necessitate the unity of the administration body which can be public or independent body that can work legally under the laws. However, the structure of that body and its authority require the approval from the Office of Emergency Medical Service System Committee which is the public organization. The office should be able to determine policy and its implementation. The office should have committees that are the representation of multi-professions including emergency physician, emergency medical technician, non-hospital service provider, patients and local authorities. The representatives (committees) should have broader view that ensure the attainment for the efficient services, be transparent without the conflicts of interests and be based on the benefit of the service beneficiaries.

The office has to respond for the master plan for development of the EMS system. This covers the standard setting for the operation of each component in the system. The development of the plan should be relied on service providers and service beneficiaries. After the commencement of the plan, it should open for criticism. The competent administration can ensure to adhere to the policy and plan. This can be performed by either full-time or part time administrator depends on the size of the system. Contracting out for minor tasks e.g. hiring a computer technician for entering data can also be the choice. The office should be able to do internal quality assessment and quality certifying which require authority to determine factors influenced the quality of services as well as the cooperation amongst staff to set and approve the standard for emergency care delivery as well as to attest the educational qualification of EMS personnel.

Master plan for EMS development

1. The office should make list of resources and services in the EMS system including hospitals, community fire department, and aid volunteer for public disaster. It should also be possible to evaluate their potential and level of contribution for the system which will be the starting point for development. Questions related to this issue are:
    a. What are EMS services available in the community?
    b. Who needs the services and what is the magnitude for their needs?
    c. How many are the ambulances and other transfer vehicles and whether they are well equipped?

♣ Consultant of National Health Security Office

d. What are the available training courses?
e. Who are the EMS staff, volunteer or hired?
f. Other resources and capability of those resources?

In relation to EMS staff, it is usual to see the regular employed staff in the city areas; however, volunteer might be the only option available for the remote rural areas. Thus, people in the community should not be over looked.

2. The plan and strategies should be target oriented which should be clearly and assessable. For instance, the target of EMS might state that the EMS unit should deliver initial cardiopulmonary resuscitation (CPR) on scene within four minutes and advance CPR should be performed within eight minutes. However, the target should not be unrealistic.
3. Drafting of the practical procedure and implementing protocol can be tried to make the target more pragmatic.
4. Time frame of development should be clearly stated.
5. Assessment of the progression of the development should be included.
6. Budgetary requirement should be completed

On the whole of the master plan, available resources should be listed and assessed. The plan should be target oriented with quality assurance and be able to be evaluated with monetary consideration.

Composition of EMS system

In 1973, the "Emergency Medical Services System Act" came to force in the USA and it stated the 15 components of the system included

1. Provision of man power
2. Training of personnel
3. Communication
4. Transportation
5. Receiving facilities
6. Critical care unit
7. The use of public safety agencies
8. Consumer participation
9. Accessibility to care
10. Transfer of patients
11. Standard medical record-keeping
12. Consumer information and education
13. Independent reviews and evaluation
14. Disaster linkage
15. Mutual aid agreements

Aside from the mentioned components, the Act included rules and regulation for receiving monetary subsidy. At present, most of the states and local authorities do not receive subsidies from the Central Government. However, most of the systems

still select these components to use. Furthermore, at the initial stage of development of the EMS system in the USA, it had been slowly developed as the medical direction was directionless and most of the services did not ground on the evidence-based research.

So far, American College of Emergency Physician recommends that the components of the EMS system should embrace

1. Medical direction
2. Pre-hospital transportation agencies
3. Inter-facility transport agencies
4. Emergency medical dispatch
5. Communications
6. Protocols for patient triage, treatment, transport and transfer
7. Special care units
8. Receiving facilities
9. Training
10. Financing
11. Audit and quality assurance
12. Public information and education
13. Mutual aid
14. Disaster responsiveness

Medical direction and quality control

As the EMS outside hospitals should assure people for its quality and should be closely supervised, thus, it is crucial for the skilled and experienced doctor to be responsible for the services. Moreover, the functions of doctor should be clearly defined and be specified under the license of medical profession. The medical director should be able to

1. Confer and suspend of licenses of doctors and other related personnel
2. Determine rules and regulations for medical services including standing orders for EMS personnel
3. Set the level of response to the emergency events
4. Align criteria for inter-hospital referring
5. Determine the standard procedure and dispatch procedures
6. Approve of the remote command from distanced doctors
7. Set the procedure for patient transfer
8. Be able to certify the ability of EMS personnel
9. Monitor and inspect for system effectiveness and efficiency to assure the quality of the system

There are two types of EMS command line; on-line and off-line. The former command line is used for the emergency practitioner in the operation field which can be direct as person to person or indirect such as via telephone and radio

communication. In relation to the off-line command line, there are three necessary compositions which must be operated by the director including

1. Practice guideline development
2. Quality assurance development
3. Practice development

This type of command should include not only treatment protocol and needs to be updated to match the present knowledge. Moreover, the command system should incorporated with continuous learning with strategies for all types of medical emergency staff

Patient transfer

Pre-hospital transfer

The transfer vehicle has been developed until the treatment can be delivered during the transfer. It is not necessary for the EMS office to have its own transfer services or respond to the emergency call. Nonetheless, all process involving with the transfer system should be looked after by the office of EMS system committee regardless of public or private transfer as well as the special transfer in some specific situation such as air transfer. It is also important that the office should be able to determine stake holder who should involved as well as their role in the transfer system. Moreover, the standard for transfer vehicle should be set as what has been done in the USA by the Central Government. The number and the qualification of transfer staff should also be established.

Inter-hospital transfer

Mostly, the inter-hospital transfer is not included into the responsibility of the EMS. In case the patient's clinical status deteriorates during transfer, the responsibility of the situation would fall under the doctor who orders the transfer. According to this, if the emergency practitioner, radio communication and vehicle are of use, their action should not exceed what they are allowed to do with the consent from the emergency medical office.

Emergency request and medical dispatch

Ideally, the EMS should be dispatched according to the request from the emergency communication centre which also liaises with other emergency unit such as fire fighter unit and police department. Thus the communication centre should be able to assess the situation of every request. The communication centre can be located separately from other unit and might also assign or pass the request to other unit. Thus, all who work in the centre should be trained and certified. At the same time the centre should be able to determine the operation order such as the patient approach system, pre-emergency service delivery advice and number and type of emergency practitioner to send off.

Communication

The communication network should cover the entire area of the nation and the radio-frequency should be used strictly under the control the of the national frequency management organization and might be divided to specify types of emergency such as separated frequency for medical request and disaster warning. However, in the USA, the number 911 is set to be the universal emergency number to access both medical and non-medical emergency request. The specification and capacity of the communication equipment should be specified to ensure the coverage and guarantee for effective emergency request.

Protocol

The protocol should include both medical and non medical instructions. Ones which involve directly with patients should be under the responsibility of emergency medical director especially triage, treatment, transport and transfer of patient. The protocol should be vivid, practical and suitable for the settings. The decision to dispatch or not dispatch the emergency services should be done exclusively by doctor who assess the request and are legally allowed to do.

The standing orders are an important part of the services delivery to reduce the waiting time for doctor orders. This can be very specific (e.g., maximum number of intravenous fluid given can be tried) or very general (e.g., giving the intravenous fluid). However, the deviation or fail to comply with the orders might be judged as the order violation, thus the capacity of the system should be adequate to ensure that all order are under the supervision of responded doctors.

Hospital

Patients in the emergency condition should be referred to hospitals which their capabilities match to conditions of the patients with the shortest distance regardless the competition amongst hospitals. The patients should be stable enough to be transferred except in case which better treatment cannot be achieved without the transfer. The hospitals should be opened 24-hour every day and should be able to undertake emergency operation, have their own blood bank and should have sufficient investigation facilities. However, in this standard might not be possible to achieve in the rural area.

Special treatment

Capacity of each referred hospitals should be explored as some might be specialized and have treatment unit specific to some groups of patients such as accidental unit, burn unit, heart emergency unit, paediatric emergency unit, neonatal unit, spine unit or toxicity unit. In areas which these units are deprived, the system should be able to refer patients to specialized unit which suit patient's conditions.

Training

The knowledge of both new coming and old EMS staff needs to be update and empowered with current knowledge. This can be very general such as basic life support and first aid or specific to some condition or both (dual system). For the basic services, they can be delivered by fire fighters, police or volunteers. For more advanced services, they should be done by emergency medical technician (EMT) which can be categorized into three tiers; EMT ambulance, EMT –intermediate and

EMT paramedics. For the EMT ambulances, they should be able to do basic life support, evacuate and restrain as well as to refer the patient. For the EMT-intermediate, they should be able to do vene-puncture, to use pneumatic trouser and esophageal airway, and for the EMT-paramedic, they should be able to perform some manoeuvres such as cardioversion and cardiac defibrillation, interpretation of EKG prior the arrival of hospitals. The international standard of practice should be met and this might require additional training for staff at both domestic and international levels. The training in the EMS system should be anchored to the training instituted such as universities, colleges or hospitals where field operation is possible. To ensure the regular training, expiration of the practice licences should be enforced.

Financing system

As the resources are limited, the same as in EMS system, potential sources of funding should be listed and sought to support the EMS strategies, however, the strategies might be adjustable in case of insufficient funding. Mostly, budget can be from taxation, member fee of population at risk, fee for service especially services from private sector and donation. In the past, entirely free services with funding solely from donation were common; however, with the high demands of services, donation alone is not sufficient. At the moment, taxation is the biggest source of funding. Again, the fix budget allocation and increasing demand, thus, screening for prompt demand might be applied. For private sector, expanding the coverage of services to meet the high demand might incur the additional. And as the EMS might be from public and private sectors, thus, the high efficiency of the system might not be achieved. For non-profit organization, funds for providing services are mostly from donation; nonetheless, contribution from clients and communities is also an option.

Quality assurance

As the services have expanded, standard of services should also be established. Quality of services should be evaluated periodically, and data determining quality of care should be collected continuously. Feed back system should be included in the system to demonstrate the arising problems during care delivery.

Public interests

People in the community should aware of the existence of the EMS. Education regarding access to EMS and first aid before arrival of the EMS team should be given as well as the assessment of the patient before alarming the EMS. However, this can be done adjunct with other organizations. The network amongst the team is needed to be enhanced especially when demand is beyond the capability of single EMS team such as in case of disaster. The cooperation with common agreement among teams should be done since the start of the event till the end of services.

Conclusion

The completion of composition of EMS system is necessary; the director of the EMS system should ensure the readiness of the system for the best care delivery of the patients. The instruction and interaction between components should be clarified. Insights of the overall system of the personnel at every level are also required.

4. Conceptual Framework, principle of EMS development

Witaya Chadbanchachai[♣]

In 1998, WHO reported that 60-80% of the patients died before arriving the hospital and there were a lot differences of this situation between developing and developed countries. Moreover, the efficiency of the transferring system was relatively poor in those developing countries. And about 15%-20% in those developing countries can be averted. With the efficient EMS system, 30% of mortality might be turned away.

Table 1: Comparison of mortality rate of injuries between developed and developing countries

Countries	Number of death	Pre-hospital (%)	ER (%)	Hospital (%)
Kumasi-Ghana	348	81	5	14
Mongowee-Mexico	300	72	21	7
Seattle-USA	187	59	18	23

Source: Charles Mock 1998

Table 2: Time spent for transferring the patient to the hospital

Countries	Time spent before reaching the hospital (minutes)	% of patients reached the hospital within one hour	% of patients transferred with ambulance
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Thus, WHO has suggested that:

1. the EMS should be implemented into medical services for emergency patients
2. the system should have the involvement from multi-disciplinary
3. the system should fit the area context
4. the system should be simple and efficient
5. the system should be accepted from the community with the community participation

With the proposed system, it shall yield:

1. mortality, morbidity and disability should be reduced
2. the patients would be looked after in term of physical and mental with the support of their well being
3. work burden should be reduced
4. the system should be one part of social security infra-structure

Situation of EMS in Thailand

From the survey of 552 out of 817 hospitals all over Thailand, there were about nine million emergency patients in 2001

Table 3: Number of patients of emergency patients in public hospital

Type of patients	1999	2000	2001
Emergency condition	4,476,741	5,042,222	5,783,981
Traffic accident	1,356,834	1,469,582	1,610,065
Other accident	1,113,575	1,280,221	1,382,419
Total	6,947,650	7,792,025	8,776,465

Source: Hospital survey 1999-2001

From the surveillance system of the Ministry of Public Health of 14 regional hospitals in Thailand in 1999, it has found that around 0.1%-18.4% of emergency patients were referred to the hospital by volunteers while about 0.1%-7.4% were referred by trained staff from the hospitals. However, more than 81.3%-99.7% came to the hospital by themselves or by the witnesses. The referral process according to what shown above were done poorly.

The Ministry of Public has initiated the emergency medical service system since the Seventh National Economic and Social Development Plan (1992-1996). However, the system was not able to reach the entire country. In the Ninth plan (2001-2006), the National Health Security Office allocated the budget (10 THB/capita) to support the emergency medical service system under the management of Narendhorn Centre. In the Tenth plan (2007-2012), the Emergency Medical Service Act came in to force.

Framework of emergency medical service system

Process of EMS during critical time comprises 6 steps (which are also called “chain of survival and star of life”)

1. Detection: the first step and should be done thoroughly
2. Report: the system should comprise 24-hour call centre, suitable communication equipment and well communicated caller
3. Response: the system should cover the entire area of response to ensure that the response can be dispatch within time
4. On scene care: well-trained skilled staff will help to ensure the effective and efficient transferring process
5. Care in transit
6. Transfer to definitive care

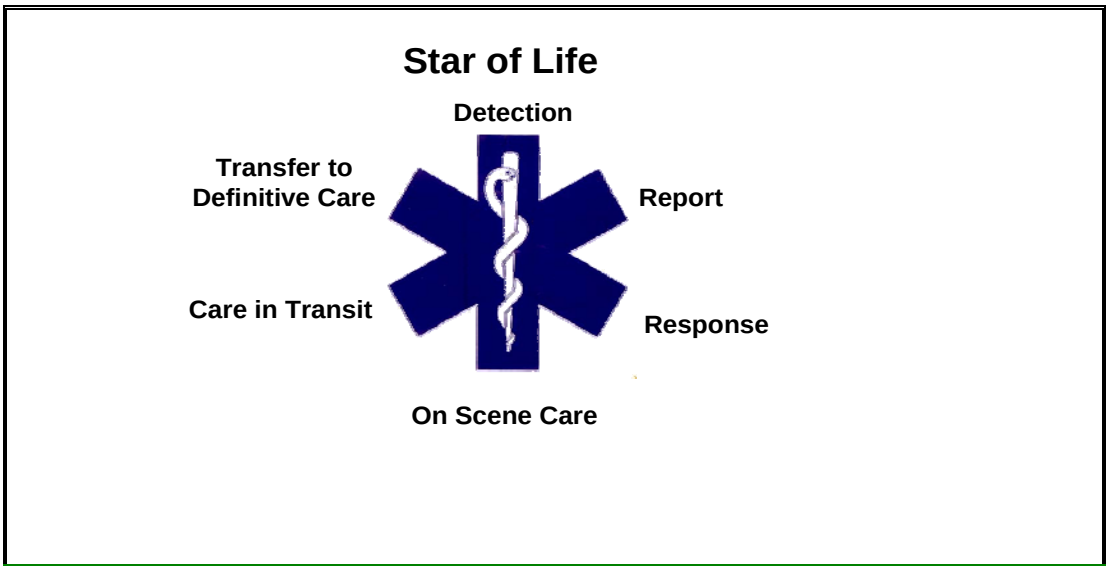

Figure 1: Star of life

National highway traffic safety administration of the USA recommends 13 components in four dimensions for establishing the EMS system. Which are:

1. Administration
   - Structure
   - Network
   - Budgeting
   - Discipline

2. Human resources
   - Human resource management and development
   - Medical oversight

- Quality control
- Research

3. Communication
   - Setting of Communication centre
   - Networking
   - Public relations
4. Transfer vehicle and equipment
   - procurement and maintenance of the vehicle
   - procurement and maintenance of the equipment

World Health Organization has suggested that the effective and sustainable of the system can be achieved through community participation. According to this the services can be categorized into three levels with the inter-communication via Command Control Centre

1. Provincial EMS network
2. Sub-district EMS network
3. Community EMS network

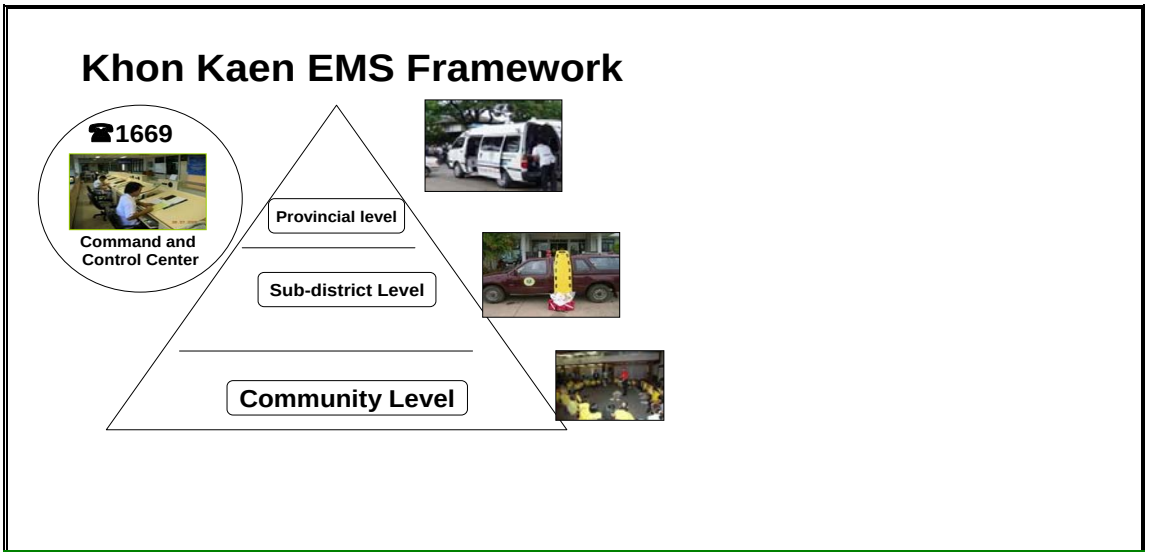

Figure 2: Framework of emergency medical service system in Khon Kaen

Role and responsibility of the network

At the provincial level, the network should design the operational system, monitor and evaluate the system as well as interact with the other levels for the unity in the province

1. Administration

- Establishing the network
- Issuing the work instruction
- Developing the network
- Zoning
- Public alarming system

2. Human resources

- Determining the number and qualification of staff
- Training course developing
- Assigning role and mission
- Monitoring of staff and developing of working indicator
- Doing research

3. Communication

- Establishing of command centre
- Issuing work instruction for command centre
- Communication network development
- Developing of working indicator
- Advertising of the services to the community

4. Transfer vehicle and equipment

- Determining type and standard of rescue vehicle
- Procurement of the rescue vehicle
- Maintenance of the vehicle
- Determining type and standard of the equipment

At the sub-district level, the network should be able to deliver the basic care while communicate with the upper level (provincial level) and lower level (community level). At this level, the care can be delivered closer than the provincial level, thus, distribution of this level is vital to the success of the entire EMS system. However, one of the most limitations at this level is the knowledge and skill of the staff. With the dual system which the care can be delivered with the staff at the sub-district level and supervised by the experts, quality of care can be improved. At the community level, the local volunteers and patients' relatives should be able to give the right notification and call for help while basic care should be done prior to the arrival of the emergency care team.

Table 4: Responsibility and role of rescue team at each level

Level	Concept/policy	Taskforce/team/ network	Plan	Result
Provincial	▪ Design the system ▪ ALS, BLS ▪ CQI, Audit ▪ Monitor	Provincial health office, Public hospital, Non profit foundation	▪ Administrative network ▪ Human development ▪ Ambulance development ▪ Command control centre development	Effective response
Sub-district	▪ First responder ▪ Accessible ▪ BLS	Municipality, Sub-district authority, Provincial, authority	▪ Integration of EMS to local authority work plan ▪ Human development ▪ Infrastructure development ▪ Networking	Effective response
Local community	▪ Basic care ▪ Alert the system ▪ Community participation	Municipality, community, CHC, EMS	▪ Integration of EMS to municipality work plan ▪ Empowerment of the community ▪ Member gathering ▪ Networking	Community networking

Conclusion

EMS system is important and complex. The keys to success includes the awareness of the policy makers, clearly set of the policy, proper budget allocation, close monitor with continuous quality improvement while the staff are proper trained and the system can reach thoroughly the country.

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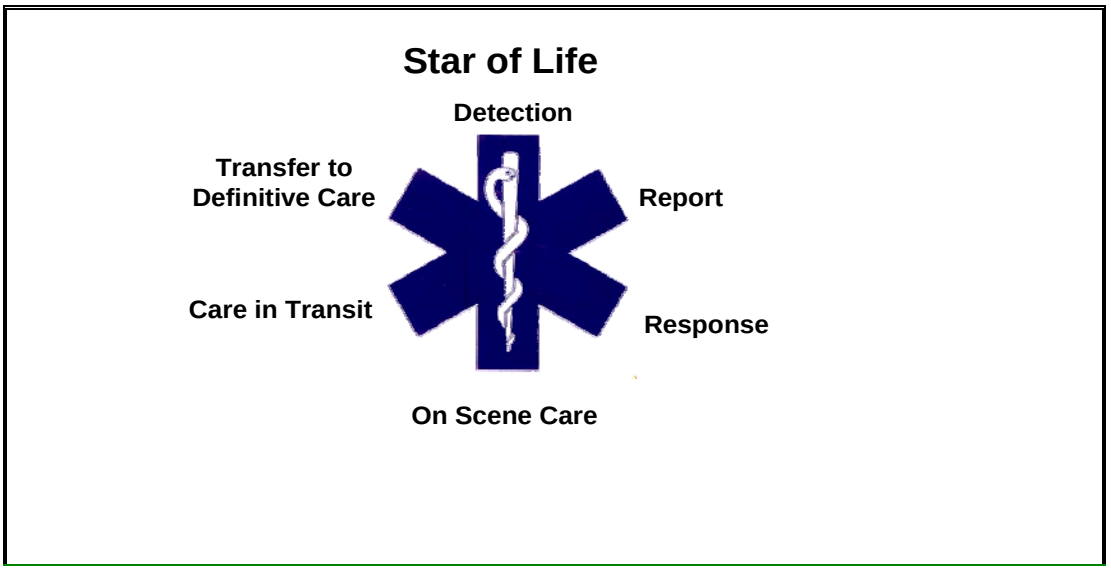

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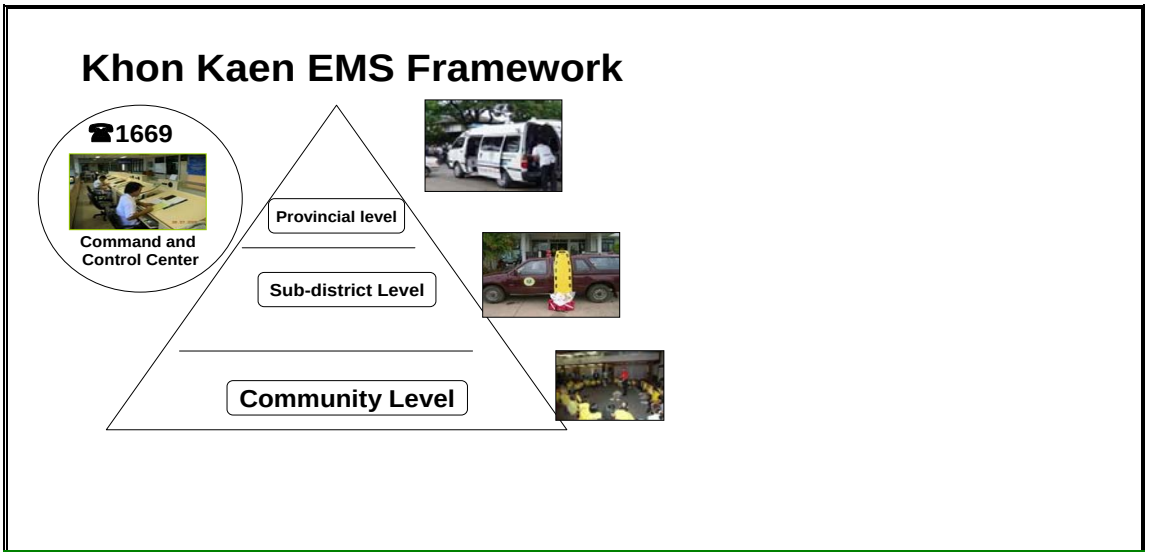

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5. Emergency Medical Service Strategy

Surachet Satidniramai[♣]

Situation and trend

In 2004 report from the Ministry of Public Health showed that there were about 12 million visits at the emergency department in every hospital in Thailand which account for 2.2% of the GDP. From this number, 3% were emergency crisis, 28% were emergency patients. From the emergency patients, 60,000 died; 17,000 died from traffic accident; 13,000 died from other accident and intoxication and 30,000 died from other diseases. Moreover, these numbers tend to be increasing every year.

Present situation

The Royal Thai Cabinet has found the Centre for Traffic Convenience and Safety in 2003 using 5E to accomplish to task

1. Enforcement (law); directed by The Royal Thai Police Office
2. Engineering (traffic); directed by Ministry of Transportation
3. Education, public relations and participation; directed by Department of Public relations, Office of the Prime Minister
4. Emergency medical service: directed by National Institute of Emergency Medical Service System, Ministry of Public Health
5. Evaluation and information; directed by Department of Prevention and Alleviation of Public Disaster, Ministry of Internal Affair

♣ Permanent Secretary National Institute of Emergency Medical Service System

Committee of Prevention and Control of Injury, Ministry of Public Health

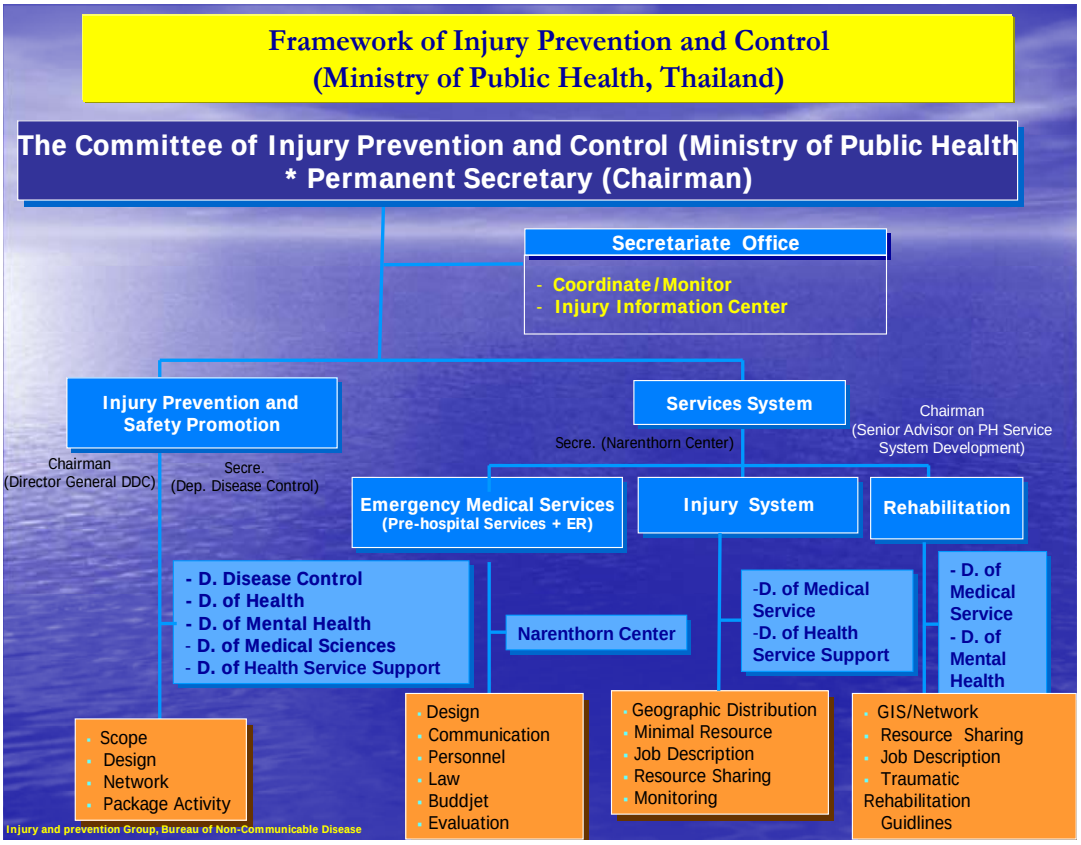


Figure 1: Structure of injury prevention and control committees, MOPH

The role of the committee includes (i) determining of the scope and strategies of the for the prevention and control of the injury, (ii) screening, deciding, commanding for the proper management, (iii) encouraging for the cooperation intra and outside organization, (iv)presenting of relevant information for proper decision making, and (v)supervise and monitoring of the unity

Problem of emergency medical service system

1. Shortage of manpower as the system was newly founded
2. Inadequacy of budget
3. Increasing trend of natural disasters
4. The universal national alarm number (1669) is new to the people

Direction and measures

As the emergency medical service system is still not accessible thoroughly Thailand. Thus, to improve the service system, several measures are proposed

1. Strategically, infrastructure, human resource and network of the system should be developed as well as its financial system

2. For general propose, thoroughly nationwide development should be endured

3. Specifically, pre-hospital care should be emphasized. Emergency room then should be empowered and filled with skilled and qualified staff equipped with sophisticated investigation equipment. The system should be made to be ready to dispatch for every emergency occurrence including natural disaster

Recommendation

1. Contain the National Institute of Emergency Medical Service System as a part of Ministry of Public Health to ensure the cooperation between government and public sectors as well as the NGO at both community and national levels

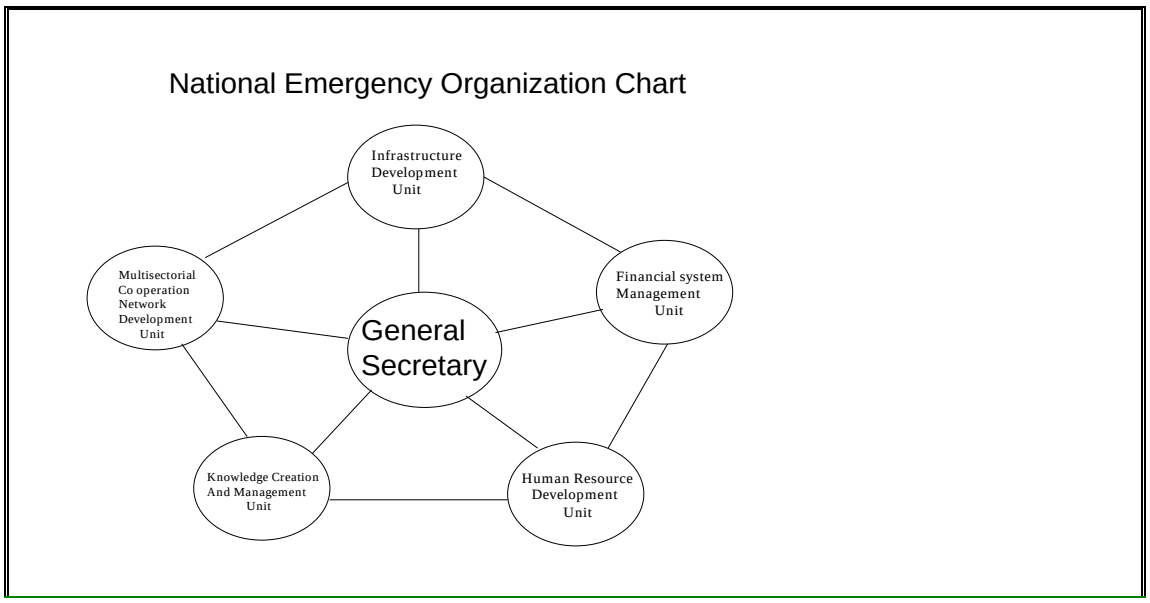


Figure 2: Structure of emergency medical service system

2. The committee should be multi-sector involvement e.g., public sectors, private sectors, NGO, National Health Security Office, Social Security Office

3. Unity of pre-hospital care should be set and be included into the emergency medical service system

4. Single number for emergency services should be enforced and promoted

5. Staff should be empowered and properly trained. Graduate-level training should be considered. Reinforcement and career path should be clarified and attracted

6. Policy makers should be made aware of the development plan of the emergency medical service system

6. Steering of EMS administration and management

Witaya Chadbanchachai ♣

To establish the EMS system, the concerns should be brought to

1. Structure and responsibility should be assigned clearly: for instance, in the context of Khon Kaen, the structure involves the participation form multi-sectors and the Governor is assigned by position to be the head of the steering group for EMS development. The community participation is also encouraged. However, this can be varied according to the differences in each area. The secretary is considered as the focal point of development horizontally and vertically. Working as a team with visibly assignment would be helpful for the development while the command centre is the information-technology centre considering the developing plan and equipment should be prepared and ready to use.
2. Direction of the development should be determined: vision and mission should be verified with brain-storming approach.
3. Budget should be set appropriately: sufficient budgeting should be set and disbursement plan should be set appropriately
4. Process of work should be done effectively
5. Monitoring system should be enforced: indictors should be set comprehensively and data regarding input, process and output should be collected continuously with periodically presented in relation to:
    - Input: number of registered facilities, number of registered staff, type and number of training course, and allocated budget
    - Process
        i. Operational indicators e.g., time to arrival the accidental scene, duration of command, time spent at the scene, number of operation
        ii. Clinical services e.g., type of patients, number of patients according to type of services
        iii. Stakeholder satisfaction
        iv. Dispatch and communication e.g., characteristics of call, accessibility, public awareness
        v. Medical oversight
    - Output e.g., survival rate, pre-hospital survival and coverage,

Conclusion

To steer the development of the EMS system, devotion of multi-sector involvement should be encouraged follow the determined visions and missions of development plan to achieve the success of the EMS implementation.

♣ Director of WHO Collaboration Centre for Accident Prevention, Director of Trauma Centre, Khon Kaen Hospital

7. Financing of the EMS system

Jakrish Ngowsiri ♣

Universal Coverage (UC) health scheme has been enforced since 2002 regarding the concerns of equity, efficacy and effectiveness, quality of services and accountability. The two most important goals of the universal health scheme are enhancing health-related quality of life of the patients while sustain the efficiency of the system. To achieve the health-related quality of life of the people in the health system, the concern should be brought to

1. Health management

Health care system can be categorized into two types which cannot be clearly separated.

- Non self-reliance system: this included the services provided by skilled trained staff fully equipped with sophisticate equipment since the primary to tertiary care
- Self-reliance system: this included the care provided by people in the community using the local wisdom to look after each other

2. Quality and knowledge management: services should be provided according to the standard of the profession to attain satisfaction of the clients with integration of organization's knowledge suitable for the context of each area
3. Community management: community participation should be enhanced especially at the primary care level

Target of financing system

1. Providing care with sufficient budget
2. Positive reinforcing of provision of care
3. Preventing financing bankruptcy of the clients

Financing of health care system

There are three main components to be considered

1. Revenue collection; this can be categorized into

- Private revenue including out-of-pocket, employer contribution, community financing and voluntary private health insurance
- Public revenue including voluntary public health insurance, medical saving account, social insurance and taxation which is the biggest source of revenue
- Donation

♣ Manager of Emergency Medicine Development Fund, National Health Security Office

- 2. Pooling: there to redistribution of the risk with concerning of differences among groups of people of income to ensure the equity
- Pay at the point of use or fee-for-services where payment is made at the point of care receiving
- Pre-paid system
    - Voluntary
    - Compulsory

3. Purchasing: the National Health Security Office is the intermediate body to purchasing care to meet patients needed while contain the cost of care. Allocation of resources and standard of care are taken into account for purchasing. Purchasing can be categorized into (i) active payment which is the commonest type of purchasing and (ii) passive payment. Principles of purchasing are

- Payment mechanism
- Gate keeper
- Hospital profile
- Reinforcement
- Utilization review

Frame of reimbursement of the universal health scheme

- Out-patient
- In-patient
- Prevention and health promotion
- High cost care
- Emergency care
- Rehabilitation care
- Capital cost
- Rural and risk fringe benefit
- Budget according other Act Number 41
- Initial budget for care provider
- Budget according to quality of care provider
- Contribution for Thai tradition and alternative medicine

However, these excludes fund for HIV/AIDS care

Financing for the EMS system

In past several years, the EMS has been evolved enormously due to the universal health financing scheme

1. Entire nation coverage of the EMS operation has been achieved.
2. Inadequate budget allocation for EMS due to the budget calculation was based solely on per capita calculation which outweighed by the high volume of the services

3. No universal financing system
4. Shortage of number and competency of manpower
5. Overlapping of service areas
6. No monitoring, evaluation of the system and no knowledge management plan was implemented
7. information and technology required addition investment

With the allowance from the National Health Security Office, the financing of the EMS system are divided into two parts. These two should be varied considering readiness and contexts of the EMS in each area

1. Reimbursement for pre-hospital care
    a. Reimbursement for the operational team who registered and qualified with the EMS system covering equipment and personnel costs
    b. Reimbursement for fix, variable and personnel costs for command centre at the community level and should not be exceed THB 800,000 per centre
    c. Pre-hospital ambulatory care reimbursement
    d. Reimbursement for the specialist consultation

    However, the allocation for this category is still in adequate. As in 2007, as much as additional THB 80 million was required
2. Reimbursement for promoting and development of the EMS system
    a. At the national level which allocated to the National Emergency Medical Service Centre
    b. Human resource development which the linkage with training institutions
    c. Investment budget for Call Centre and Command Centre development
    d. Investment for the Medical information System (MIS) development
    e. Investment for the knowledge management (KM)
    f. Promoting community participation
    g. Public relations

In year 2008, additional budget was supplemented regarding the workload due to the shortage of budget based on per capita calculation alone.

Financing of the EMS in 2008

1. Budget allocation: base on 46-million population, THB 12 per head with the total of THB 557,724,000 were allocated to National Institute of Emergency Medical Service System, and this amount of money was divided into
    a. Service budget; accounted for 75% of budget (THB 418,293,000)
        i. Pre-hospital care = THB 380,000,000.
        ii. Specific reimbursement = THB 38,293,000. This includes the reimbursement for specific circumstance such as air transfer, specialist consultation and reserved as the contingency fund

b. System development; accounted for 25% of budget (THB 139,434,000). This is for developing of the existing system or developing a new system of replace the existing one

i. Regional and provincial level development (THB 100,000,000)

ii. National level (THB 20,000,000); for development of the Narendhorn Centre, Ministry of Public Health

iii. Community level (THB 19,434,000)

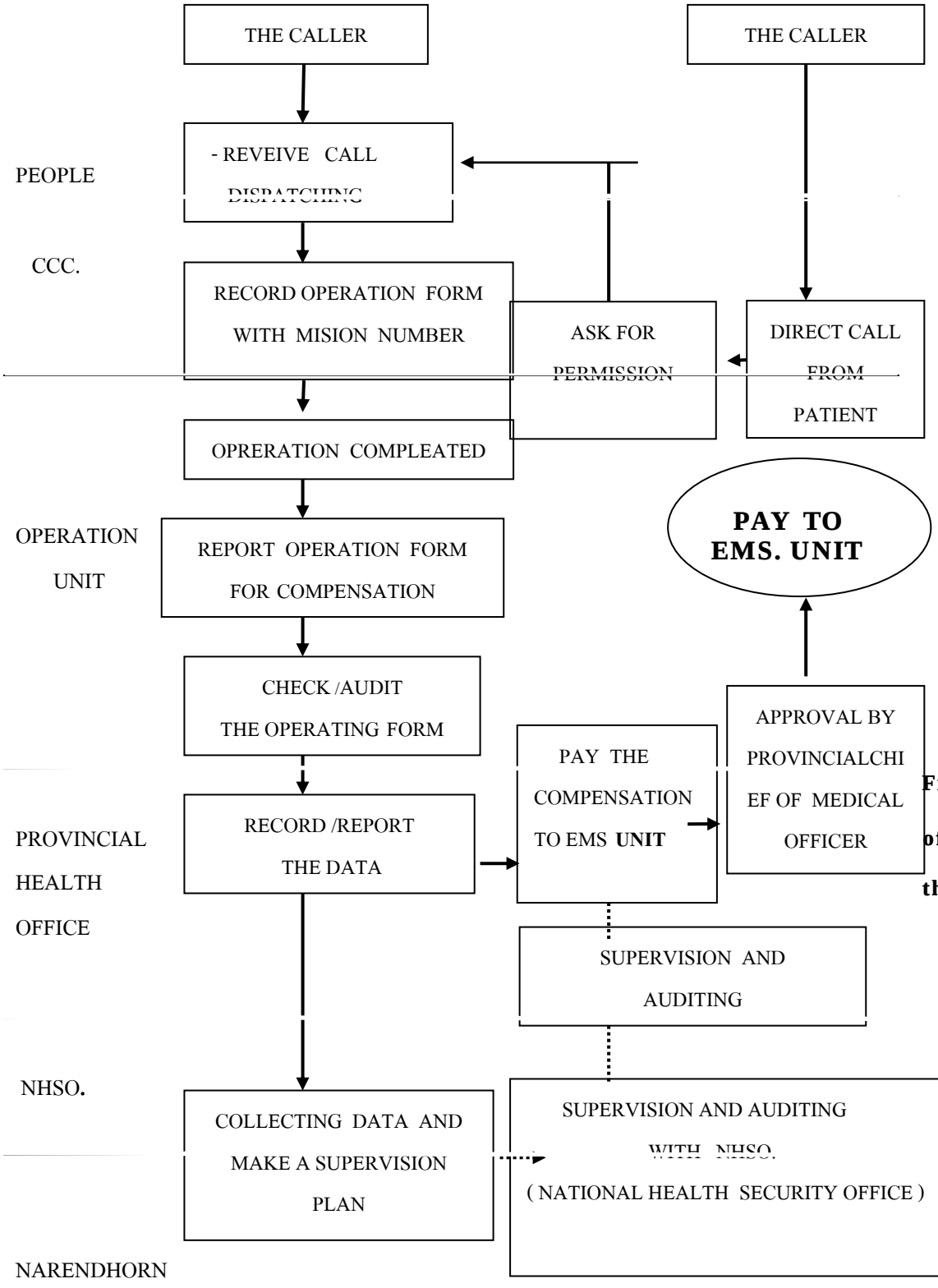


Figure 1: Frame of financing of the EMS 2008

2. Role and responsibility EMS stake holders

    a. Client: are people who are in the emergency condition. The cares start since the start of the event till, on scene management, transfer, hospital management till the discharge of the patients. The system is activated by the call of 1669.

    b. Care provider: the operational team has to be registered with the allowance of the provincial EMS system authority. The reimbursement is performance based calculation. The reimbursement form should be sent to the provincial EMS authority monthly

    c. System manager: the role starts since the call receiving and command should be re-directed to the nearest operation team. Qualified provider should be entitled with the process of quality control to ensure the standardized care delivery. The manager includes both national (Narenthron Centre) and provincial levels (such as Provincial Health Office, Regional Health Security office) which supervise the operation team.

EMS UNIT / Rule for payment	ALS		BLS TYPE 1 (EMT –I) (2 Year Training)		BLS TYPE 2 (EMT – B) (110 Hours Training)		FR (16 Hours Training)	
CHRACTER of MISSION	FEE Per Mission 1,000 THB	(%) OF payment	FEE Per Mission 750 THB	(%) OF payment	FEE Per Mission 500 THB	(%) OF payment	FEE Per Mission 350 THB	(%) OF payment
MISSION - Cancel , No Patient - Dead before arrival	200	20	150	20	100	20	100	20
- First aid and Transfer	-	-	-	-	300	60	250	80
- On scene/ In transit care	600	60	450	60				
- Complete Record Form.	200	20	150	20	100	20		
TOTAL	1000	100	750	100	500	100	350	100

Figure 18: Process for reimbursement

Conclusion

Financing system of the EMS should match to financing of the overall health care system to ensure the efficient resources used with the access of the patients to the fundamental health services and do not leave the financial burden to the health care provider while averting the personal bankruptcy due to the treatment.

8. Rule, regulation and the Act of EMS 2008

Surachet Satidniramai[♣]

Various intensity of regulation should be set to match the contexts and situations of the EMS, and this can be rule, regulation, discipline, limitation, guideline or law. In some countries, rule regarding the EMS is set as the regulation by of the Profession Council while in the USA, the Act is enforces by the approval the Central Government.

The development of regulation should be based on

1. Existing problem
    a. In competence health personnel which mostly of the patients are looked after initially with new doctor and handover to specialist in complicated case
    b. Underserved population poorly access to the services
    c. Unqualified pre-hospital care delivered by the inappropriate trained volunteer which can cause morbidity to patients
    d. No single insurance scheme which might cause the health provider reject the patients
    e. Financial bankruptcy due to the high cost of cares
    f. Shortage of doctor in rural areas
    g. Long distance transfer which might jeopardize the patients
    h. Low coverage of the EMS in rural area
    i. Reject of patients due to problem of reimbursement and ability to pay for care
    j. Unethical refer
    k. Denial of liability of the provider authority
    l. Overuse of the EMS, excessive dispatch due to inappropriate call
    m. Unnecessary transfer to avoid legal prosecution from patient relatives
2. Expecting problem
        i. Unwilling to work of the EMS personnel in the rural area
        ii. Limitation of the EMS services due to the limitation of subsidy
        iii. High demand and high expectation beyond the capacity of the EMS
        iv. Drainage of manpower to private sector

♣ Permanent Secretary National Institute of Emergency Medical Service System

9. Manpower development

Vipada Watananamkul[♣]

Development of the manpower should emphasize at community, regional and national levels, both public and private, administrator and practitioners. Moreover, Emergency Medical Technician (EMT) should be trained as another profession. Training should comprise short and long tem. Career path should be clarified to sustain the manpower in the EMS system.

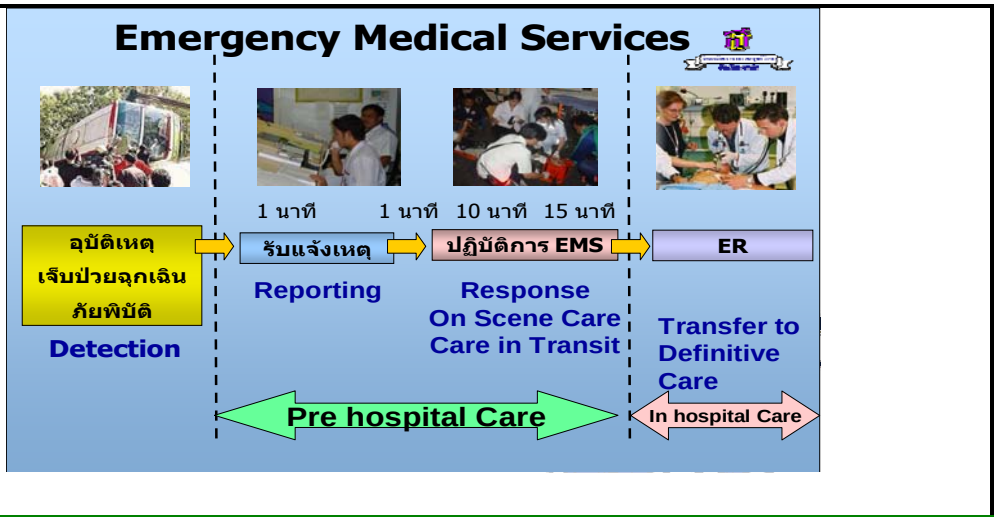


Figure 1: Emergency Medical Services (EMS)

Personnel in the EMS including those who work in the Command Centre, Call Centre, Dispatch Centre, EMS Unit and Definitive Care Institute should be trained using the continuous education approach regarding their competency. At the moment, the training centres are Narendhron Centre, Academic Institutes and hospitals which can confer the certificate to those who are trained, and they should be able to train at least every two years

Table 1: Personnel in EMS system

Unit	Type of personnel
Call and Command Centre	Emergency dispatcher
Operational team	Emergency First Responder
	EMT-basic
	EMT-intermediate
	EMT-paramedic
	Pre-hospital care nurse
Emergency room	Trauma nurse
	Emergency physician
Disaster	Trained provincial authority
	Trained provincial responder
	Trained hospital personnel
	Trained pre-hospital care nurse

♣ Head of Emergency Health service Group, Sirinthorn Public Health College, Khon Kaen

Emergency Medical dispatcher

Scope of work

1. making the equipment at the Command Centre ready to use
2. Receiving the emergency notification
3. Screening and assessing the notification
4. Giving advice
5. Deciding whether to sent the operation team
6. Notify the relevant facilities such as referred hospitals
7. Facilitate the interaction between the EMS team and hospitals
8. Redirecting the notification to responders
9. Recording the relevant information

Course for Emergency Medical Dispatcher: the course was firstly developed in 2007 to train the trainers with the objective to make the dispatcher to be able to

1. Evaluate the patient on site
2. Make connection with other teams
3. Teach to the other dispatcher

Table 2: 24-hour course for emergency medical dispatcher

Unit	Detail	Hours
Lesson 1	Notification and command system	
	Introduction	1
	Systematizing of notification and command system	
	▪ Operational system of the notification and command system	2
	▪ Communication of the EMS notification	2
	▪ Information and technology in EMS	1
	▪ Quality control	1
	▪ Ethics and laws	1
Lesson 2	Management of the emergency patients	
	▪ Assessing of threats, and call for help	6
	▪ Disaster and mass casualty management	1
	▪ Emergency and safety management	1
	▪ Counselling	2
	▪ Mental support	2
Lesson 3	Service behaviour	4

First responder

Scope of work

1. Making the transport vehicle and equipment ready to be used
2. Control the on scene situation before the arrival of the EMS team

3. Parking the vehicles where easy to access
4. Communicating with the Command Centre to report and request for additional help
5. Assessing patient with universal precaution approach
6. Applying first aid including
    a. Open airway
    b. Clear the airway
    c. C-spine fixation with cervical hard collar
    d. Breath assisting using pocket mask
    e. Bleed stopping
    f. Basic life support
    g. Cord clamping in case of baby delivery
    h. Fixation of broken bone
    i. Positioning of the patients
7. Transferring patient without using of hard board
8. Driving the vehicles using appropriate signal and siren
9. Assisting the higher level personnel

The training course for the first responder was initiated in 2004 by the Ministry of Public Health which adapted form the basic life support course and the course is suitable for non-profit volunteers, police, fire fighters and community volunteers as well as to the drivers who drive the EMS vehicle. The trainees must be 18-60 years of age with at least elementary education. The course is set in the communities with the community participations emphasizing the transferring process rather than giving the treatment. The course aims to make the first responder to be able to

1. Distinguish emergency patient from other types of patients
2. Correctly move the patients
3. Correctly apply of first aid, do the basic life support, stop bleeding, open and clear the airway
4. Communicate with the Command Centre

Table 3: 16-hour course for the first responder

Unit	Detail	Hours
Unit 1	Basic knowledge	3
Lesson 1	Basic EMS	
Lesson 2	Human body	
Lesson 3	Assessment of the situation and injury patients	
Unit 2	Basic life support	3
Lesson 4	Basic life support	
Unit 3	Lift and move the patients	3
Lesson 5	Lift and move the patients	
Unit 4	Emergency medicine	4

Lesson 6	General emergency condition	
Lesson 7	Blood lost and muscle and bone injury	
Unit 5	Simulation practice	3

Emergency Medical Technician (EMT-basic)

Scope

1. Making the transport vehicle and equipment ready to use
2. Scene sizing-up before the arrival of the EMS team
3. Parking the vehicles where easy to access
4. Communicating to the Command Centre to report and request for additional help
5. Assessing patients with universal precaution approach
6. Measuring vital signs (heart rate, blood pressure respiratory rate, temperature, capillary refill and pupil response)
7. Applying first aid including
    a. Open airway
    b. Clear the airway with suction
    c. Apply the oropharyngeal airway
    d. C-spine fixation with cervical hard collar
    e. Breath assisting using pocket mask and Ambu bag
    f. Apply oxygen cannula and mask
    g. Stop bleeding
    h. Perform Basic life support
    i. Apply AED
    j. Cord clamping in case of baby delivery
    k. Fix broken bone
    l. Position of the patients
    m. Give medication according to the doctor prescription
    n. Take off the helmet from the patients
8. Transferring patient with and without using of long spinal board, stretcher, scoop, KED, Stair chair
9. Assisting the higher level personnel

The course for the EMT-basic was developed according to the policy to expand the EMS thorough out the countries in 2004. The short course was initiated in 2005 adapting form the existing course in the USA. The objectives of the course are to make the EMT-basic to be able to

1. Understand the EMS system
2. Assess the on scene safety before help delivery
3. Distinguish emergency patient from other types of patients

4. Classify type of patients according to their severity in case of disaster and mass casualty
5. Prioritize the patient for transferring
6. Lift and move the patients correctly
7. Apply first aid correctly
8. Communicate with the Command Centre

The trainee should age between 18 and 35 years old with at least high school education. After the course, it will be followed with one month for the trainees to practice in real situation.

Table 4: 110-hour course for EMT-basic

Unit	Detail	Hours
Unit 1	Introduction	23
Lesson 1-1	EMS system	1
Lesson 1-2	EMT Basic	1
Lesson 1-3	Law and ethic	2
Lesson 1-4	Human body	3
Lesson 1-5	Vital sign	4
Lesson 1-6	Pharmacology	2
Lesson 1-7	Communication	2
Lesson 1-8	Life and move	7
Unit 2	Airway	11
Lesson 2-1	Airway	7
Lesson 2-2	Basic life support	4
Unit 3	Situation and injury patient assessment	14
Lesson 3-1	Situation assessment	3
Lesson 3-2	Basic patient assessment	4
Lesson 3-3	History taking and physical examination of injury patient	4
Lesson 3-4	History taking and physical examination of the other patient	2
Lesson 3-5	Continuous assessment of the patients	1
Unit 4	Emergency condition	29
Lesson 4-1	Airway emergency	3
Lesson 4-2	Cardiac emergency	7
Lesson 4-3	Neurological emergency	3
Lesson 4-4	Allergic reaction	2
Lesson 4-5	Endocrine emergency	2
Lesson 4-6	Toxicology	2
Lesson 4-7	Environmental emergency	2
Lesson 4-8	Psychological emergency	3
Lesson 4-9	OB&GYN emergency	3
Lesson 4-10	Infectious diseases and new disease emergency	2
Unit 5	Injury	18

Lesson 5-1	Blood lost and shock	3
Lesson 5-2	Soft tissue injury	4
Lesson 5-3	Caring of muscle and bone	4
Lesson 5-4	Head and spine injury	7
Unit 6	Infant and children	5
Lesson 6-1	Infant and children	5
Unit 7	EMS operation	12
Lesson 7-1	EMS vehicles	5
Lesson 7-2	Patient approach	2
Lesson 7-3	Report	2
Lesson 7-4	Simulation	3

Emergency Medical Technician- Intermediate

Scope

1. Making the transport vehicle and equipment ready to use
2. Scene sizing-up and control of situation and liaise with police, fire fighter and other emergency personnel
3. Parking the vehicles where easy to access
4. Communicating to the Command Centre to report and request for additional help
5. Triaging the patients according to their severity
6. Initial assessing, rapid trauma assessing, focused history taking and physical examining and ongoing assessing
7. Measuring vital signs (heart rate, blood pressure respiratory rate, temperature, capillary refill and pupil response) and Glasgow Coma Scale
8. Doing specific tests such as blood glucose, pulse oximetry and EKG
9. Apply first aid including
    a. Basic airway management and C-spine immobilization
        i. Open airway
        ii. Suction
        iii. Apply the oropharyngeal airway
            1. Doing Heimlich manoeuvre
        iv. Doing Sellick's maneuver (Circoid pressure)
        v. Apply cervical Hard collar
    b. Take care of ventilation, oxygen administration using pocket mask , mask and nasal cannula
    c. Apply oxygen cannula and mask, bag-valve-mask (Ambu bag) and neubulizer
    d. Circulation management
        i. Bleeding control
        ii. IV fluid management
        iii. Dressing

iv. Basic CPR
v. Cardioversion using AED

e. Do Advance CPR
f. Administrate medication via oral, nebulized, intra-muscular or intra-dermal
g. Perform basic operation
i. Apply catheter
ii. Apply NG tube
iii. Gastric lavage
iv. Suture and wound dressing
v. Bone splint
vi. Hot and cold applying
vii. Eye irrigation
viii. Tepid sponge
h. Perform baby delivery in the emergency
i. Take off the helmet from the patients
j. Position of the patients
k. Give medication according to the doctor prescription
l. Emotional support

10. Collect scene evidences
11. Transfer patient with and without using of long spinal board, stretcher, scoop, KED, Stair chair
12. Look after the patient during the transfer process
13. Assist the higher level personnel
14. Manage basic EMS unit
15. Promote health and prevent emergency health condition
16. Communicate, command and advise at the Command Centre for people involving with emergency scene

Diploma of Emergency Medical Technician

Since 1996, the first course for EMT was established by Khon Kaen Regional Hospital, Sirinthorn Public Health College, Khon Kaen, and Khon Kaen Provincial Health Office under the Khon Kaen Initiative Project (KKIP) aimed to produce ambulance officer for the EMS. Later in 1997, it was developed to be the certificate course and became the first EMT course in Thailand in 2001 call the Certificate in Emergency medical Technician-Intermediate), and in 2006, the EMT-Advance course was set.

Aims of the course

1. Awareness of the role and scope of EMS
2. Be able to provide treatment on scene and during transfer as well as alleviate the situation on scene
3. Be able to promote health and prevent health problem regarding EMS with the participation from the community

4. Have good attitude towards EMS
5. Communicate using MIS efficiently
6. Have a leadership in decision making with good relationship, be initiative, be a role model and dedicate to society
7. Be able to learn life-long

Requirement

1. Must be Thai citizen with 16-35 years of age
2. Have good physical and mental health without disability
3. Have good history record and personality
4. Pass the military conscript
5. Be not in a monkship
6. Must complete high school or equivalent

Course duration

Two years

Table 5: Curriculum of the EMT diploma

Details	Unit
Social science and archaeology	5
Psychology	
Human social and environment	
Educational Science and linguistic	7
English for communication	
Thai for communication	
English for emergency medical technician	
Science and mathematics	6
General chemistry	
General physics	
Utilization of computer	
Basic profession knowledge	20
Fundamental pharmacology	
Holistic health prevention and promotion	
Biostatistics Epidemiology	
Profession ethics and laws related to EMT	
Anatomy an physiology for EMT	
Forensic medicine	
Traumatic path physiology of injury	
Public health administration	
EMT	41
Procedure	

Procedure for EMT
Lifting and moving
Field work
Operation with patient
Assessment
Emergency medical care of patients
Emergency medical care of injuries
Field work
Basic and advanced life support
EMT service 1
EMT services 2
Field work 3
Field work 4
Optional subject
Swimming
Self defence basic
Photography
Traditional massage
Rhythmic activity
Driving
Personality development
Group dynamics and team working
Independence study

Pre-hospital nurse

Scope

1. Assessing the emergency scene and enquiring help
2. Triage patient according to their severity
3. Assessing patient during the transfer
4. Taking care life threatening condition
    a. Perform advanced airway management
        i. Open airway
        ii. Suction
        iii. Apply oropharyngeal and nasopharyngeal airway
        iv. Perform Heimlich maneuver
        v. Apply cervical hard collar
        vi. Apply endotracheal tube, esophageal tracheal combitube, laryngeal mask airway (LMA)
        vii. Ventilation
    b. Take care of patient's ventilation

i. Administrate oxygen using pocket mask, mask, nasal cannula, Ambu bag, neubulizer
ii. Perform needle decompression

c. Take care of patient's circulation
i. Control bleeding
ii. Administrate IV fluid
iii. Use defibrillator

d. Perform advance CPR

e. Administrate medication

5. Perform some procedure before and during transfer
6. Collect on scene evidence
7. Fix, lift and move patient

This course was firstly initiated by Narendhorn Centre with the paramedic trainer from Australia. Later, Khon Kaen Hospital, Provincial Health Office, Sirindhorn Public Health College and Sri Nakarin Hospital had developed the course for paramedic nurse in 2006 and then the title of the course was changed to "Pre-Hospital Nurse Course" in 2007. In 2008, the course has been expanded to reach the national level which aims that all hospital in Thailand should have the pre-hospital nurse.

Objective of the course

After this course, the trainee should be able to

1. Understand and take care of patient during the transfer before arrival of the hospital
2. Have high skill and experience in pre-hospital care
3. Have good attitude toward pre-hospital care

Table 6: Curriculum of pre-hospital nurse

Lesson	Duration	
	Theory	practice
EMS knowledge		
EMS system	2	
Law ethic and safety of EMT	1	
Receive call, communicate and report	2	1
Management of mass casualty	1	1
Patient assessment		
Patient assessment	2	2
Advance CPR	4	4
Taking care of injured patient	3	1
Taking care emergency patient	2	2
Transfer of patient		
Lifting and moving of patient	2	2
Operation of ambulance	1	

Simulation operation		7
Total	**20**	**20**

Paramedic

Paramedic is another profession of the pre-hospital care. In some countries, the times of training course for being a paramedic are ranging from 300-2,000 hours. However, according to the Thai EMS plan (2006-2010), the course for paramedic is still being developed by the Ministry of Public

Scope

1. Making the transport vehicle and equipment ready to use
2. Scene sizing-up before the arrival of the EMS team
3. Parking the vehicles where easy to access
4. Communicating to the Command Centre to report and request for additional help
5. Triaging the patient according to the severity of the patient
6. Advance assessing patients on scene and during transfer
7. Doing specific tests such as blood glucose, pulse oximetry, capnography and EKG
8. Applying first aid and advance CPR including
    a. Advance airway management
        i. Open airway
        ii. Clear the airway with suction
        iii. Apply the oropharyngeal airway
        iv. Perform Heimlich manoeuvre
        v. Perform Sellick's maneuver (Cricoid pressure)
        vi. Apply cervical hard collar
        vii. Apply endotracheal tube, esophageal tracheal combitube, laryngeal mask airway (LMA)
    b. Take care of patient's ventilation
        i. Administrate oxygen using pocket mask, mask, nasal cannula, Ambu bag, neubulizer
        ii. Perform needle decompression
        iii. Perform needle cricothyrotomy
    c. Take care of patient's circulation
        i. Control bleeding
        ii. Administrate IV fluid
        iii. Vagal manoeuvres, precordial thump, carotid sinus massage
        iv. Use defibrillator; automatic, semi-automatic, and manual
    d. Perform advance CPR
    e. Administrate medication
9. Deliver advance procedure and taking care of patient on scene and during transfer

10. Collect on scene evidence
11. Fix, lift and move patients
12. Transfer and taking care patient during the transfer
13. Operate EMS in case of multiple casualty incidents
14. Administrated the EMS system
15. Promote and prevent help problem regarding the EMS

Emergency Department personnel

There are several courses for the personnel working at the Emergency Department including

1. Trauma nurse
2. advanced cardiac life support for physician and nurse
3. advanced trauma life support for physician
4. Emergency physician

Disaster medicine course

There are four courses being developed by the Office of EMS, Ministry of Public Heath

Disaster medicine course for provincial authority

This course aims the trainee to

1. Have knowledge and understanding of disaster medicine
2. Be able to command and assessment for preparing for disaster attack

It is a 16-hour course cover the area of

1. Epidemiology, problem and consequences of not preparing for disaster attack
2. Disaster risk management
3. Disaster cycle and preparedness and surge capacity
4. Evacuation plan via air and water transport
5. Law and international agreement on disaster
6. Preparedness for disaster attack
7. Check list for preparedness
8. Discussion regarding the disaster attack

Disaster medicine course for provincial disaster team

Aims; after this course, the trainee should be able to

1. Have knowledge and understanding of disaster medicine
2. Be able to command and assessment for preparing for disaster attack

It is a 40-hour course covering the area of

1. Definition, epidemiology and consequences of no preparedness for disaster
2. Disaster risk management
3. Disaster cycle

4. Rescue plan via air and water transport
5. Law and international agreement on disaster
6. Preparedness for the disaster attack
7. checklist for preparedness
8. Exemplar of preparedness
9. Emergency response management principle and concept and HEICS
10. Organization of Relief, Organization of Delivery, Organization of Logistic and Communication
11. Preparedness for emergency health
12. Role of emergency physician
13. Mass casualty management
14. Overview of preparedness, planning and simulation
15. Plan development and rehearsal of preparedness
16. Planning for evacuation process
17. Recovery process
18. Identification of body
19. Information management (Media and VIP) and PR
20. Mental health
21. Presentation
22. Evaluation and reflection of plan rehearsal

Disaster medicine for hospital personnel

Aims; after this course, the trainee should be able to

1. Know the definition of disaster
2. Know the definition of disaster medicine and role for disaster management Know the management system, command system, preparedness and planning for the disaster attack
3. Know various type of disaster medicine

It is 24-hour course covering the area of

1. Overview of disaster management
2. Responding unit, law, resources regarding disaster management
3. Incident command system (ICS)
4. Health services system regarding disaster
    a. Preparedness period: risk assessment at the community and hospital level
    b. Responding period: search, evacuation, treatment on site of the incident, refer back, treatment for disaster victim and corpse management
    c. Rehabilitation period: mental health support, reconstitution of health system
5. Surgery during the disaster

a. Mass casualty management
b. Triage
c. Weapons effects and blast injury
d. Damage control surgery

6. Toxicity management
    a. Decontamination
    b. Personal protective equipment
7. Disease outbreak management
    a. Surveillance
    b. Quarantine
    c. Self-protection equipment

Pre-hospital management

Aims; after this course, the trainee should be able to

1. Have knowledge and understand of disaster
2. Pre-hospital management

This is a 24-hour course covering the area of

1. Disaster overview emergency, preparedness and chain of survival
2. Safety protocol
3. Incident medical commander
4. Triage system
5. Transport system
6. Initial care
7. Communication system
8. Special situation, HAZMAT, conflict, tactical medicine
9. Discussion, story telling of previous disaster

10. Quality improvement and indicator

Tanongsan Taintaworn[♣]

Most of the casualties occur outside hospital however, the first hour after the incident (golden hour) is critical to reduce the morbidity and mortality. The good EMS system should reach the incidental site on time and deliver the appropriate care (Narendhorn 2004). The EMS is apparently different from hospital services due to the uncontrollable condition of the environment and other factors with less well equipped (Linwood, Day et al., 2007). In case of traffic accident, the risk might increase for those who deliver the EMS. Moreover, many factors contributed to the outcome of EMS since the first start of the EMS system; call making (by victim or bystander), call taking, initial given information, dispatching, distance used, time spent, severity, organ involvement, team and its competency (see Figure 20)

Figure 20 : Diagram of the EMS

In Thailand, the EMS system has been developing dramatically in the past five years which is, however, incomparable to the EMS system in Western Countries. Khon Kaen is considered as the pilot province implementing EMS system in Thailand. Service information in this province might give a clue for developing quality indicators such as balanced scorecard (BSC) and Key performance indicators (KPIs). And these indicators measure the performance of all stages: planning, implementing, evaluating, and standardizing (Pathpong 2003). Balance scorecard which comprise four perspective (financial, customer, internal process and learning and growth) has been opted to use by many companies such as CIGNA, Mobil, Brown and Root, Apple Computer, Advanced Micro Devices (AMD) (Pathpong 2003)

Before doing the BSC, the concern should be brought to (Pathpong 2003; Norton and Gouillart 2004)

1. Objective
2. Measures or key performance indicator

♣ King Mongkut Memorial Hospital, Bangkok

3. Target
4. Initiatives

In relation to EMS system, with the clear of objective, measure, target and initiative, the goal of the organization could be achieved.

1. Learning and growth perspectives; this perspective concerns about human resource and health technology with three KPIs
    - Number, level and rate of expansion of the EMS units
    - Number, level, and increase rate of health personnel
    - Number, level and increase rate of ambulance
2. Internal process perspectives; this perspective is part to exhibit the value of the patient with two KPIs
    - Number of operation and quality
    - Time spent per operation
3. Financial perspectives
    - Increase of the budget
    - Increase of the budget per capita
    - Reduction of cost per case
4. Patient and relative perspectives
    - Market share, patient retention and patient acquisition
    - Patient and relative satisfaction

For the effective use of KPIs, the indicator should have the characteristics of SMART which comprises of

- S-Specific
- M-Measurable
- A-Achievable
- R-Result-oriented or relevant
- T-Time

The case study of Khon Kaen

Learning and growth perspectives

Aims: to provide the EMS cover the entire area of Khon Kaen. During 2003-2007, the infrastructure of the EMS including operation unit, personnel and ambulance was being expanded.

Operational unit: the number has been increasing from 43 units in 2003 and reached 124 units in 2007. According to this, the ratio of the unit per population was loosen from one unit per 40,000 capita in 2003 to one unit per 14,000 capita in 2007 (see Figure 21), and mostly were using the unit at the sub-district level. The expansion should meet the demand of each community. In each province, the target of expansion should be set. Such as in Khon Kaen, the rate of expansion of 20 units per year is expected and the projection is shown in Figure 21.

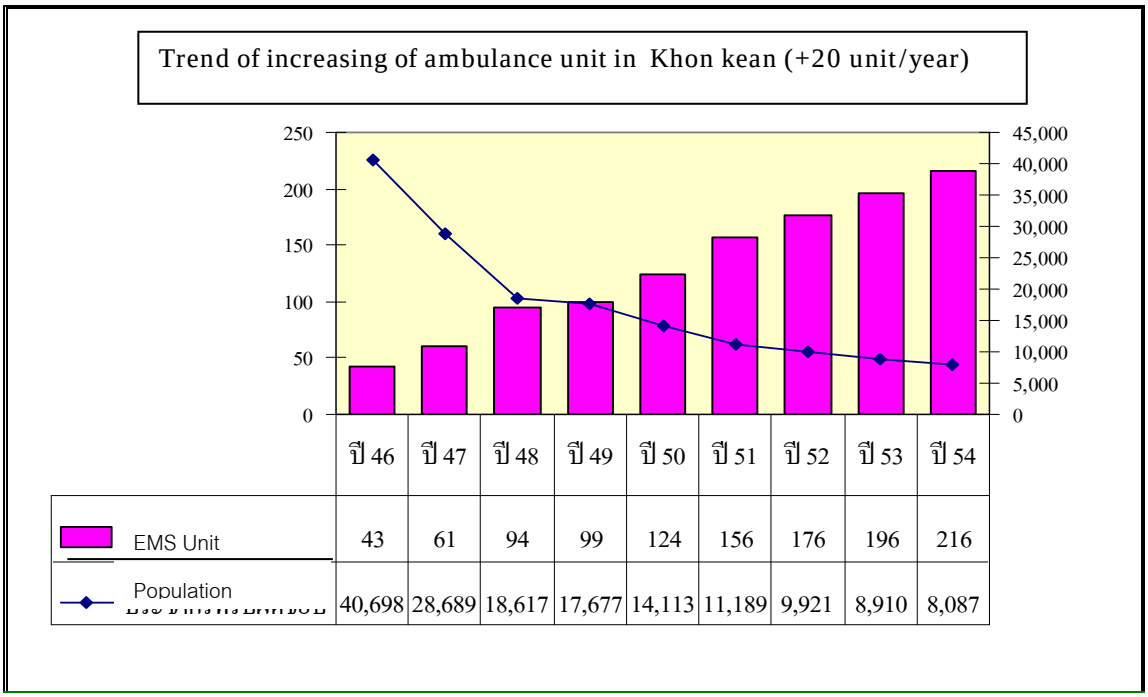


Figure 11: Number of the operation unit by year in Khon Kaen

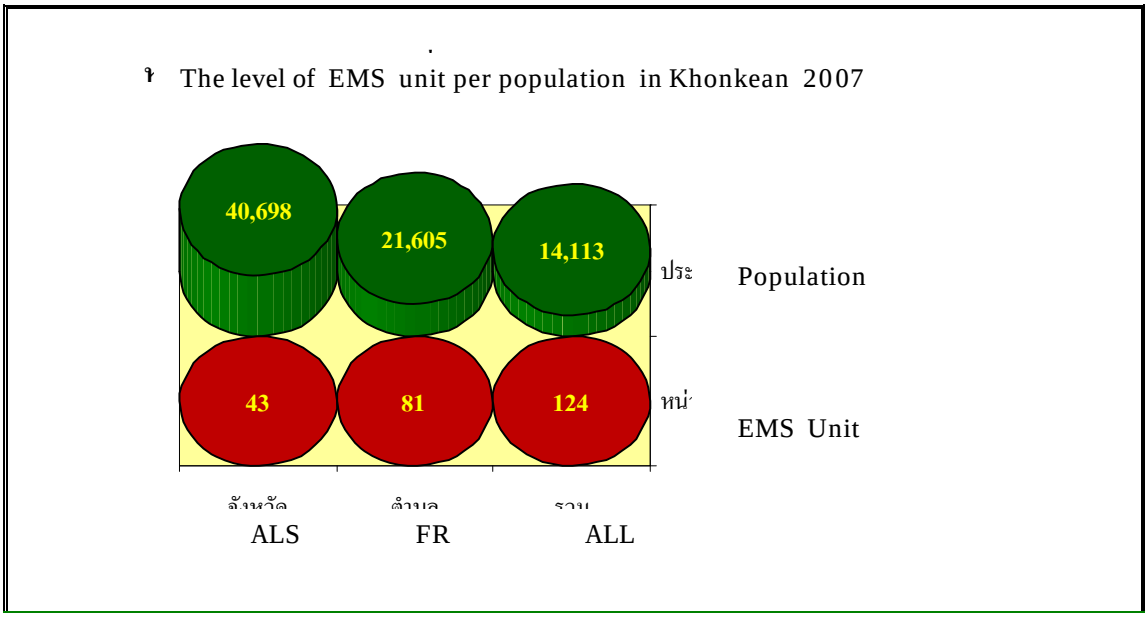


Figure 22 : Number of units stratified by level of the unit in 2007

Personnel: the number of personnel in the EMS has also increased from 1,349 in 2003 to 2,368 in 2007 or one personnel per 739 capita (see Figure 23). However, the shortage of high level personnel still exists as most of the personnel are volunteers, and one emergency physician has to look after 80,000 people. To achieve the target, at least 2 emergency doctors, 20 EMT nurse, 10 EMT-intermediate, 20 EMT-basic and 200 first responders have to be trained yearly to match the increase of 20 operational units yearly.

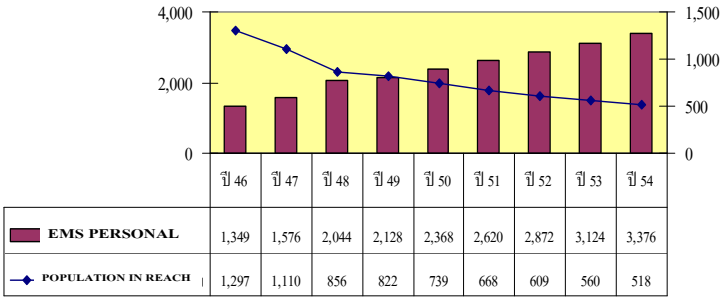


Figure23 : Number of the EMS personnel (2003-2011)

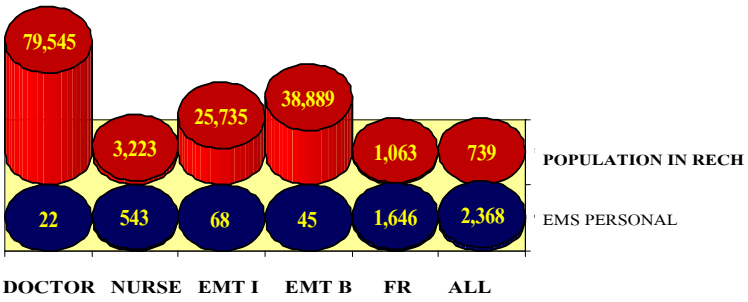


Figure 24 : EMS personnel in Khon Kaen stratified by type in 2007

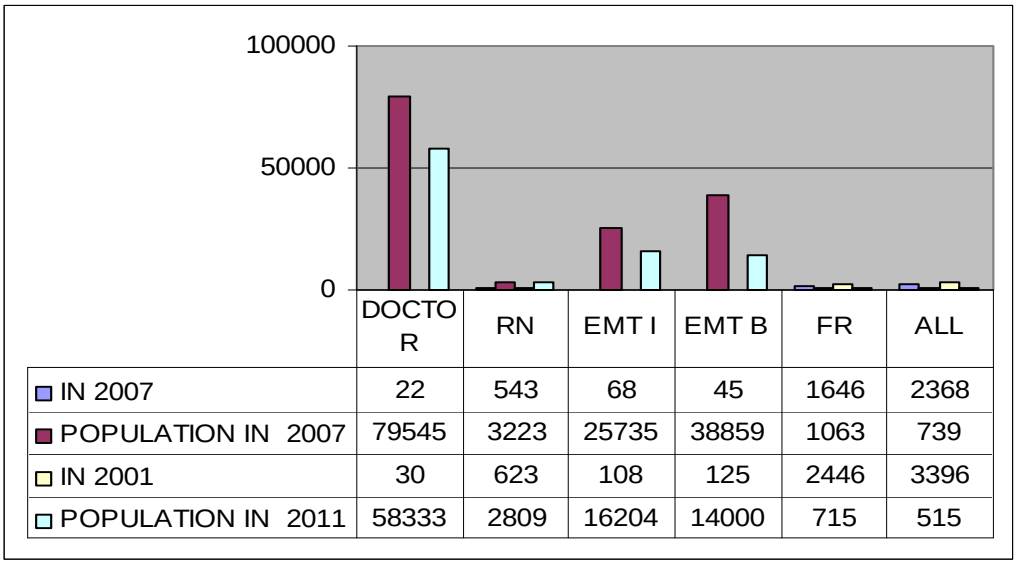
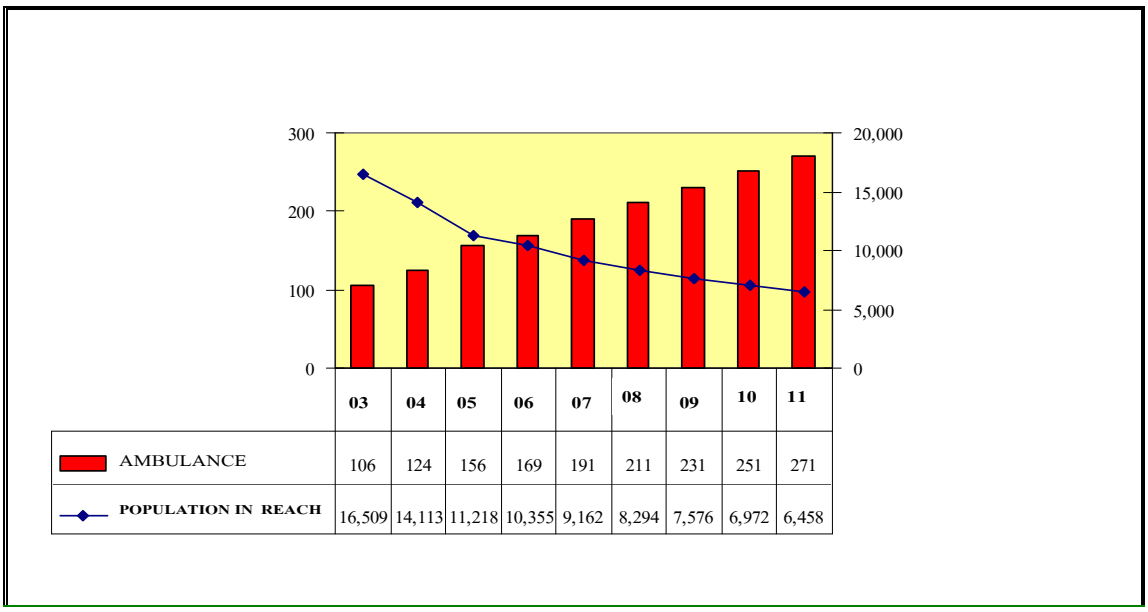


Figure 25 : Number of EMS personnel by type in 2007 and 2011

Ambulance: for this component the number of the ambulance has been increasing to match the incline of the both operation units and personnel (see Figure 26-28)



	03	04	05	06	07	08	09	10	11
AMBULANCE	106	124	156	169	191	211	231	251	271
POPULATION IN REACH	16,509	14,113	11,218	10,355	9,162	8,294	7,576	6,972	6,458

Figure 26 : Number of ambulance (2003-2011)

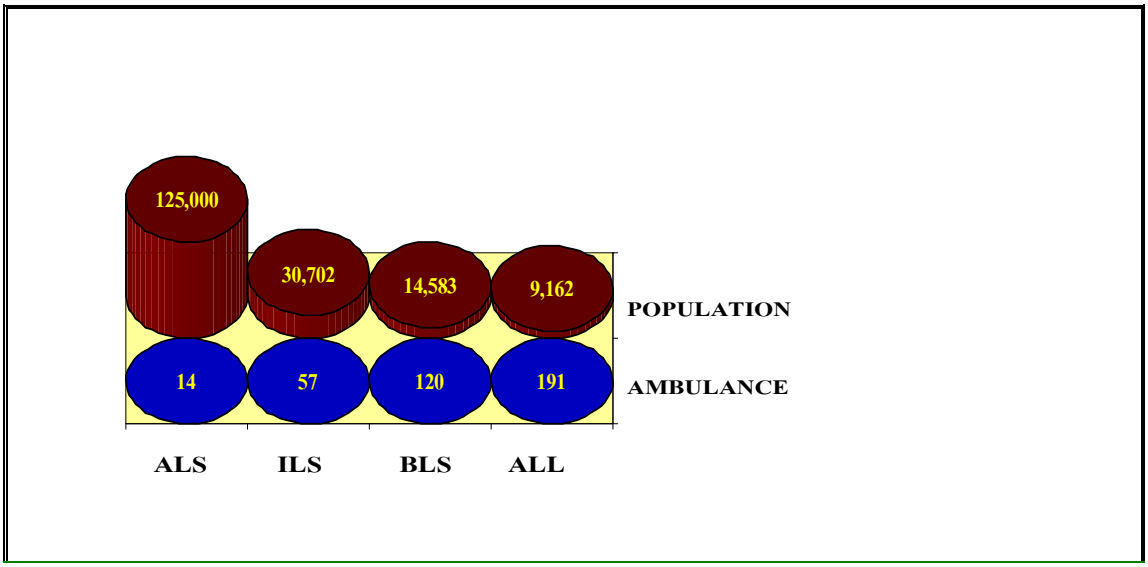
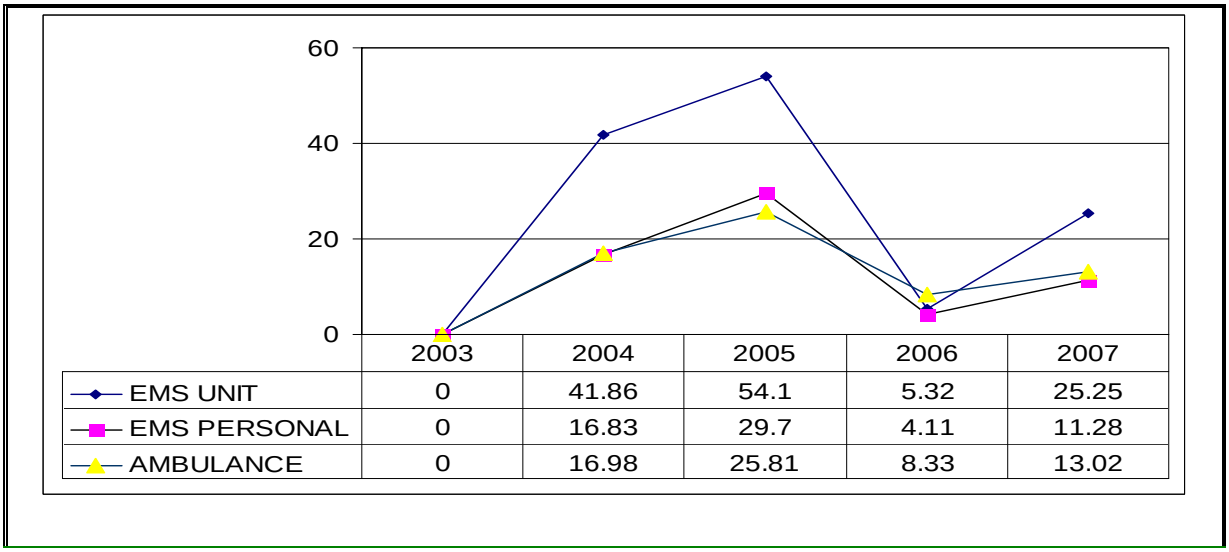


Figure 27 : Number of ambulance Khon Kaen stratified by type in 2007



	2003	2004	2005	2006	2007
EMS UNIT	0	41.86	54.1	5.32	25.25
EMS PERSONAL	0	16.83	29.7	4.11	11.28
AMBULANCE	0	16.98	25.81	8.33	13.02

Figure 28 : Number of ambulance by type in 2005 and 2011

With comprehensive data, the KPIs can be shown clearly and the trend can be visualized. Aside from the analysis of the information to construct the KPI, other factors that might contribute to the indicators including economics, society value, politics both local and national as well as research and the MIS level should take into account.

Internal perspectives

Aims: Deliver the accessible EMS

Operational indicator: the operation starts since the activation by call of the system, operation unit is later triggered and is sent to the emergency scene until patients arriving hospitals. The indicators in this perspective would capture all process of the EMS operation. Moreover, number of dispatch is also an important indicator in this perspective. In Khon Kaen, the number of operation has been increasing from the 1,917 operations in 2003 to reach 38,059 in 2007.

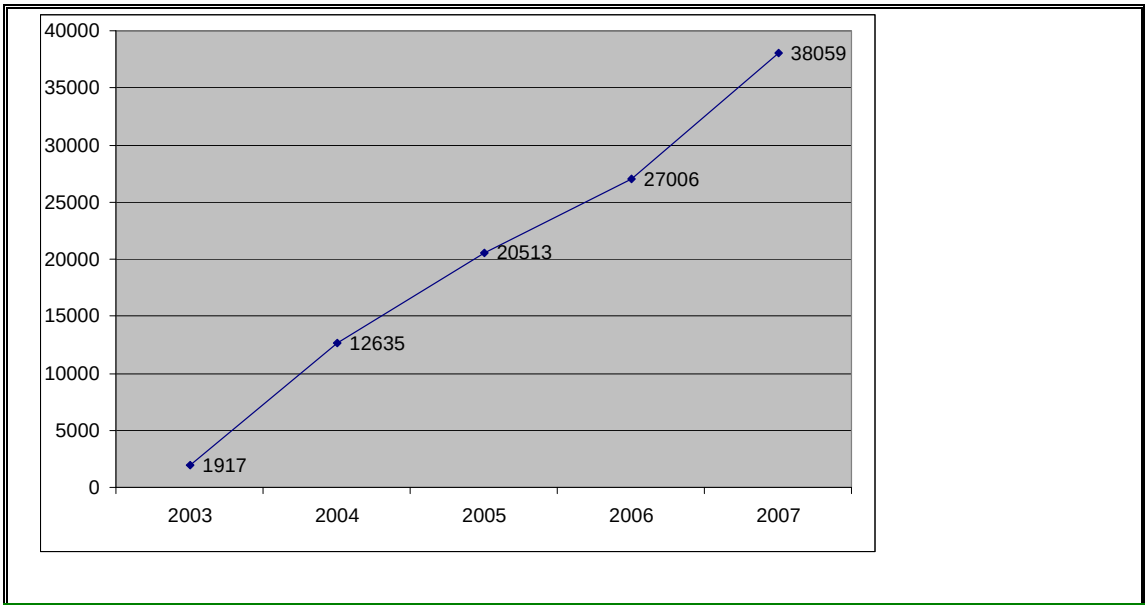


Figure 29 : Number of the operation 2003-2007

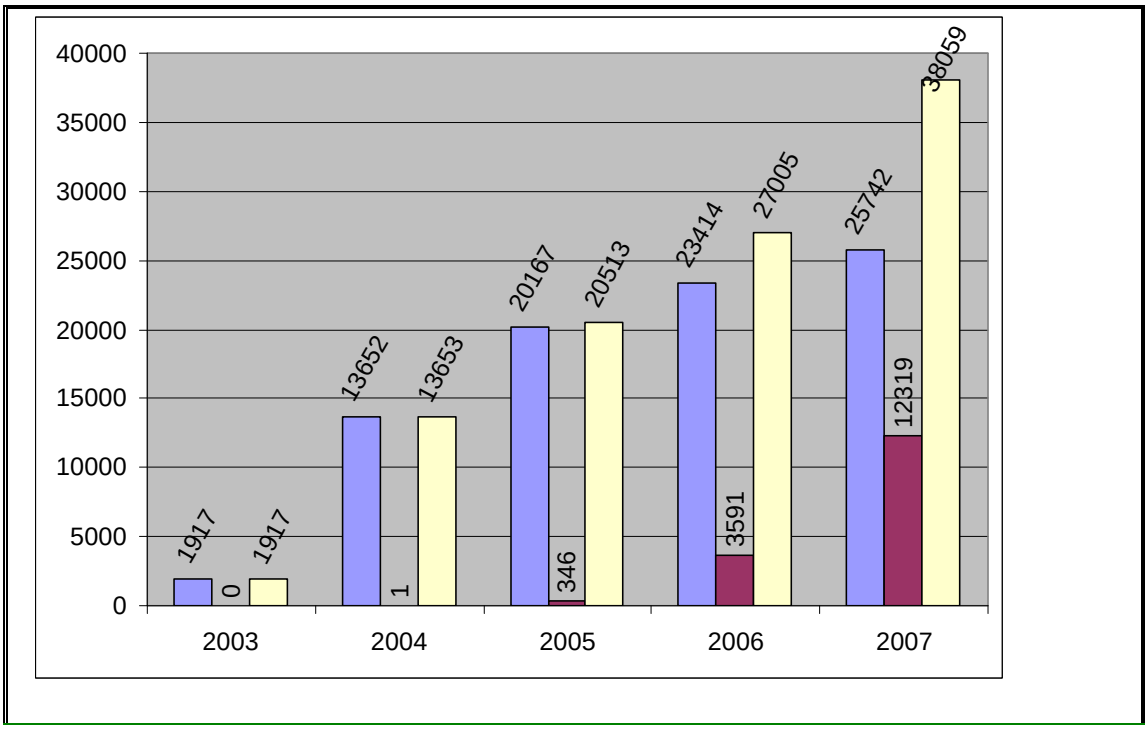
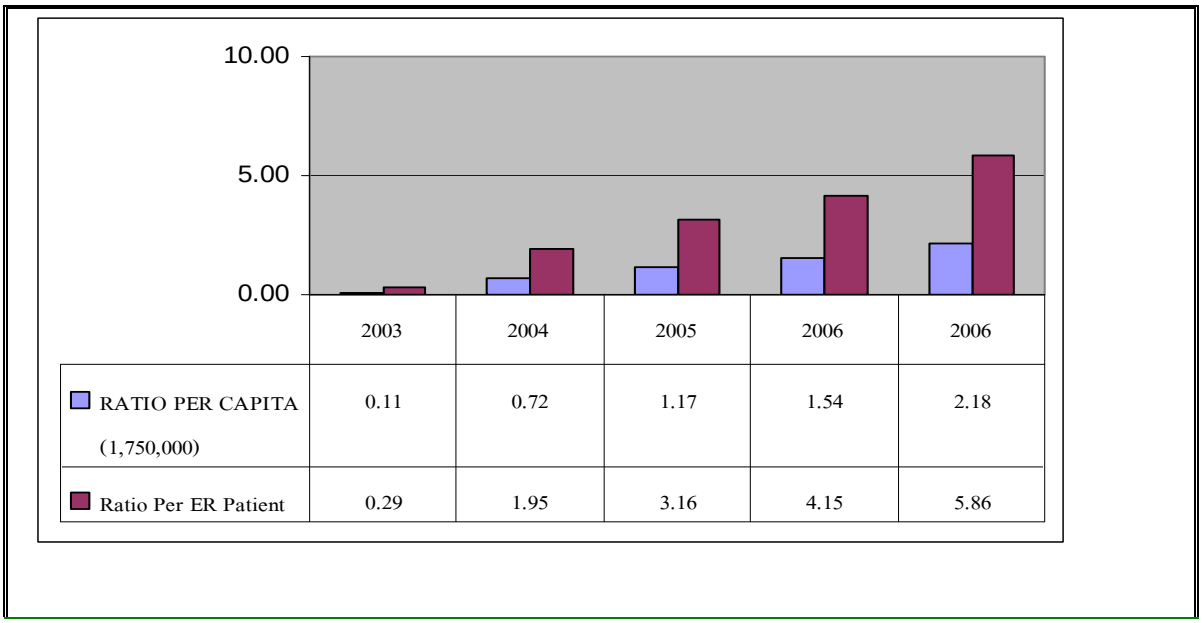


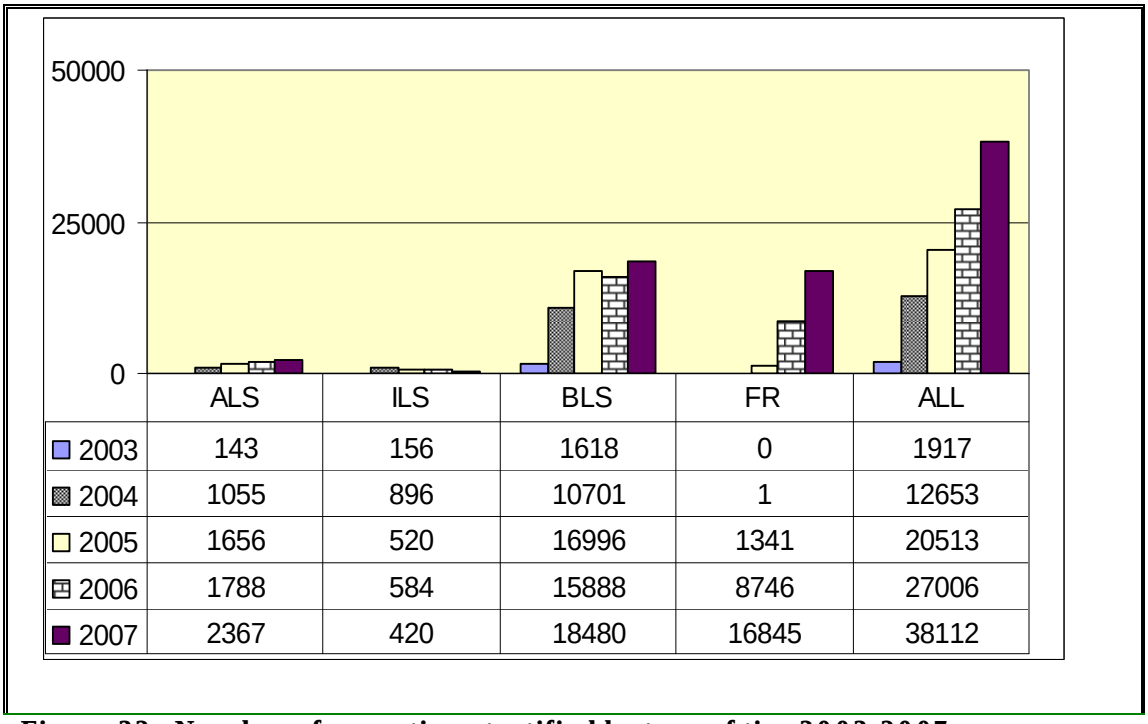
Figure 30 : Number of the operation stratified by level of operation unit 2003-2007



	2003	2004	2005	2006	2006
RATIO PER CAPITA (1,750,000)	0.11	0.72	1.17	1.54	2.18
Ratio Per ER Patient	0.29	1.95	3.16	4.15	5.86

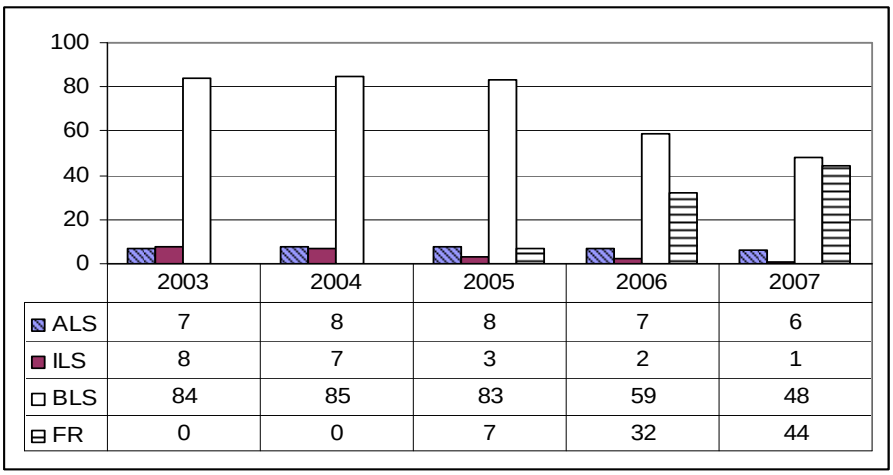
Figure 31 : Ratio of operation per capita in Khon Kaen and per number of patient at the ER 2003-2007

From Figure 31, with the estimation of the patients at the ER of 650,000 yearly, the numbers of those who visit the ER by the EMS operation has been increasing continuously, and reach the level of 6% in 2007. In Khon Kaen, the operation comprising four tiers including advanced life support (ALS) operation, intermediate life support (ILS) operation, basic life support (BLS) operation and first responder (FR) has increased every since 2003 to 2007 (see Figure 32).



	ALS	ILS	BLS	FR	ALL
2003	143	156	1618	0	1917
2004	1055	896	10701	1	12653
2005	1656	520	16996	1341	20513
2006	1788	584	15888	8746	27006
2007	2367	420	18480	16845	38112

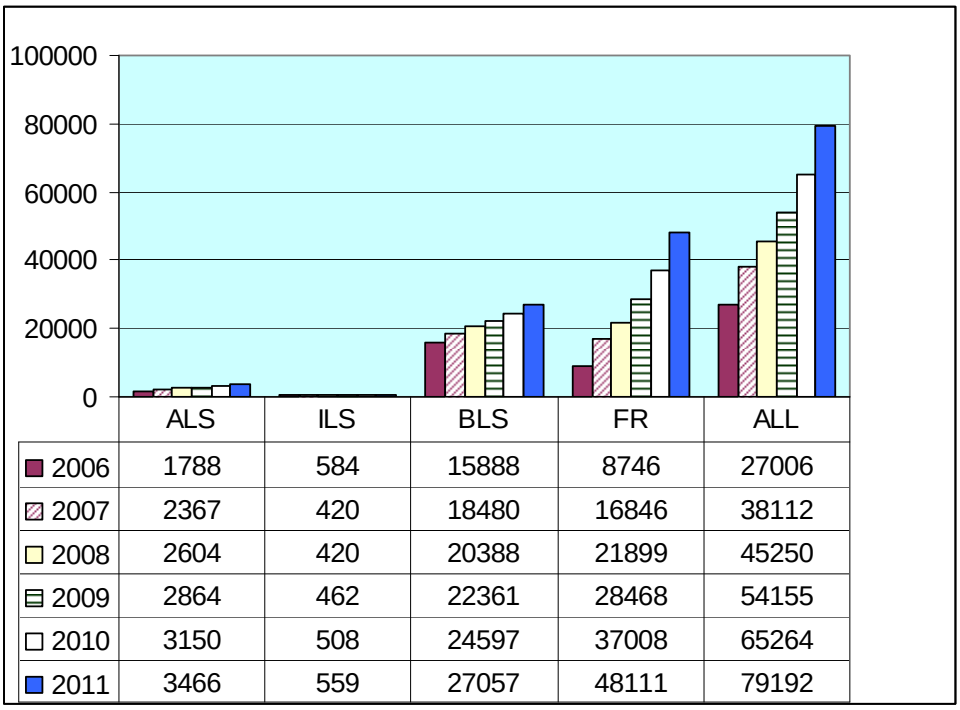
Figure 32 : Number of operation stratified by type of tier 2003-2007



	2003	2004	2005	2006	2007
ALS	7	8	8	7	6
ILS	8	7	3	2	1
BLS	84	85	83	59	48
FR	0	0	7	32	44

Figure 33 : Proportion of operation stratified by type of tier 2003-2011

From Figure 35 identified the proportion of the operation by type of tier, it suggested that the proportion of ALS and ILS operations were declining even though the number of such operation had increased every year while the expansion were containing in the FR and BLS operations which might not be the real emergency and might incur opportunistic costs.



	ALS	ILS	BLS	FR	ALL
2006	1788	584	15888	8746	27006
2007	2367	420	18480	16846	38112
2008	2604	420	20388	21899	45250
2009	2864	462	22361	28468	54155
2010	3150	508	24597	37008	65264
2011	3466	559	27057	48111	79192

Figure 34: Projection number of EMS operation classified by type of tiers (2006-2011)

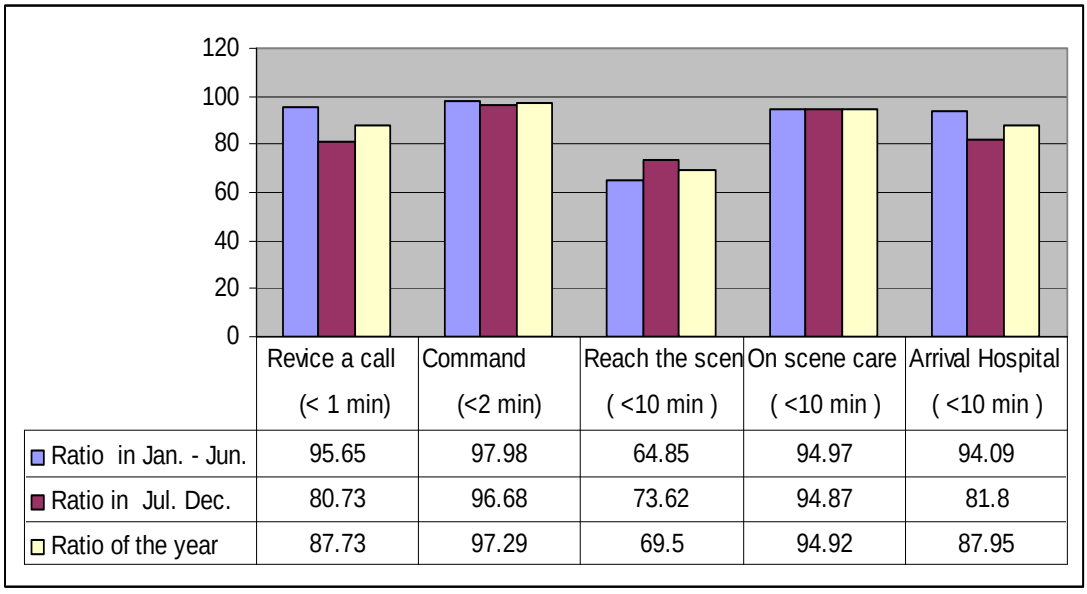
Time spent: It has suggested that the "golden hour" is the first hour after the incident which the morbidity and mortality can be reduced greatly if we can deliver the EMS within this period. In the UK during the 2006-2007, the care could be delivered to the urgent cases within the first 15 minutes and 8 minutes for the emergent case (NHS 2007).

เติมกราฟ

In Khon Kaen, the target operation times have been set;

- Time to receive the notification should be within 1 minute after receive the contact
- Time to order should be within 2 minutes after receive the notification
- Time to reach the incidental site should be within 10 minutes after the order
- Time spent at the incidental site should be within 10 minutes after reach the site
- Time to refer to hospitals should be within 20 minutes after leaving the site

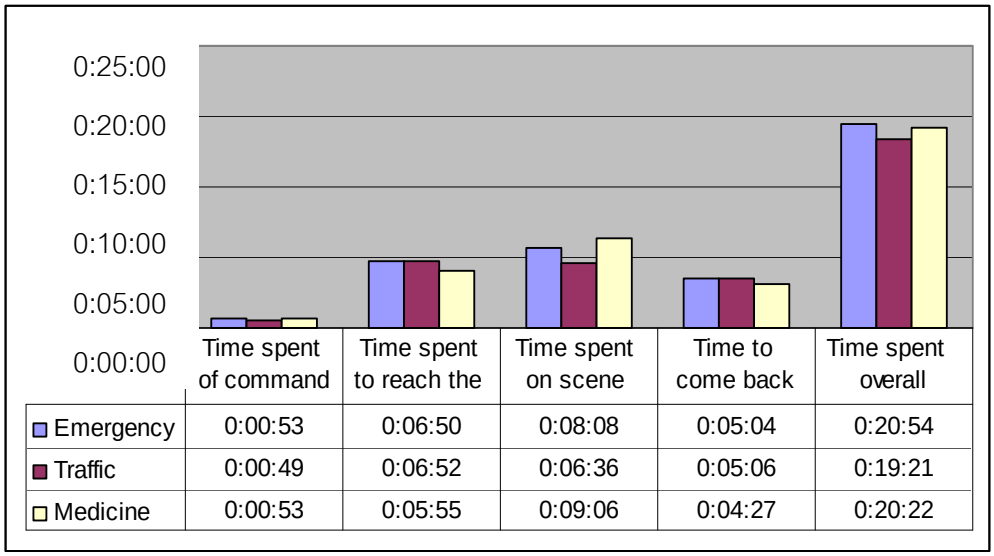
From the information in 2007, about 87% of the operation spent time to receive the notification within 1 minute, 97% spent time to order within 2 minutes, nearly 70% can reach the site within 10 minutes, 95% spent time at the site within 10 minutes and nearly 88% spent time to refer to hospitals within 20 minutes (see Figure 35)



	Revice a call (< 1 min)	Command (<2 min)	Reach the scen (<10 min)	On scene care (<10 min)	Arrival Hospital (<10 min)
Ratio in Jan. - Jun.	95.65	97.98	64.85	94.97	94.09
Ratio in Jul. Dec.	80.73	96.68	73.62	94.87	81.8
Ratio of the year	87.73	97.29	69.5	94.92	87.95

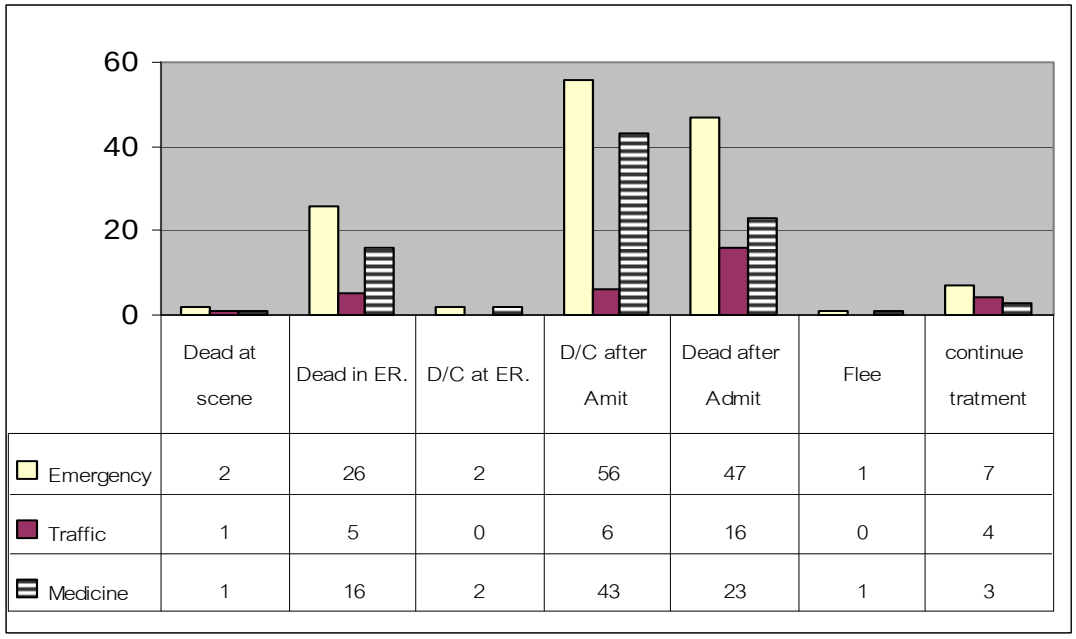
Figure35 : Percentage of operation spent time within the target

When explore the time spent for the emergent cases in each activity, it has found that the ALS operation can transfer the patient to the hospital within 20 minutes; 19.2 minutes for traffic accident patient and 20.52 minutes for others emergent condition. And for those who require ALS operation, the time spent to reach the site was about 8 minutes.



	Time spent of command	Time spent to reach the	Time spent on scene	Time to come back	Time spent overall
Emergency	0:00:53	0:06:50	0:08:08	0:05:04	0:20:54
Traffic	0:00:49	0:06:52	0:06:36	0:05:06	0:19:21
Medicine	0:00:53	0:05:55	0:09:06	0:04:27	0:20:22

Figure36 : Operation time for five activities stratified by type of emergent in 2007



	Dead at scene	Dead in ER.	D/C at ER.	D/C after Amit	Dead after Admit	Flee	continue tratment
Emergency	2	26	2	56	47	1	7
Traffic	1	5	0	6	16	0	4
Medicine	1	16	2	43	23	1	3

Figure 37: Discharge status stratified by type of emergent 2006-2007

Financial perspectives

Aims: deliver high efficient EMS

In this perspective, the reimbursement had been increased continuously due to the increase number of operation; less than THB 1 million in 2003 and reached THB 16 million in 2007. From Figure 39, the increase of reimbursement just started to rise in 2005, and the overall of the reimbursement for the sub-district level EMS operation was accounted for only a quarter of the total budget in 2007. Still the average cost per operation was found to be decreased (see Figure 40). In Figure 41, the average cost of the EMS per capita had also been increasing due to the rising of the overall cost and number of operation.

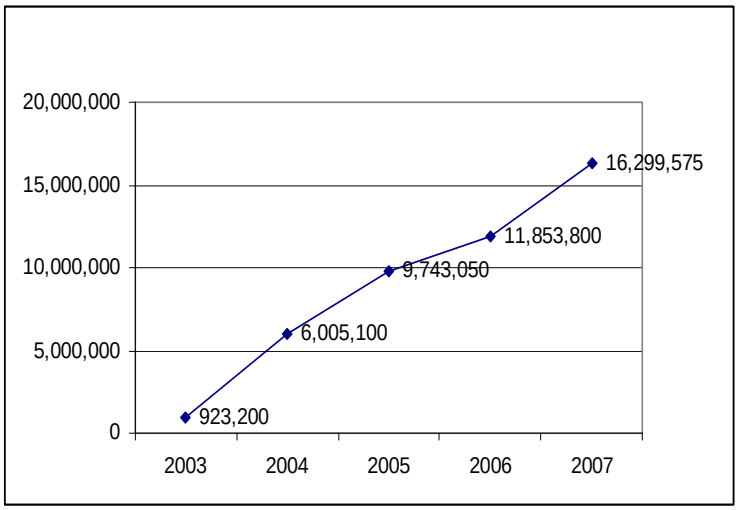


Figure39 : The reimbursement for the EMS operation by years (2003-2007)

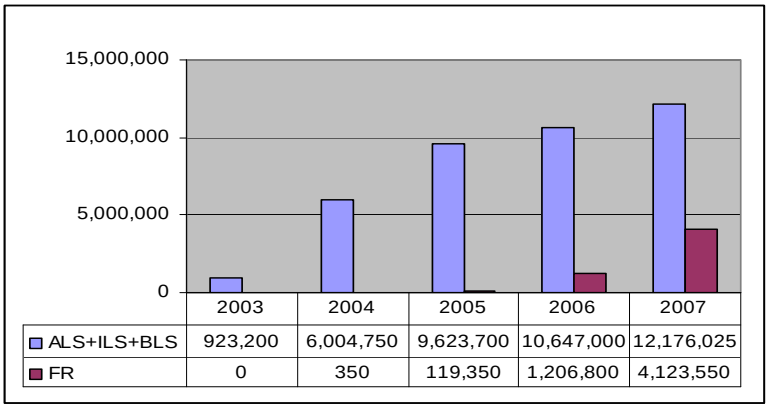


Figure 40 : The reimbursement for the EMS operation stratified by level of the operation (2003-2007)

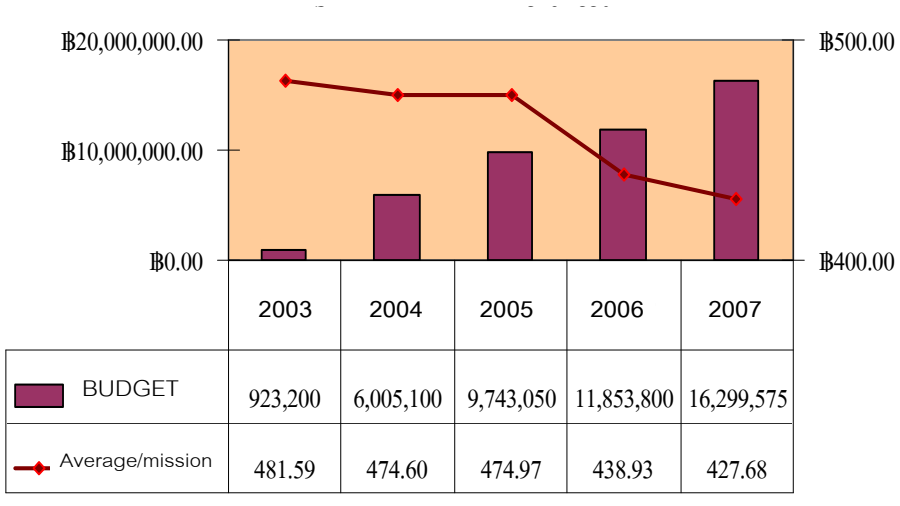


Figure41 : The reimbursement and the average cost per EMS operation (2003-2007)

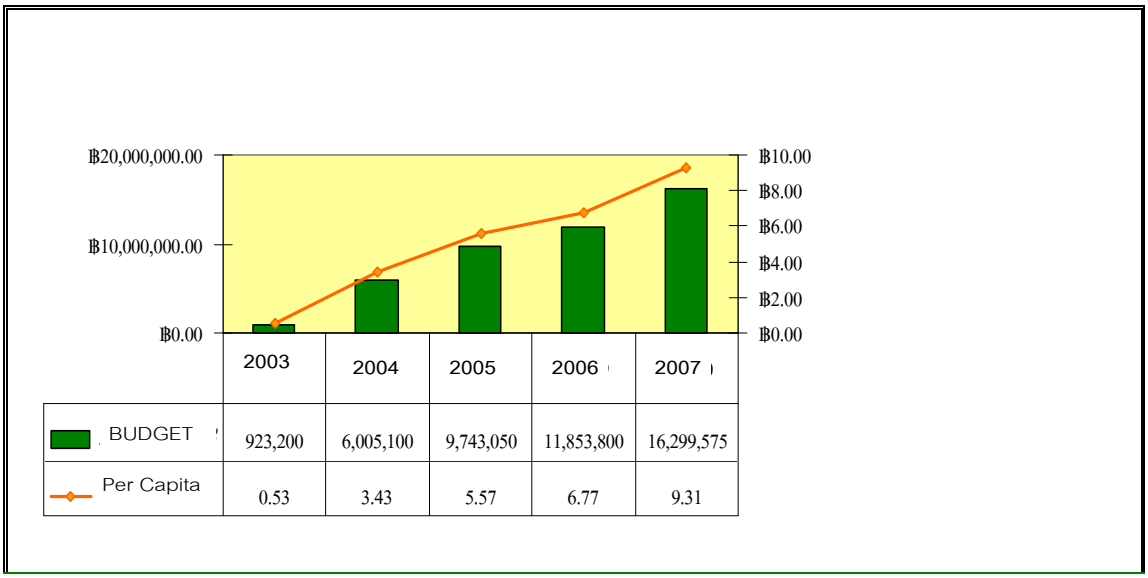


Figure 42 : The budget allocation per capita and the reimbursement (2003-2007)

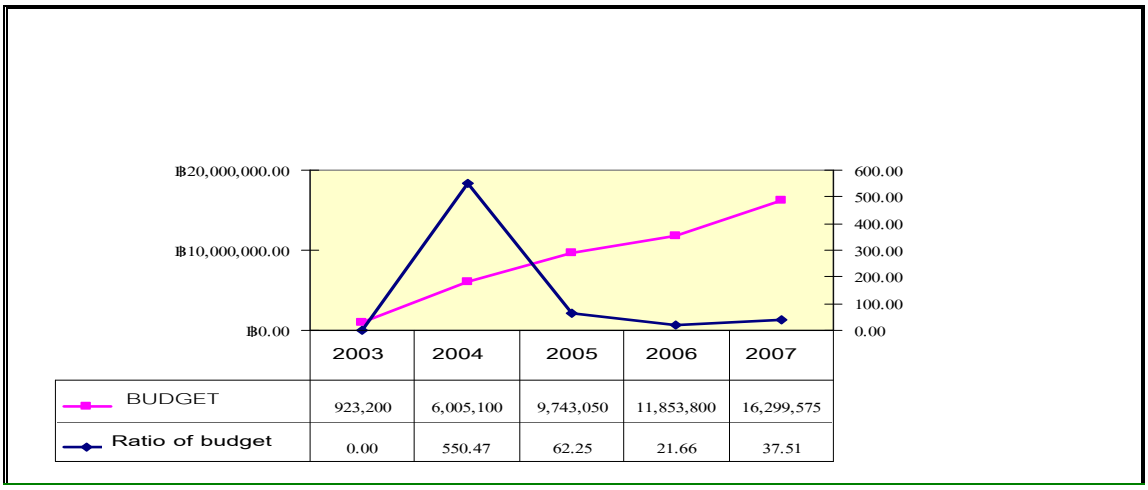


Figure 43 : The reimbursement and its increase rate (2003-2007)

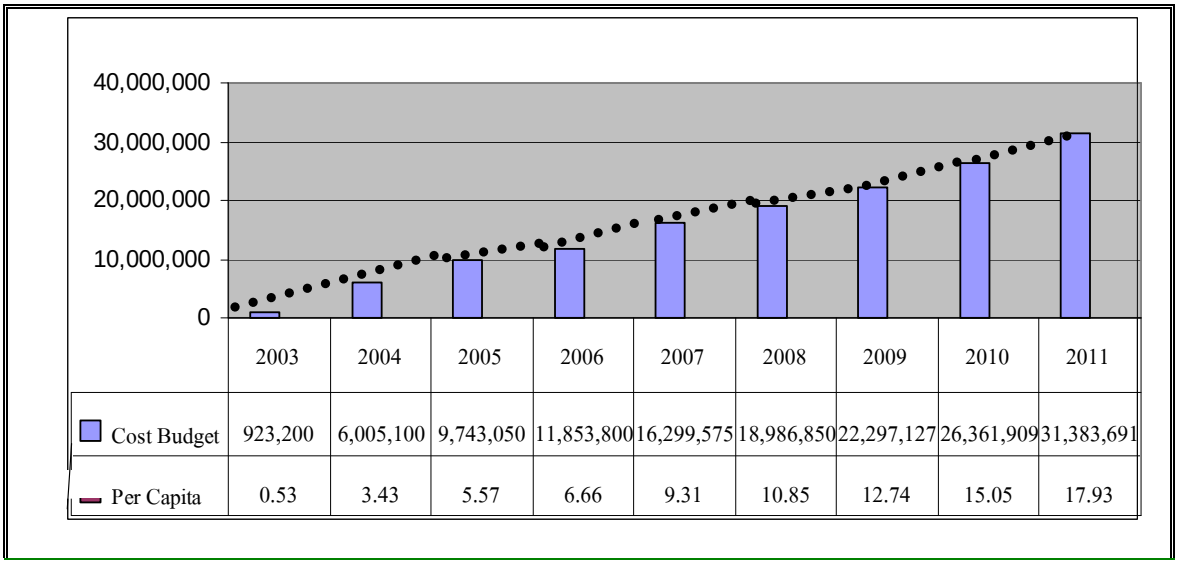


Figure 44 : The projection of reimbursement for the EMS operation stratified by level of the operation (2007-2011)

Without the control rate of the increase of the operation and the expansion of the EMS, the overall reimbursement and cost per capita would also increase; 31 million THB or 17 THB per capita in 2011, 50% of the reimbursement (15 million) would

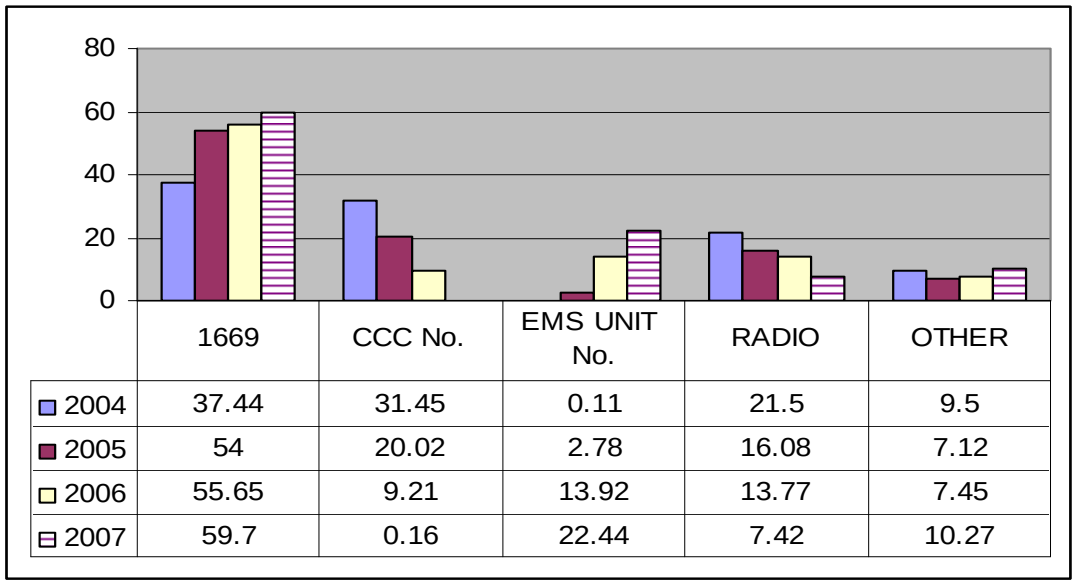
come from the sub-district EMS operation (see Figure 43). The projected reimbursement excludes other costs e.g., cost of human resource development, ambulance, technology and equipment used.

Patient and relative perspectives

Aims: to make the people aware of the EMS system

Portal for request of the EMS

The entry point to the EMS system is another important instant; the high request for the EMS, the high awareness of the EMS among the people in the community. The requests should direct to the call centre as the centre with trained personnel can screen the call, advice and redirect the request to the relevant EMS unit (R. Gunderson; Chadbanchachai 2007). 1669 is the universal emergency call number in Thailand. In Khon Kaen, the rate of usage of 1669 is still low. Mostly, the requests are presently direct to the local number of operation unit e.g., fire fighter unit and police department. It has estimated that 65%-70% of the population should aware of this universal number.



	1669	CCC No.	EMS UNIT No.	RADIO	OTHER
2004	37.44	31.45	0.11	21.5	9.5
2005	54	20.02	2.78	16.08	7.12
2006	55.65	9.21	13.92	13.77	7.45
2007	59.7	0.16	22.44	7.42	10.27

Figure 45 : Percentage of call direct to different type of operation unit (2003-2007)

Satisfaction of the patients and their relatives

As patients are the target of the EMS, thus, assessing solely the quality of care while ignoring the patients' satisfaction might not be justified even through they cannot assessing the performance of the services. In Khon Kaen, for the assessment of patient satisfaction in 2007 (see Figure 46), it has found that sufficient of the EMS equipment and ambulance were the areas required the improvement.

As mention earlier about four perspectives of BSC, however, it requires the integration of these four perspectives, and balancing of these four perspectives is crucial (see Figure 48).

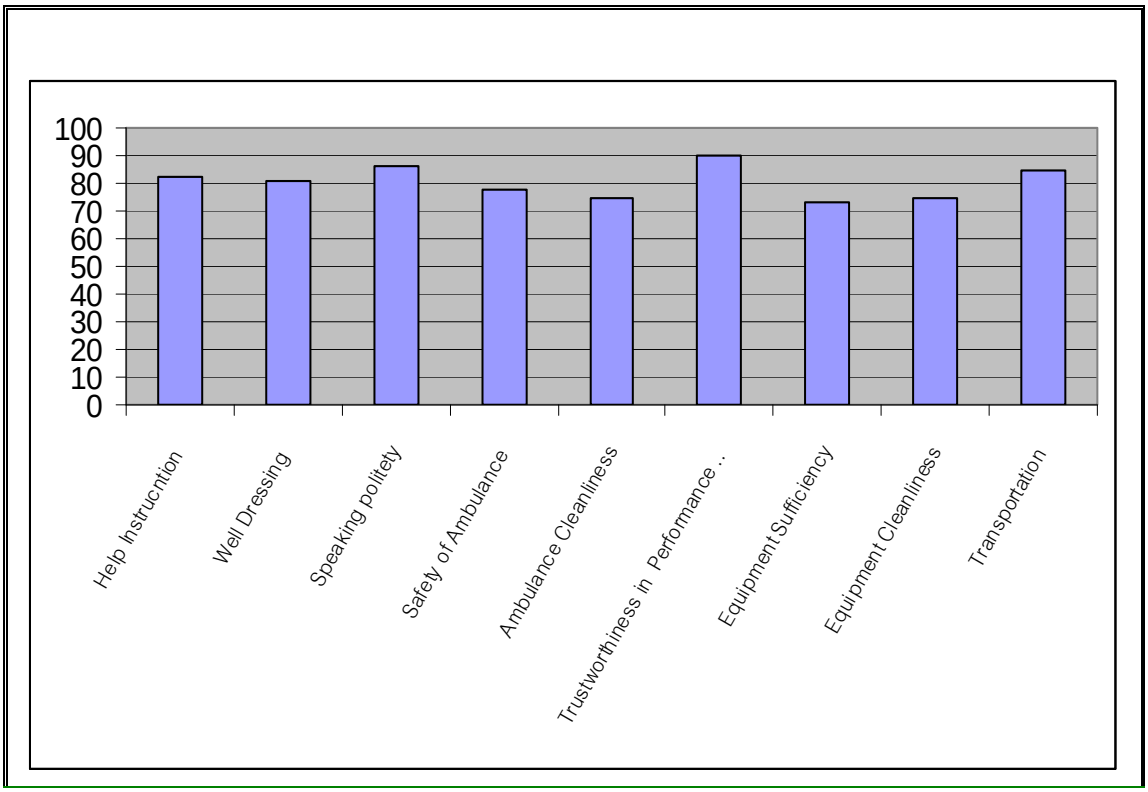


Figure 45 : Satisfaction of the patients and their relatives (2007)

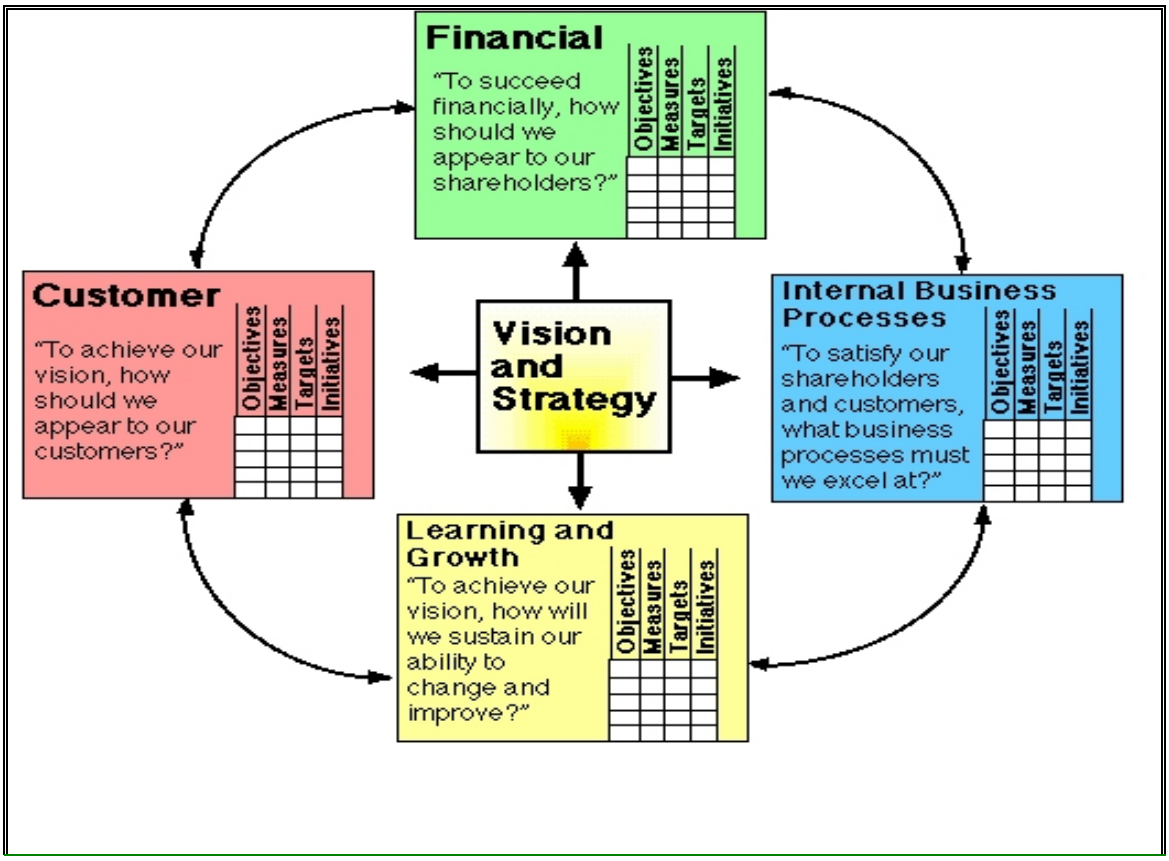


Figure46 : Relationship of vision, strategies, and four perspectives of BSC

11. Equipments in the ambulance and inspection of the ambulance

Chaiyooth Thanaphaisan[♣]

The inspection the ambulance should be done periodically, mostly; it should be performed prior to the use. The personnel who work in the ambulance should be acquaintance with various types of installed equipment, be able to use and to take care those equipments. Initially, it may take time, and it can be done faster after several uses.

Figure 1: Inspection of equipments in the ambulance

Preparing of the equipments in the ambulance

As the ambulance has to deal with various types of patients, it is necessary for the ambulance to be sufficient and well equipped. On the other hand, space in the ambulance is quite limited, installed equipment can hinder the operation. Thus, the ambulance should install only necessary equipment, place in the proper area, check for sufficiency and make them ready to use. The equipment refers to those are medical and none medical equipments. They are adjustable according to the contexts of diseases, budget and problem in the area of service.

1. Basic supplies
    - Pillow, pillow sheath, blanket, towel, tissue paper
    - Bin; should be separated for general rubbish, infected, sharp object and used gloves
    - Bedpan, urinal, vomit bag
    - Sphygmomanometer and stethoscope

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- Sterile and disposal gloves
- Water and glass

2. Ventilation and airway equipment
   - Nasal cannula for adults and children
   - Oropharyngeal airway for adults and children
   - Nasopharyngeal airway for adults and children
   - Oxygen mask for adults and children
   - Pocket face mask and bag-valve mask (two sets each) without endotreacheal tube for adults and children. The mask should be transparent for visibility of the secretion and blood and should be connectable with the oxygen supply


Figure 2: Various sizes of oropharyngeal airway and nasopharyngeal airway

- Suction; one fixed with the ambulance and one portable. The suction pressure should be able to reach 300mmHg within four seconds. The suction tube should be large enough and easy to connect and pliable. The ambulance should be equipped with both soft-end suction (for suction of liquid substance) and semi-rigid (for suction of blood and secretion) with water to clean and tube and the suction. The suction unit should be place next to heads of the patients in every position


Figure 3: Portable suction unit and suction tube

- Various sizes of laryngoscope and endotracheal tube
- Plaster and robe
- Ventilation; one fixed with the ambulance and one portable

3. Oxygen supplies

The ambulance should have at least two sets of the oxygen supplies; one fixed with the ambulance and one portable. For the portable, the capacity should be at least 300 litres together with gauge pressure, oxygen flow metre, nasal cannula and it should be able to deliver the oxygen at least 15 litre/minute and a reserved of 300 litres oxygen tank should also be installed in the ambulance. In addition to this, in the ambulance, the reserve of 3,000 litres of oxygen should also be available with clearly seen flow metre. The flow should be able to adjust between two and 25 litres per minutes and should be placed over near patients' head. Humidifier should be used in case of the use of oxygen more than one hour.

Figure 4: Portable oxygen unit nearly the exit for convenient use with the pressure gauge and flow metre

4. Cardio-pulmonary resuscitation (CPR), CPR equipment

In some severe injured cases, the CPR is immediately required. A set of CPR equipment includes

- CPR board for the effective chest compression in injured cases without spinal injuries. Patients' head should be tilted to open the airway and some commercial boards can tilt patients' heads automatically. In case of the flat spinal boards are used, patients' shoulders should be lifted 3-4 inches. If the CPR board is not available, short or long spinal board can be used instead.
- Automated external defibrillator (AED); it should be charged and ready to use. Wires, probes and gel should be available all the time
- Automated cardiac massage (optional)

Figure 5: Automated external defibrillator (AED)

5. Basic wound care supplies
    - Scissors and plaster tape
    - Cotton bud
    - Thin and thick gauze and Vaseline gauze
    - Normal saline solution, providine, 70% alcohol
    - 4”- and 6”-size elastic bandage
    - Burn cream
    - Tourniquet

Figure 6: Basic wound care supplies

6. Splinting supplies
    - Arm, leg splint for adults and children; might be wound splint, plastic splint, vacuum splint, air-inflatable splint, aluminium splint
    - Traction splint for adults and children
    - Short and long spine board with restraint
    - Head immobilizer
    - Cervical collar
    - Elastic bandage
7. Childbirth supplies
    - Sterile and disposal gloves
    - Umbilical cord clamp and umbilical tape
    - Umbilical scissors
    - Suction
    - 4x4 inches gauze
    - Towel and wrapping towel
    - Plastic bad and tissue paper
    - Mask, goggles, cap

8. patient transfer equipment
    - patients transfer bed which can life the patients' heads up 60° and can lower the patients' heads 10°-15°
    - scoop stretcher
    - stair chair for those who have difficulties to go up and down stair and being use in the area that referred bed is not accessible
    - Kendrick Extrication Device (KED); is the equipment use to transfer patient in sitting position

Figure 7: Transfer bed, scoop stretcher, stair chair and KED

9. Medications and other supplies

The ambulance should supply the medicine to be able to deal with various types of cases including asthma, diabetes, snake bite, foreign body in the eyes and burn

- Water and paper cup
- Activated charcoal
- Sterile water
- Portable blood sugar measure
- Glucose for drink and injection
- Tourniquet and serum in case of snake bite
- Emergency medication including;
    - Adrenaline
    - 10% calcium gluconate, 50% glucose
    - Diazepam, metoclopramide
    - Hyoscine, paracetamol

- Diclofenac
- Dexamethasone
- Albuterol and nebulizer
- Normal saline, Ringer's lactate solution, 5%DN/2, 5%D/W
- IV set, extension set, 3-way stopcock, medicut, alcohol and transpore

The usage of the both basic and advance medication should be under the guideline, under doctor standing order, and under the approval of the EMS committee of each hospital.

10. Personal protective equipment
    - Goggle and mask
    - Gown and cap
    - Boots and boots cover
    - Ear plug
    - Helmet
11. Equipment for work area

This includes the extrication equipment such as hammer, screwdriver, knife, rope in case that the victim is stuck in the vehicle, and the operation should be handed over to the specialist in complicated case. Light signal, torch, fire extinguisher, traffic cone, fire hose, barricade tape should also be available

12. Equipment of mass casualty

As the occurrence of the mass casualty is not high, some equipment regarding this situation might be expired, it should be checked periodically for readiness to use.

- Flog or sign to set distinguish the area in to read, yellow, green and black
- Triage label
- Incident commander
- Barricade tape

Figure 8: Triage label

13. Documentation
    - Operation mapping
    - Pre-hospital care report
    - Manual for emergency treatment
14. additional equipment for doctors and paramedics
    - Endotracheal tube and ventilator
    - Esophageal obturator airway (EOA), Combitube airway
    - Intercostal chest drain
    - Cricothyroidotomy
    - Ultrasound

Table 1: Exemplar of the check list (basic and advance)

Basic equipment
A.Ventilation and Airway Equipment:
1. Electric suction apparatus and accessories
• Portable suction (1)
• Installed suction (1)
• Wide bore tubing (2)
• Tonsilar suction tips (4)
• Flexible suction catheters 5F – 14F (1 each)
2. Portable oxygen equipment
• Portable tank 300L/min (2)
• Constant flow tegulator with adjustable flow rates from at leat 2-15 lpm (2)
3. Installed fixed oxygen equipment able to simultameously deliver to at least two patients
• Fixed tank 3000 L/min (1)
• Remaining tank – pressure gauge (1)
• Liter flowmeter with adijustable flow rate and quick disconnect (2)
• Wall mounted standard oxygen port with quick disconnect (2)
4. Oxygen administration equipment
• Nasal cannula
Adult (4)
Pediatric (2)
Infant (2)
• Transparent non-rebreather mask
Adult (4)
Pediatric (3)
• Oxygen tubing (6)

• Pocket mask

Adult (1)

Pediatric (1)

5. Bag vale mask resuscitators

• Adult minimum_800 ml tidal volume (2)

• Child maximum_400 ml tidal volume (2)

• Clear masks for use with resuscitators

Adult (2)

Child (2)

Infant (2)

6. Airways

• Oropharyngeal sizes 55 mm - 115 mm (2 each)

• Nasopharyngeal sizes 20F – 34F (1 each)

B. Immobilization Devices:

1. Rigid cervical collars

Pediatric and adult assorted sizes (1 each, total 5)

2. Head immobilization device (2)

3. Lower extremity traction device (1)

4. Extremity immobilization devices in appropriate sizes (1 set)

5. Long backboards (2)

6. Short spine immobilization device (2)

7. immobilization straps or cravats (1 set per board)

C. Dressings and Bandages:

1. Sterile burn sheets (2)

2. Triangular bandages (1)

3. Sterile dressings

• 10x30” or larger (4)

• ABD 5x9” or larger (6)

• 4x4” (50)

4. Clean rolled bandages4” or larger (4)

5. Sterile occlusive dressing, 3x8” or larger (4)

6. Adhesive tape

• 2” or 3” hypoalletgenic (6)

D. Radio Communication:

Installed mobile radio transceiver utilizing state EMS frequencies

E. Obstetrical:

1. Individual sterile kits containing at least a bulb syringe, surgical gloves, sterile disposable scalpel, cord clamps, and plastic bag for placenta disposal (2)

2. Heat reflective or insulating blanket for infant

F. Miscellaneous:

1. Sphygmomanometer

• Adult (2)

• Child (1)

• Infant (1)

2. Stethoscope (2)

3. Heavy bandage shears (2)

4. Flashlights (2)

5. Blankets (4)

6. Sheets (4 sets) pillowcases (4)

7. Pillows (2)

8. Fire extinguisher (1)

9. Triage tags (50)

10. Ambulance cot with mounted cot fastening system (1)

11. Luminescent traffic warning devices (2)

12. Scoop stretcher (1)

13. Stair chair or equivalent seated transport device

14. Emergency Response handbook (1)

G. Infection Control:

1. Body substance isolstion

• Eye protection, gloves, gowns, masks, shoe covers (sufficient number for crew)

• Antimicrobial hand wadh

• Standard sharps container (1)

• Disposable trash bags (2)

• Biohazard bags

H. Medications:

As defined by the board of medicine

I. Defibrillator (if licensed at this level):

1. Semi-automatic defibrillator (1)

2. Defibrillator pads (2 sets)

Additional equipment for advance level (add up from basic level)

A. vascular Access:

1. Minimum 6000 ml of intravenous fluids, either

• Normal Saline and/or

• Lactated Ringers

2. Intravenous administration sets (6)

3. Intravenous catheters sized 14g to 24g (6 each)

4. Tourniquet (2)

5. Antiseptic wipes (6)

6. IV pole or roof hook (1)

B. Advanced Airway Control:

1. EOA with mask and syringe (2 boxed sets)

2. Laryngoscope handle with extra batteries and bulbs

3. Laryngoscope blades

   • Straight size 0, 1, 2

   • Curved and/or straight 3,4

4. Endotracheal tubes

• Uncuffed size 3.0 mm – 5.0 mm (2 each)

• Cuffed size 5.5 mm – 8.0 mm (2 each)

5. Stylettes

• Adult (2)

• Pediatric size 6 Fr (1)

6. Water soluble lubricating jelly (1)

7. Magill forceps, adult and pediatric sizes (1 each)

C. Medications:

As defined by the board of medicine

Inspection of the ambulance

There are three steps of the ambulance inspection; inspection while engine off, while engine on and patient compartment inspection.

1. Engine-off inspection; the steps include the inspection of following

- Exterior condition of the vehicle emphasizing for safety systems of the vehicle such as bumper, hospital name, emergency number
- Tyres and wheels; inspect the tread grove of the tyre, any splinters such as glass or nail stuck to the tyre. This includes the inspection of the spare tyres as well
- Windshield, rear-view mirror, side-view mirrors; they should be in the visible view and should be clean
- Doors and windows; inspection for it widest open range, properly closed
- Engine cooler
- Steering wheel, break-in oil, engine oil
- Battery, its water level, wire
- Interior of the ambulance; look for its cleanness
- Car's horn and siren
- Safety belt; check for its lock and unlock condition
- Adjust the seat for the driver
- Patrol

2. Engine-on inspection; perform the inspection while the engine is on, use the hand break and the steps include the inspection of following

- Look at the car console for level of patrol, battery, temperature of the engine and speed measure
- Test for the breaking system
- Steering wheel range; turn the wheel to the very left and right end
- Cleanness of the windshield and the wiper
- Turn on all lights with another person to observe their function
- Air conditioner
- Test the function of the communication system

3. Patient compartment inspection; the engine must be off, inspect the following

- Patient compartment; inspect their general condition, cleanness and its readiness to be used
- Medical and non-medical equipment with fully charge battery
- Refill for the sufficient use, replace the malfunction equipment and supplies and re-sterile for those are re-used.
- Arrange and place in the proper area

12. Hospital role to support the development and medical control of EMS

Anucha Sethasathian[♣]

Most of the components of the EMS presently are in the control of the hospital since the request for the services 1669 till the discharge or refer to other hospitals as most of the hospitals manage to set up the their own EMS units

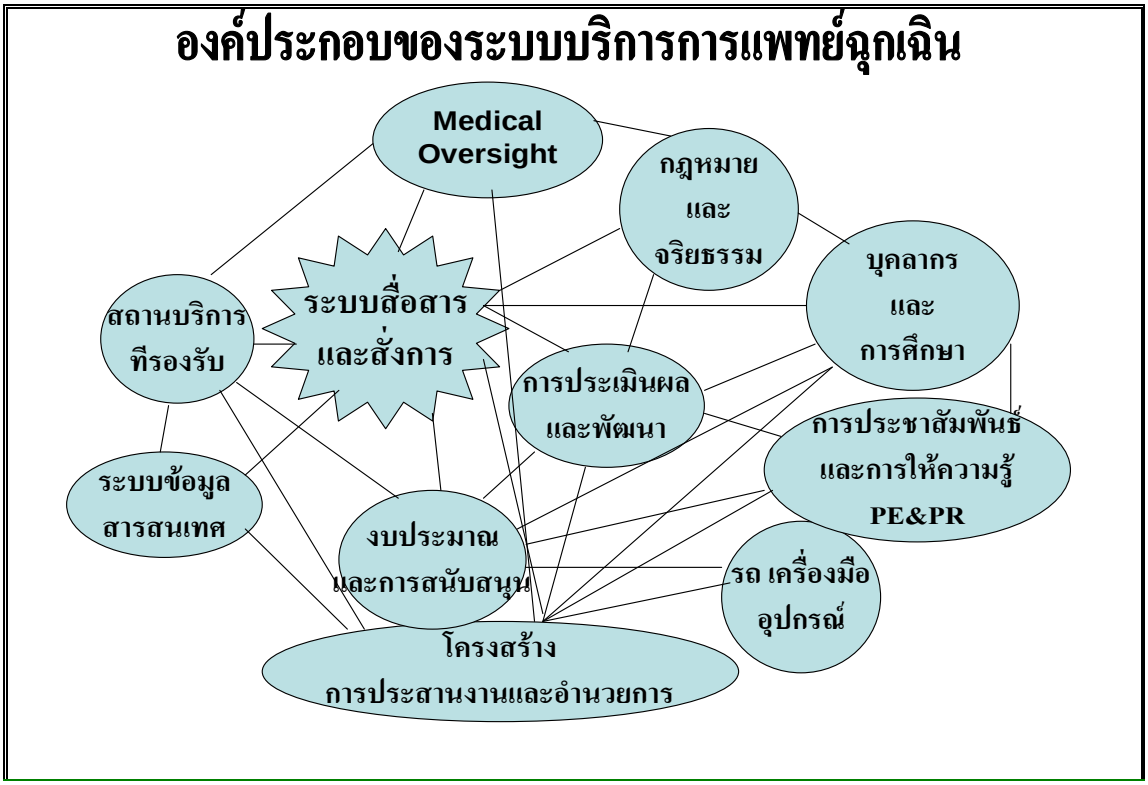

Figure 1: Component of the EMS system

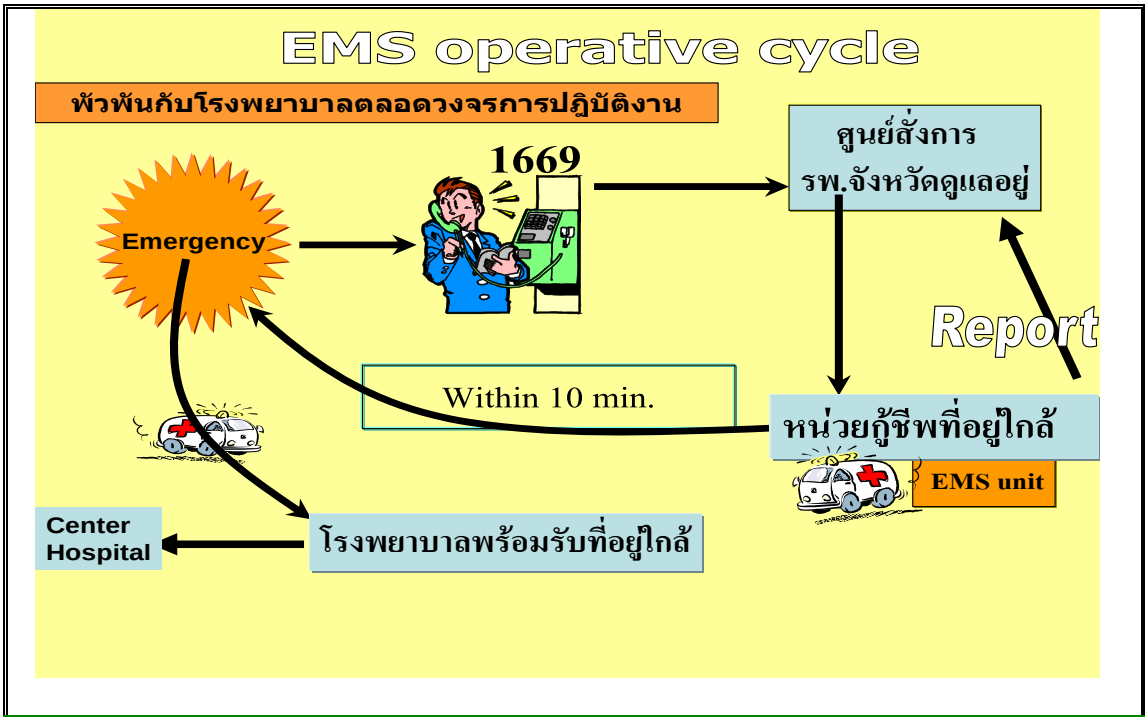

Figure 2: EMS operative cycle

♣ Office of Emergency Medical Service System, Udon Thani

There are eight roles of the hospital to promote the EMS in Thailand

1. Hospital network development for severe injured cases
2. Establishing of the rescue team at the hospitals
3. Education and coordination
4. Assessment, evaluation and qualification
5. Establishing and development of the Command Control Centre
1. EMS system development
2. Disaster preparedness; health service section
3. medical oversight

1. Hospital network development for severe injured cases

Core process; the hospital should defined their ability regarding the EMS, for instance, in Australia; hospitals will not response for the EMS if they declare that the EMS is not available in their hospitals. In the USA, the hospital will classified themselves as trauma centre level 1 (the highest capacity), 2, 3 or 4 regarding their capacity.

Pre-hospital care unit and hospital network; the EMS team on scene should know responded area of the hospital and in some cases, the patients can be sent directly to the special care centre such as cardiac and paediatric centre

Inter-hospital referral system; in complicated cases, the patients might have to be transferred, and they should be screened and treated by the expert. The network for refer should be well established with clearly instruction.

2. The establishment and development of the EMS unit at the hospital

2.1 Hospitals should establish the EMS unit in their area where easy access with the ambulances situate near the exit where easy to dispatch, and this should be equipped with either domestic or internationally trained personnel both

Figure 3: Ambulance

2.2 Demonstration unit for hospital based EMS unit; with high experience of the EMS in some hospitals, the unit can become a model for service practice demonstration which allow other units to join the practice in field operation.

2.3 EMS unit for local area; the responding area should be clearly distinguished according to the catchments area of universal health coverage scheme to allow EMS unit to access the scene within ten minutes.

3. Educational coordination

3.1 The training role of the hospital according to the EMS development is to coordinate with the academic institutes start firstly as the training site (on the job training)

Figure 4: Training centre

3.2 Development of the course curriculum; the hospital as a part of training centre, another role of educational coordination is to take part in the curriculum development

3.3 Continuous education for the graduates from all course of the EMS to maintain their competency and promote their career paths

3.4 Knowledge management; the stakeholders of the EMS should be gathered; their knowledge should be exchanged and synthesized.

4. Assessment, evaluation and qualification

4.1 Trauma registry is the information system of the EMS, the information should be analyzed as a part of the service assessment such as what shown in the Table

Table 1: Percentage of firs aid cares given in various years

First aid care	1998	2004	2005	2006	2007
Care of the respiration	15.8	47.9	56.4	63.2	80.5
Bleed stopping	14.5	61.5	74.2	79.3	84.6
Fracture splint	23.9	40.2	44.1	49.4	58.3
IV fluid given	28.3	51.8	60.3	68.7	75.2

4.2 Station for examination; as the performance of the EMS personnel should be assessed, the hospital then should be able to arrange the examination and the certification should also be given

4.3 Medical qualification role; medical qualification can be done by the experts in their own hospital. Its assessment manual can also be written by the coordination other quality assessment institutes.

4.4 Medical ethics and regulation; the hospital should take part regarding the issuing the EMS regulation with the community participation.

5. Command Control Centre (CCC) establishment and development

5.1 CCC should be established with the standardized communication equipment, information and technology and personnel as it is a public communication safety service.

5.2 Promoting emergency medication dispatcher education

5.3 Protocol development and evaluation; the manual protocol and work instruction relating the CCC should be written.

5.4 Special consultation and special centre connection; the network connection between EMS and special consultation unit should done via the CCC.

6. EMS system development

6.1 Coordination for strategic plan; the hospital should take part in the EMS strategic plan development at all levels.

6.2 Coordination for quality control cycle; the hospital should apply the system of hospital accreditation into the EMS services for continuous quality improvement.

6.3 Networking for management information system; the information regarded the EMS should be collected, submitted to the central EMS registry for analysis and synthesis at the national level. The programme to match the database will then be created and hospital will become a user to access the information.

7. Disaster preparedness

The hospital is a part of the preparedness with the guideline of Planning, Equipment and Training (PET)

7.1 Planning; the hospital should issue the plan for disaster preparedness covers both inside- and outside-hospital in relation to

- Surge capacity of the ambulances, personnel and the maximum capacity of the victim can be served within one hour
- Medical field commander; the responder at the field should be clearly assigned

7.2 Equipment; should be prepared and ready to be used including

- Medical equipment to match various type of disasters
- Communication equipment
- Protection and safety equipment such as gloves, goggle, light reflection, mask, boots and helmet.

7.3 Training; covering the area o f

- Education in term of principle, plan making, signs and equipments and safety
- Exercise and simulation to allow the personnel to practice

8. Medical oversight

According to the Emergency Medical Service Act 2008 which came to force since March 6, 2008, the Section 28 has state that; to protect the emergency patients, the EMS unit, health facilities, operational personnel should be

1. Triage the patients according to their severity and emergency
2. The patients should received the highest capacity of the health facilities before referring to other facilities, except the approval by doctor in case of life threatening
3. The service should be grounded on medical standard and indication regardless the patients' insurance scheme, hospital registration and patients' economic status

From this Act, the medical oversight is the important part of the EMS to effectively regulate the services which can be done in various forms

1. Direct medical control; the doctor supervises and gives the advice at the CCC.
2. Indirect medical control; the personnel work under the developed protocol which continuously revised and updated.
3. Combined medical control; is the combination of the previous two, in case of complicated case and given cares are beyond the protocol, the advice should be given by the doctor at CCC
4. Special consultation and special centre; consultation should be done via the CCC on the basis of the network agreement
5. Continuous education; learning activity should be given to enhance the capacity of the personnel

13. Guideline for Command Control Centre and Communication System development

Anuruk Amornpethsathaporn[♣]

The command control centre (CCC) is the centre to response the emergency events since emergency notification till the EMS cares are given with the role to coordinate and support the EMS units. This covers the management of the information for the highest benefit the patients.

Structure of the CCC

In the EMS system, the CCC is necessary and has to work independently from the other system. It can be located anywhere. Mostly it usually located in the hospital. However it can be sited at the Provincial Health Office. The working space depends on the responded population. For instance, with up to 200,000 populations, the CCC can serve as many as 2,000-20,000 people annually (6-55 people/day). The cost of technology installation can rage from THB 1-5 million per centre. According to this, the centre can be merged where possible to save the costs. The structure of the CCC should comprise

1. Administration department; is the department to supervise, regulate, coordinate and monitor other departments in the CCC. Usually the chief of this department is also the commander of the CCC
2. Operational department; this responds for the pre-hospital treatment, giving advice, preparedness, planning, protocol development (criteria-based dispatching). The chief of this department should be trained in the emergency medical dispatcher course and can be nurses or other personnel
3. Operational communication department; this department response for all communication of CCC. Moreover, they should be able to screen and give advice under the protocol. Moreover, they should be able to fix and maintain the communication equipments

Personnel

1. Doctor is the director of the CCC who makes decision, gives advice and solves the problem.
2. Nurses; their roles involve giving the emergency medical order and order to dispatch the EMS unit. They can consult with doctors in case of the complicated cases who required more attention from physicians
3. Call receiver; they should be able to give the advice and should be able to handover the complicated case to higher level such as nurses and doctors.

Operational and coordinating system

The system is activated since the notification call from victims, relatives or witnesses. In Thailand, the call via 1669 will be received by the CCC. Later initial information regarding patients' situation, severity and scene location will be assessed. The call will be re-directed to the response unit. In complicated case, the call receiver will consult with nurses or doctors. The number of call will vary according to population which will affect the number of call receivers. Aside the number

♣ Nakorn Sawan Pracharak Hospital

1669, in Thailand, the emergency numbers include 191 for police emergency and 199 for fire department. However, the single number should be used to avoid the confusion and the call will be re-directed to the related department via the coordination of the CCC.

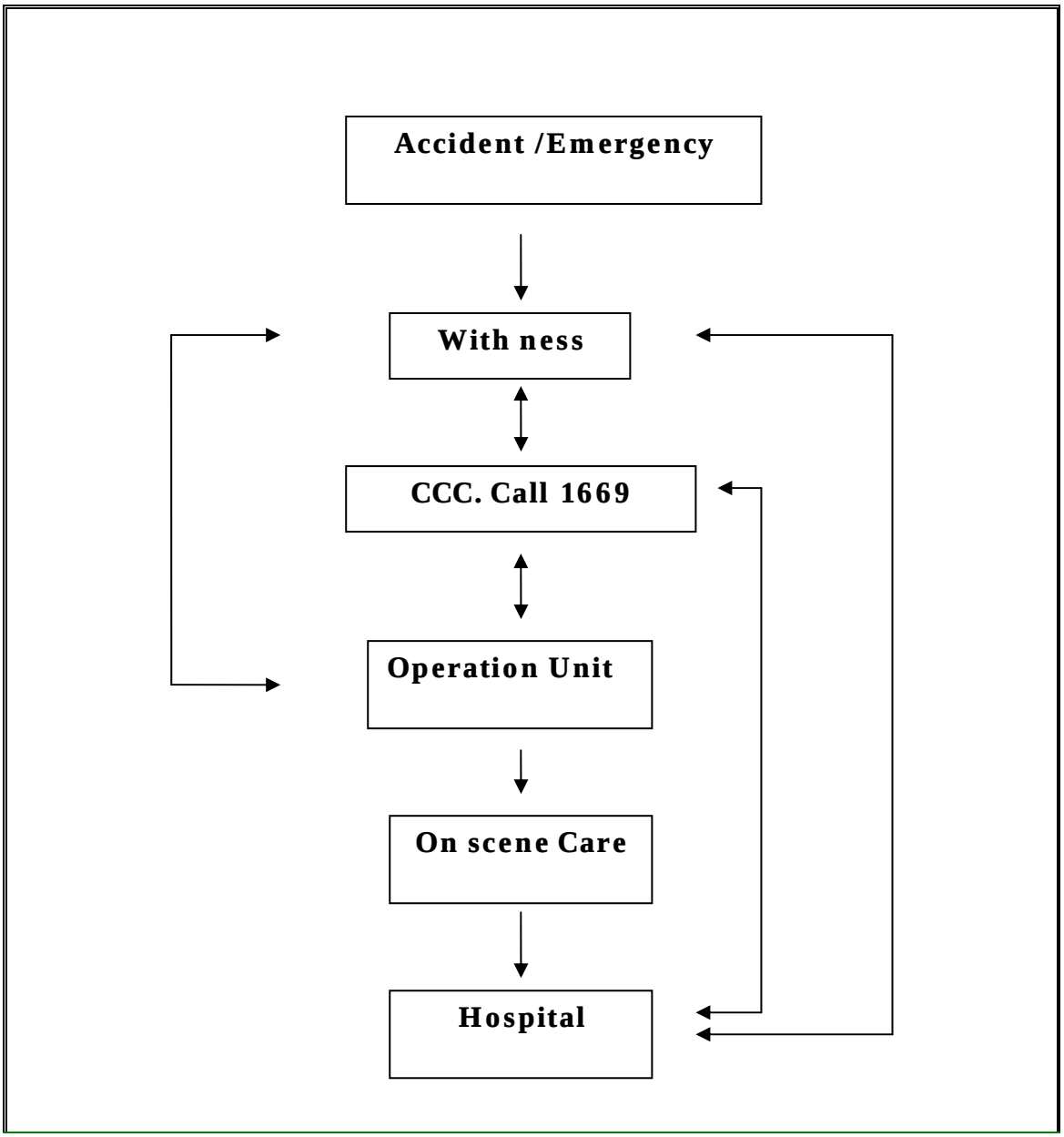

Figure 1: Operational flow of 1669

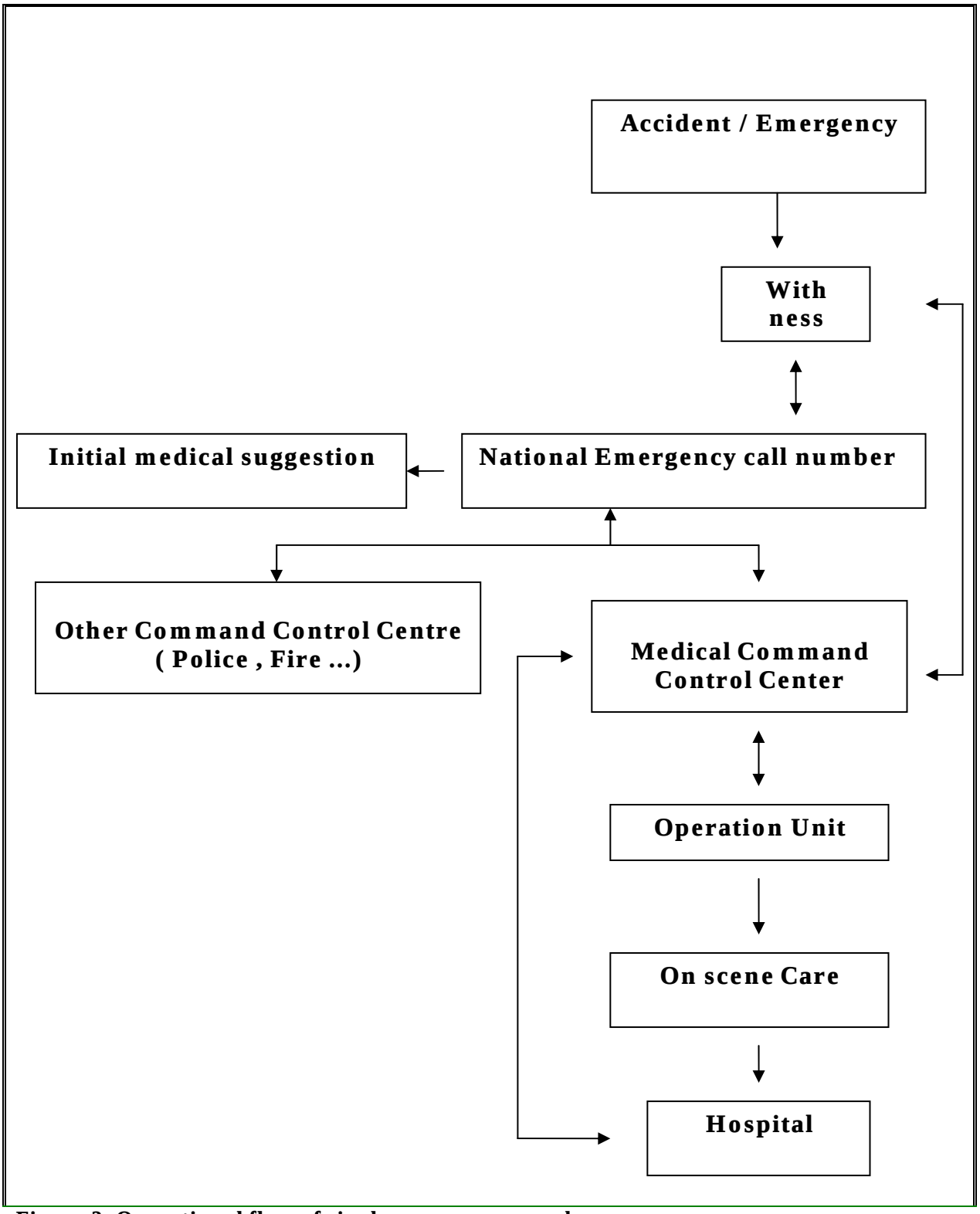

Figure 2: Operational flow of single emergency number

Communication and command principle

Received information by the CCC should be vivid with sufficient and could be from single or multiple sources. Steps of communication and command comprises

1. Call notification
    a. Receive all calls at all times to assure the confidence of the people
    b. Name of call back number of the caller should be retrieved.
    c. Detail of the incident

d. Site
e. Time
f. Number of injuries and death

2. Command and assignment; assessment of the patients' symptoms and severity should be done initially by the call receiver. The responded unit with capacity that matches the incident should be notified.
3. Advice and instructions of first aid for the patients such as airway opening and bleed stopping should be given to the caller
4. Communication during the transfer; the communication should be able to use during the transfer.

In case of disaster, multi-sectors coordination should be gathered. The first unit which arrive the event should report on scene. In Europe, the METHANE protocol is used for reporting disaster which comprises

a. Major incident; alert for the incident
b. Exact location; report the location of the event
c. Type of incident; report type of the incident
d. Hazards; report risks and damage
e. Access and egress; report of entry and exit of the event
f. Number and severity of causalities
g. Emergency services; reports of available services

Communication system and equipments

The equipment for communication should be adequate, effective and ready to use in all situations. The equipments include

1. Telephone should be
    a. Single number
    b. Able to track for location of the caller
    c. Able to receive multiple call at the same time
    d. Easy to call, call without paying, auto-complete,
2. Radio; can be used instantly, simultaneously with multiple unit and no connection charge. However, it limits with distance from the network. The signal can be enhanced using the repeaters in distanced areas for effective communication
    a. High frequency (HF) such as single side ban (SSB); it covers the entire areas of the countries. However, it is easy to be disturbed by the fluctuation of atmosphere. Thus, it is not common to be used in normal circumstance. But it can be kept to use when other communication is failed to use.
    b. Very-high frequency (VHF (30-175 Mhz); is the most widely use under the control from the central government. The signal is clear with the range of 30 km. they can be divided using various criteria
        - Portability; fix or portable
        - Frequency adjustability; fix frequency or adjustable
        - Receiver or sender radio

c. Ultra high frequency (UHF) (300-3,000 Mhz); the most advanced used frequency which used in the mobile phone and can send and received of both voice and non-voice
d. E-radio; using the radio via the internet

3. Mobile phone; can be used national-wide with effective communication. However, the expense can be expensive. In the future, images of the pathology can also be sent real time for better understanding of the people at the CCC
4. Computer; it can be used for various purpose such as
    a. Collection of call data
    b. Collection of patients and operational data
    c. Creation of the criteria-based dispatching
    d. Creation of severity-based protocol
    e. Tracking for patient location and this has to be registered before using co-ordinately with mobile phone and satellite
    f. Diagnosis assisting
    g. Voice record for quality control of the call receiver
    h. Creation of the global positioning system (GPS)
5. Protocol; is the commitment and agreement of all stake holders including doctors, nurses, personnel at the CCC, operational unit and the hospitals such as criteria-based dispatching is the protocol for personnel who receive the call. The effective protocol,
    a. Role for each person should be clearly assigned
    b. Legally protect the EMS staff during the operation
    c. The ability to decide in problematic situation should be clearly stated
    d. The protocol should not contradict with each other

14. Problem associated with Command Control Centre and Communication System

Anuruk Amornpethsathaporn[♣]

Since the launch of 1669 which is the universal number to access CCC in every province since 1996, there have been some problems arisen during this working period which can be divided into

1. Law and policy

Initially, Narendhorn Centre is the CCC for Bangkok and the vicinity as well as some provinces which does not have their own CCC. Thus, Narendhorn has to give the command to the operation unit in distance and this can cause miscommunication due to the language barrier, the event cannot be located. This will later cause the delay of the EMS dispatch and delivery. At present, mostly provinces have their own CCC, however, the unity of the CCC structure is still not established. This may cause the confusion of the command centre. Thus, policies from National Institute of Emergency Medical Service System and the National Health Security Office should go in the same direction and the clear and unified.

2. Structure of the CCC
   a. Insufficient of CCC; at the beginning of the development, the CCC was located at the emergency department in each hospital due to the limitation of the budget. However, in some provinces, the CCC is still not well situated and is shortage for personnel. This requires the supports from the local authorities.
   b. Shortage, dependent, unskilled and unqualified EMS personnel; at the initial stage, the CCC was quite new for the EMS personnel. Most of the personnel at the CCC do not work independently and exclusively for the CCC. They were not confidence to give advices or assign the operational unit. This also caused delay delivery of the EMS. Thus, clearly work instruction with operation manual is definitely required especially in case of new personnel. Moreover, the CCC should arrange their staff to be trained periodically for the effectiveness of the CCC
   c. Shortage of the on duty doctors; as in some circumstance, the advices should be given by doctors who were on duty. However, due to the shortage of manpower in this some areas. On duty doctors are not available and most of doctors work not exclusively for the EMS. Thus, the effective communication system that allows real-all-time contact doctor to be possible might be an option.
   d. Informal conversion; due to the high volume of call everyday, the CCC operator might be stressed, tired and sometime may express some hostile response which will later cause the problem for the CCC. Thus the CCC operator should be those who willing, emphatic with service mind. Moreover, during the operational time, resting period such as work and rest every one hour alternately might be an option
3. Operational and coordinating system
   a. Non-targeting notification
      - Fault alarm (notification)
      - Call the CCC for chronic ill patients to transfer to hospitals

♣ Nakorn Sawan Pracharak Hospital

- Call the CCC for inter-hospital transfer patients purpose
- Call the CCC for health consultation
- Call the CCC for personal interest purpose

Thus, the universal number of the EMS CCC should be recognized by people. However, the responsibility and duty of the CCC should be aware as well.

b. Ineffective coordination in case of mass casualty; this involves with more than one EMS unit to assist the victims on scene, however, lack of good communication between the units can jeopardise the victims as some of them might be ignored. In some occasion like this, the METHANE protocol might be a good approach

c. Information system; the collected data since of the EMS operation since the call to the CCC until the arrival of patient to hospitals is used for analysis for better performance. However, due to the variety of database system of the hospitals, merging of data might not be possible. Some of them might be duplicated, unnecessary. Due to this, the single platform of the database should be encouraged to be used to allow the performance of each unit to be comparable. Moreover, the platform should be easy and not cause confusion with the information system of each hospital.

4. Communication system and equipment

a. Unable to access the universal emergency number (1669) from the mobile phone as there is not connection between the mobile phone operator and this number at the initial stage, however, this problem has been already solved

b. Ineffective communication between CCC and operational unit; as the distance between the CCC and operation unit might beyond the capacity of the radio installed in the operational unit (mostly using VHF). The repeater might be necessary to be installed together with the radio in every unit

c. Unreachable of the universal emergency number (1669); this might be due to the limited number of landline to this number or the overuse in some occasions. Recording the conversation at the CCC might help to identify the causes of problem.

d. Unrecognized of the CCC; the number is not well recognized as it is a new service. Thus, the advertisement for people to be able to recall this number is necessary

e. Non familiar with radio code and language; as radio code and language is specific to use, manual should be published and staff who use the radio are required to have a proper training.

5. Protocol

To avoid the delay of the EMS operation unit to reach the emergency scene due to the incomplete information at the CCC, the protocol that allows the CCC to gain more necessary information should be written and easy to use by the CCC operator. People are required to be able to report the emergency incident with proper information. In the future, the CCC should be operated by the trained staff such as the emergency medical dispatcher (EMD) for effective CCC operation

15. Computer assisting for the Command Control Centre

Voravit Panpanyatep[♣]

1. Notification of the emergency event

The most important information is symptoms and location of patients. The symptoms will lead to the accurate diagnosis and management which limited to the knowledge and skill of the CCC operator. Thus, the outcome could be varied event the protocol is of use. Thus, computer-based assisting programme might be helpful in this situation. The programme has to be able to triage the patient (using colour scheme) according to severity and symptoms of patients. For instance

- Red refers to those require advance life support (ALS)
- Yellow refers to those require basic life support (BLS)
- Green refers to those require first responder (FR)
- White refers to those require only suggestion and advice

This will lead to proper management for the patient, and while waiting for the operational team, the advice would be generated by the computer and be given to the caller by the CCC operator

2. The operational assignment

a. Identification of patient location

As the location of the patients might be not easy to identified especially in case the caller and the operator do not get used to the areas, the computer tracking system such as using satellite mapping, phone number tracking can assist to locate the patients. Types of telephone are also helpful; for landline telephone, the location is fixed and consume short period of time to find the location. For the call from mobile phone, the location will be identify using the information from the mobile phone operator

b. Choosing of operational unit

The usage of technology such as GPS and GPRS could assist to find the nearest and proper to match the condition of the patients.

3. Transfer of patient to health facilities

a. Transfer of information

The computer programme can also help to identify the nearest and proper hospital to take care of the patients. The initial information at the CCC will also be transferred to the target hospital for the preparedness for the arrival of the patient. All information will be kept in the system and waiting for the analysis to comprehend the performance of each hospital. The information of the operational unit can also be sent during the transferring of patients using the GPRS technology including the information of heart rate, rhythm and blood pressure

b. Record of information

In future, all information will be keyed in directly onto the computer programme real time to avoid the duplication of work; as in the past, the information has to be record on paper and later put into the computer

[♣] Institute of Field roBotics

c. Connection to other systems

The computer programme should allow the EMS system to reach to other database such as the database of the hospitals, insurance database and population database. This will allow the accurate estimation of the budget use for the EMS. Moreover, if the combination the information between hospitals is possible, the hospital which takes care of the emergency patients will be able to know the medical history and deliver better care for the patients.

d. Data analysis

The data in the database should be analysed such as to determine the frequent accidental sites to create prevention and control measures, and the analysed data can be use for the evaluation purpose as well

e. Registration

In some risk patients for the emergency situation such as patients with cardiac disease, diabetes and hypertension, they can be registered with the CCC for the prompt action of the EMS operation using. The call can be made directly from the number registered with the CCC

f. Communication between CCC

In case of mass casualty or disaster, more than one CCC should work corporately with each other. The computer programme should allow the CCC to access from multiple locations with the single command direction

g. Combination of the CCC

In the advance CCC using computer, the CCC may not be necessary to located in the same province with the caller. Thus, the combination of the CCC is possible which will incur lower costs in overall

16. Public relations

Somkiat Lalitwongsa[♣]

One of the most important keys for success of the EMS system is the participation of the people in the community. In this case, the people have to be aware, and understand the EMS system. Moreover, they have to be able to convey the right information to the CCC. To accomplish this, the regular advertisement for this new service is required. Ivey Lee, the father of modern public relations used to state that "when you tell and inform your people to make them understand by yourself and make them get along with you, then you will get their cooperation, support and make your work progress in every manner". The aim of public relations is to deliver the fact to the people for their better understanding and good cooperation and relationship.

Public relations (PR) is the practice of managing the flow of information between an organization and its publics. Public relations - often referred to as PR - gains an organization or individual exposure to their audiences using topics of public interest and news items that do not require direct payment. Because public relations places exposure in credible third-party outlets, it offers a third-party legitimacy that advertising does not have. Common activities include speaking at conferences, working with the press, and employee communication. PR can be used to build rapport with employees, customers, investors, voters, or the general public. Almost any organization that has a stake in how it is portrayed in the public arena employs some level of public relations. A number of specialties exist within the field of public relations, such as Media Relations, Investor Relations or Labor Relations.

Objective of the PR

1. Create the image of organizations, products and services
2. Rectify misunderstanding of clients
3. Maintain good relationship with people
4. Provoke interest of clients
5. Create value for organizations, products and services
6. Present and report to the authority
7. Explain and make understanding of organizations, products and services
8. Develop good relationship with public services

Factors influence PR

1. Communication gap
2. Increased population
3. Social responsibility
4. Government assignment

[♣] Lampang Hospital

5. Development of communication equipment
6. Standard of the Ethics
7. Influence of client and their protection
8. New science of PR
9. Professional PR association

Objective of PR of the organization

1. To stimulate and gain attention from the people
2. To create the understanding of the people in relation to philosophy, policy, objective, process, officer, obstacle and resolution
3. To create the image, value, faith, confidence for the operation of the organization
4. To make the people aware correctly about problem condition, principle, conceptual thinking, evaluation of the problem
5. To create the atmosphere of brain storming to make the organization mission progress
6. To operate based on the transparency, honest without corruption

Difference between PR and advertisement

Advertising is very different from public relations. One key difference is that you always pay for the space and time of an advertisement (or commercial, which is an insert appearing on radio, television, or the Internet). By contrast, editorial coverage generated through public relations is not paid for by the organization issuing the news release. The media will pick up and publish the story because they consider it newsworthy, not as a paid advertisement.

Another crucial difference is that, in advertising, you have virtually full control over the message. Because you are paying for advertising, the ad or commercial runs your exact text (called copy), provided the copy complies with generally acceptable standards for advertising. In the case of public relations, the media outlet you are targeting is under no obligation to run the story in any form. If a media outlet does decide to run the story, an editor will generally rewrite the news release, or use pertinent information from the news release to create the news. (For instance, your news release might be used as part of a larger story on players in your industry or profession.) In addition, you have no control over when the release or news will run. All decisions are made by the editor.

Principle for PR practice

1. Aim for the benefit of the society
2. Draw to the common target
3. Understand the organization deeply
4. Know technique and equipment
5. Hold on the truth
6. Perform consistently
7. Distribute knowledge and truth

8. Use of high capacity personnel and equipment
9. Access the leader of the society

Strategy for effective PR

1. Self interrogation
    a. What is the organization doing
    b. What are the advantages and disadvantages of organization
    c. What are channels to communicate with outside
    d. What are responses from the outside
2. Planning for PR
    a. Set the target and target group
    b. Choose the channel to access the target group
    c. Create the content for PR
3. Process of practice
    a. Determine the target group, what is the target and target group for?
    b. Determine the target of PR to choose the channel
4. Perform the PR
5. Evaluation

PR is a continuing process consists with the following:

1. Research and listening

This process is to search for information to identify roles of the organization, advantages, disadvantages, methods to communication with outside and what are responses.

2. Planning and decision making

This is the process where gathered information are used for planning for the most effective method to use for PR and this should coordinate with the target, in time. This has to determine the channel for PR, activities in term of volume and frequency, time and personnel used.

3. Communication to people

This is the channel to communicate with people which can be press, radio, broadcast mobile unit, online PR and television. This has to be aware of the feed back as well.

4. Control and evaluation

This is the process to ensure that everything will hold on to the plan and target, this can be done prior, during and after the PR.

17. Sub-district EMS network by the local authority

Witaya Chadbanchachai[♣]

Dr. Etienne Krug, the Director of Violence and Injury Prevention, WHO Geneva has stated the direction of the EMS development that "Selected bystanders, community volunteers and other citizens with minimal training working in concert with providers and formal medical care structures can provide effective and sustainable Pre-Hospital Care regardless of a national level of resources"

The important of community participation in EMS

1. Volunteers in communities usually get use to the areas of their own surrounding, thus, they can reach to the emergency site faster than the standard operational team from hospital.
2. As the local EMS teams are situated in the local areas of the emergency event, the distance is shorter and the response time is quicker to approach the scenes.
3. Local EMS is a part of the community, work for the community, and well accepted by the community. It is easier to access than the standard EMS team from the hospital.
4. Local EMS requires no sophisticated equipment, thus, the founding of the local EMS incurs lower cost than the standard ones. Thus, the coverage of the EMS can be easily promoted.
5. Most of the events, patients' relatives would come along with the patients during transfer to hospitals. Thus, with the transfer by the local EMS team, those relative can be brought back to their communities and this can reduce the transportation costs for patients and their relatives.
6. In case of complicated cases, the dual system which allows the standard EMS to accompany their works should be used. And this still requires the initiation of services by the local team.
7. As the local EMS team is the part of the community, the sustainability of the service can be assured. To accomplish this, development plan should be set and budget should be allocated by their own community

The local EMS team is not new. In some countries such as Australia and Japan, the local team has an important role for the EMS. In Western Australia, there are about 3 million population, 300 ambulances, 400 paramedics, 3,000 volunteers, covers 150 communities. Their work is more effective than the standard hospital team in term of shorter transferring time. Their strategies includes

1. Central planning; the management system of the local EMS is unified at the central level
2. Simple-effective; the management is simple but effective
3. Handle most case; the team should be able to take care most of the cases
4. Avoid hi-technology equipment

♣ Director of WHO Collaboration Centre for Accident Prevention, Director of Trauma Centre, Khon Kaen Hospital

5. Avoid hi-technology training; most of the staff in the team should be trained properly. However, this should not consume long time. The time for training should be around 50-100 hours

Conceptual framework of the local EMS team establishment

1. Structure of the sub-district EMS

a. Administration

- Structure of the local EMS
- Target, direction and plan
- Financial management
- Zoning
- Network
- Discipline, protocol and manual

b. Human resources

- Responsible staff and commander
- Role and duty of the staff
- Capacity and competency
- Training
- Quality improvement
- Monitoring system
- Safety measure

c. Communication

- Standardization of the equipment
- Work instruction and protocol for communication and command
- Operational network
- Public relations

d. Transfer vehicle and equipment

- Standardization of vehicle and equipment at the sub-district level
- Procurement of the vehicle
- Procurement of the basic equipment
- Maintenance of the vehicle
- Safety measure

2. Institute of Emergency Medical Service System at the provincial and national level should be able to design the following points

- Work instruction and protocol
- Standard of vehicle and equipment

- Qualification of the local EMS staff
- Training course
- Registration of the EMS units
- Registration of the vehicles
- Determination of working payment
- Determination of the working area
- Quality control
- Monitoring and evaluation system

3. Supervising service network

The local EMS team should have the standard hospital EMS team to supervise and look after in relation to administration, academic and training. The supervising team should be able to accompany the local team in some occasion (dual system). The supervising team can be multi-level such as district and provincial levels.

4. Local authority

The local authority should be one of the stake holders of the local EMS team to ensure the sustainability of the services especially when the EMS is one of the routine activities. The participation can be in various forms such as

- The local EMS is operated by the authority
- The local EMS is operated by the by the community leader
- The local EMS is promoted to operate by the health centre
- The local EMS is promoted to operate by private sectors

5. Steps of establishment of the local EMS

- Set the primary responder for the local EMS
- Planning for the local EMS
- Create the structure and responsibility of the EMS
- Office establishment
- Conscript the volunteers
- Procurement for the vehicle
- Register with the Provincial Institute of Emergency Medical Service System
- Training the staff
- Uniform the staff
- Procurement for the communication equipment
- Procurement for the basic equipment
- Creation of the work instruction
- Creation of the report forms
- Creation of the on-shift time table and notify the CCC

- Public relations with the community
- Community opening
- Stand by at the office and ready to work
- Summarize and report
- Monthly meeting with EMS development team

6. Mechanism and steering for EMS development

- Set the provincial EMS committees which are the representative of all local EMS team
- Monthly meeting
- Content of the meeting includes direction and plan for the EMS, creation of the working instruction and KPI, control the practice of all local EMS teams, follow up the practice of all teams, problem identification and problem solving, lesson sharing and learning and initiation of idea for development.
- Monitoring and evaluation of the performance of all teams

18. Emergency medical service and mass casualty

Nakorn Tipsunthronsak[♣]

In the event of mass casualty, aside from the high number of victims, the number of operational teams from multi-department including police, fire fighters, rescue team as well as the observer such as reporter and people in the surrounding area is also large. Due to this, it requires the effective management to avoid the delay of treatment and transfer of patient in the nearby hospitals. It is necessary that all working staff to aware of their roles, their responsiveness and be able to manage coordinate with other working staff under the proper order from the incident commander. And this requires the cooperation with the local EMS team to take part into the event

Mass casualty (multiple casualty or major incident) refers to the event in which the number of the victims is high as well as their severities, and the event is beyond the capacity of the local operational team. Thus, the component of mass casualty includes both high volume and high severity of the victim. The mass casualty can divided into

- Natural or manmade
- Simple or compound
- Compensated or uncompensated

a. Natural incident; including earthquake, flood, fire blast, volcano blast, tsunami, famine, land slide and pestilence
b. Manmade incident; including traffic accident, accident in the factory, threat from mobbing, threat from terrorists
c. Simple incident refers to incident without destruction of the community structure
d. Compound incident refers to incident that destruct the community structure such as road disruption and black out of electricity
e. Compensated incident refers to controllable incident
f. Uncompensated incident refers to uncontrollable incident

There are three steps for dealing with the major incident

a. Preparation; for manmade incident the loss can be reduced using law and regulation, and preparation for the natural incident can also contain the damage. There are three components for preparation
    (i) Planning; some had said that “to fail to plan for a major incident is to plan to fail on the day one occurs”. Thus, it requires plans for all operational team in case of the major incident including plans at the local EMS team, hospital, high risk place such as sport stadium, plan at provincial and national level.

♣ Head of Department of Emergency Medicine and Forensic Science, Khon Kaen Hospital

(ii) Equipments; they should be adequate and ready to be used. These include helmet, boots, radio, traffic cone, barricade tape, amplifier

(iii) Training of the operational team to be able to tackle and manage the event

b. Response; is the management strategies for the event

(i) Command; the operational teams should have their own commander. However, the overall incident should have only one incident commander

(ii) Safety refers to safety of self (operational staff), scene and survivors

(iii) Communication; the effective communication between incident commander and commander of each operational team is required. The METHANE protocol might be chosen to be used

- M Major incident (declare of the incident)
- E Exact location (inform the location)
- T Type of incident (state type of the incident)
- H Hazard (inform the existence of the risk)
- A Access (inform of convenient access point)
- N Number of casualty (inform number and severity of victims)
- E Emergency services (number and type of operational team)

(iv) Assessment; initially, type of the incident, number and severity of victims should be assessed. The assessment then should redone as well as the resource required for control of the incident should be estimated

(v) Triage; this is to distinguish victims according to their severity

(vi) Treatment; this aims to alleviate the problem before referring the victims to hospitals

(vii) Transportation; " Get right patient to the right place at the right time"

c. Recover; to both victims who might later suffers from post-traumatic stress disorder (PTSD) and working staffs due to the acute stress. Both of them should be carefully looked after.

19. Role and plan of the EMS network in case of mass casualty

Chaiyooth Thanaphaisan[♣]

Mass casualty (multiple casualty or major incident) refers to the event in which the number of the victims is high as well as their severities, and the event is beyond the capacity of the local operational team. However, the capacity of the local team is quite varied. For instance, at the regional hospital, the severity the mass casualty can be graded into three levels

1. Minor degree; defined as severely injured victims less than 5 and minor injured victims less than 50
2. Intermediate degree; defined as severely injured victims around 5-10 and minor injured victims around 50-100
3. Severe degree; defined as severely injured victims more than 10 and minor injured victims more than 100

Hospital with less capacity might state otherwise. From the figure above, the degree of the mass casualty is primarily defined using the number of severely injured victims.

The preparedness for the event of mass casualty involves

1. Planning; there should be plans at every level for the event of mass casualty including plan for
   a. EMS network
   b. EMS operational team
   c. Hospital
   d. Big event such as sport stadium and festivals
   e. Department store, airport and factory
   f. Local and national level
2. Equipment
   a. Personal protective equipment such as goggles, glove, helmet and boots
   b. Medical equipment for triage, treat and transportation of victims
3. Training
   a. Principle of mass casualty; done by giving lecture and doing group discussion
   b. Practice in the simulation environment or in the real situation

Role of EMS network in the event of mass casualty

Zoning

The areas around the event should be zoned to avoid the confusion and facilitate works of the operational team

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1. Inner zone or bronze zone which is inside the inner cordon. It is the place where the event takes place. Only the operational staff with suitable uniform should be able to access, and there should be control staff at the entry point
2. Outer zone or silver zone which outside the outer cordon. This is the area to locate the command centre, to deliver treatment, to park ambulances and to collect corpses.

For the authorities from local and national level who aim to assist, control and support the work. They should stay outside these two areas

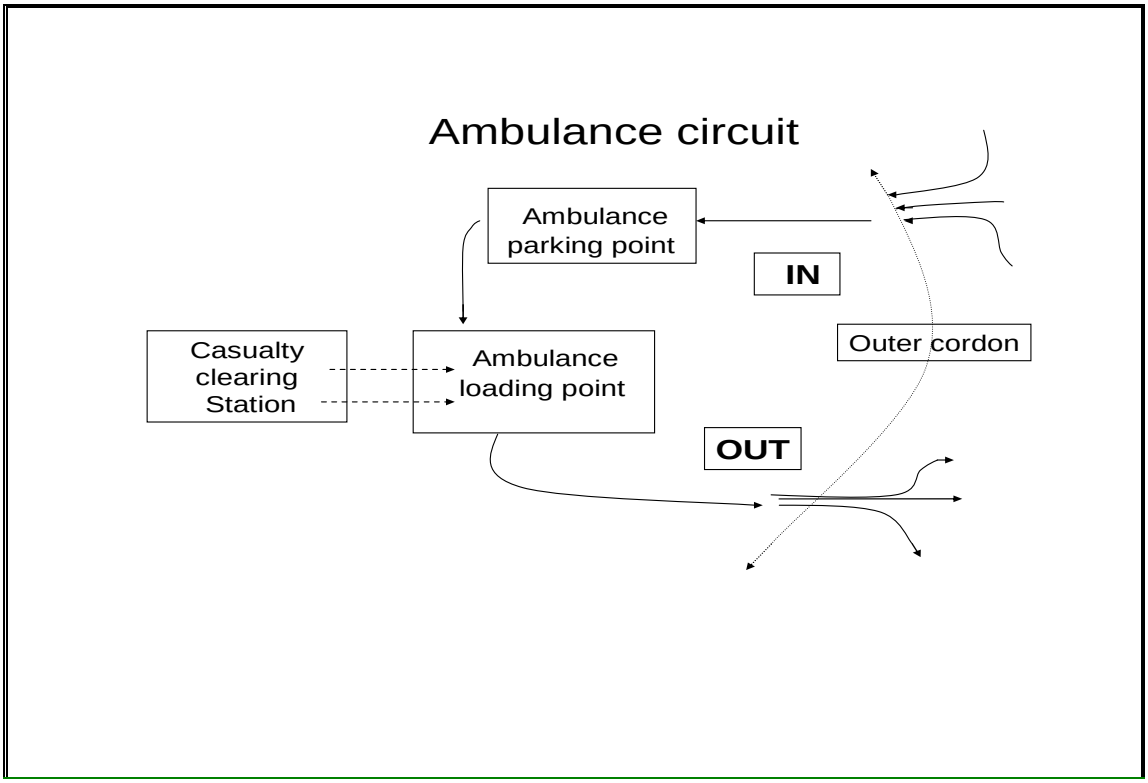

Figure 1: Zoning at the mass casualty scene

Assignment of the first arriving team

Due to the chaos around the scene due to high number of victims and surrounded people as well as the existing risks such as fire, smoke and leaked chemical agents. The role of the first operational team who arrive the scene is crucial to control the situation and they have to inform the situation for the next incoming teams. For the effective rescue, the working staff should be at least 5-6 people with at least three ambulances. However, most of the occasion, there are only 2-3 working staff at the beginning. There should be one leader and the others are assistances with the separate roles as shown below

Team leader

1. Locate the parking area for ambulance
2. Work as the commander until the real one arrive
3. Assess the event
4. Declare of the event
5. Estimate the required working staff
6. Use the METHAE protocol to the CCC
7. Locate the areas for command centre, ambulance and treatment delivery point

Assistance

1. Park the ambulance
2. Use the light signal to notify the other arriving teams
3. Contact the CCC and notify of their arrival
4. Coordinate with the CCC
5. Stay at the ambulance (at least one)
6. Do not turn off the engine and leave the key to the ambulance at all time
7. Barricade the area before the arrival of the police
8. Determine the inner and outer zones

Assignment of the later arriving teams

1. Report of their arrival to the command centre
2. For the senior team, they have to take in charge of the command centre
3. Follow the assignment given by the commander
4. Parking the ambulance in the proper area with the position ready to depart
5. communicate with the team leader all the time

Role of the commander

1. Supervise and control the event, do not join helping the victims
2. Assign and distribute working staff
3. Ensure the sufficient of communication equipment for all teams
4. Request for additional staff, ambulance and equipment from the network
5. Supervise the triage
6. Supervise the assistance in every team
7. Notify the nearby hospital for referring the victims
8. Coordinate and evaluate the situation closely with other commanders from other departments

Command Centre

1. Should not be far from the event site
2. Should locate up tide of the wind
3. Convenient to access
4. Should be able to see the other team clearly
5. fully equipped with communication equipment
6. should have some equipment such as barricade tape, speaker, map and board
7. The first arriving team should turn on the light signal as the temporary command centre

Position of the EMS network

1. Commander of the network
2. Communication officer
    a. Correspond between commander and team leader
    b. Correspond between commander and staff in the network
    c. Correspond between event site and referred hospitals
    d. Correspond between commander and staff at ambulances
    e. Inspection and prohibition of communication that might confuse the order or command
    f. Choose method to communication
3. Safety officer
    a. Check for wearing of safety equipment in staff
    b. Allow tired staff to rest
    c. Determine risk areas and find to measure to control the risk
    d. Coordinate for treatment for injured staff
4. Triage sieve officer
5. Triage sort officer
6. Medical officer; deliver cares and assist doctors and nurses
7. Officer at the ambulance parking space
    a. Align the ambulances and make them ready to depart
    b. Record name of driver of each ambulance
    c. Coordinate the transfer of victims
8. Officer who manage the transfer
    a. Coordinate with police to access and leave the site
    b. Prioritize the victims before transfer
    c. Coordinate with the Office at the ambulance parking space
    d. Deliver the basic care to the patient before transfer, and inform the situation of the victim to the driver and hospitals to transfer to

Assignment for the EMS network

1. Determine the operational system at the event scene
2. Rescue the victims
3. Prevent repetition of the event
4. Coordination with other department
5. Determine transferred hospital
6. Request for the support
7. Communicate with relevant department

8. Determine the area and location for each position
9. Triage and prioritize the victims before transfer
10. Record of victims' information

Role of the police in the event of mass casualty

Mostly, the EMS teams and network have to work closely with the police. In general, the medical and EMS network will look after those who were injured while the police will take care of those who are not injured, death, victims' relatives, press and control the traffic. Their roles include

1. Control the overall situation, control the access to the event site
2. Take care of those who are not injured
3. Take care of the crowd, victims' relatives
4. Collect the evidence and information for scene investigation
5. Take care of victims' belonging
6. Investigate, collect evidences, belonging and information of death victims
7. Control the traffic
    a. Block the irrelevant vehicle to access the site
    b. Open the way for irrelevant vehicle to leave the site
    c. Open the way for easy access of ambulance
    d. Open the way for relevant unit to park in the proper area
8. Control and support the press
9. Find rest area, water and food for those who are not injured
10. Support the transfer such as using helicopter and other vehicle

Triage

Is the take to distinguish victims according to their severity for appropriate treatment and transfer, this can be done in the small event with 4-5 injured patients or in the case of mass casualty. This has to be done dynamically as the symptoms of the victims can deteriorate overtime. This should be done at the event site, prior to move, at the point of treatment delivery, prior the hospital arrival and at the emergency room. Usually, triage should be done at least in two occasions; (i) primary triage (triage sieve) and (ii) secondary triage (triage sort). See Figure below

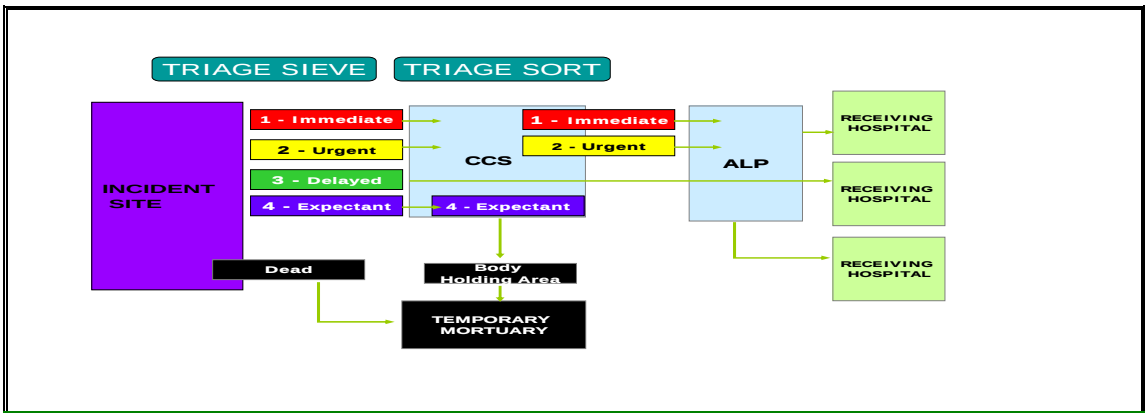

Figure 2: Site to perform triage.

Mostly, triage at the event site is done by the EMS staff while the triage at the treatment delivery point is done by doctors or nurses. For the minor injured victims, they can be sent directly to the hospital and might not require the transfer by the ambulance

T (treatment) system triage

Is one of the commonly use system to triage the victim, colours are assigned to determine groups

Table 1: T system triage

T	Severity	Colour	Definition
T1	Immediate	Red	Patients require immediate attention
T2	Urgent	Yellow	Patients require attention within 2-4 hours
T3	Delayed	Green	Patients who can delay receiving the treatment more than four hours
T4	Expectant	Blue	Patients who impending death even with aggressive treatment
Dead	Dead	Black or white	Dead patient

T4 is a difficult category to assign the patient to be in this group, and it is not common except in the event of war. However, in the high incident of injured patient, not assigning patient into this category may incur higher loss. But if the number of carer is sufficient, the T4 might change to T1. In the event of mass casualty, the unity of the triage system should be used

Triage sieve and triage sort

For the primary triage, it is usually done by first responder or nurse. This has to be done fast and simply. However, at the point of care and treatment delivery, triage can be done with more time using more equipment and should be done by doctors and nurses. In case of shortage of manpower and time, repetition of the triage sieve can be used instead of triage sort.

Triage sieve

This has to be done under the consideration of following

1. Ability to walk of the patients
2. Accessing of the airway, breathing and circulation (ABC)

If they are walk able, they will be put into T3 group. In case of unable to breath, perform the jaw thrust, if they still can not breathe; put them into the dead group. If they can breathe, put them in T1 group and their airways have to be opened all time using the oropharygeal airway. In case they are able to breathe, assess their breathing, if less than nine times per minute or faster than 30 times per minute. Put them into T1 group, if their breaths around 10-29 times per minutes, assess their circulation. If the capillary refill time longer than two seconds (press the patients' nail bed for five seconds). They are

prone to have problem with circulation, put them into T1, if faster than two seconds, put them into T2. In relation to their pulse, if it faster than 120 per minutes, put them into T1. Using criterion of pulse is more accurate as the capillary refill time has to deal with light and temperature. However, it consume more time (15 seconds at least) that the capillary refill (five seconds to press the nail bed and two seconds to see the perfusion.

Figure 3: Triage sieve procedure

Triage sieve in children

As there are some differences between adults and children and the measure values can be varied according to their ages. Thus, the triage has to be done differ from what perform in the adults. For small children who are not able to walk, they have to be T2 at least, the capillary refill should be done at their forehead. Respiratory and heart rates are shown in Table 19

Table 2: Respiratory and heart rate in children

Height (centimetres)	Respiratory rate (per minute)	Pulse rate (per minute)
50	20-50	90-180
80	15-40	80-160
More than 100	10-30	70-140

Triage sort

After arriving at the point of care and treatment delivery, the triage will be re-done with more equipment and test to gain more information than the triage sieve. At this point, the trauma score will be used to classify the patients using five parameters including respiratory rate, respiratory effort, systolic blood pressure, capillary refill and Glasgow coma scale. However, the revised trauma score contains only three parameters; respiratory rate, systolic blood pressure and Glasgow coma scale. The score for each parameter ranges from 0 (immeasurable) to 4 (perfectly normal) (Table 20). Thus, the total score will be 12 and this will be to classify the patients into four groups later (see Table 21. Aside from the information

regarding patients' physiologic parameters to informed the referred hospital, specific information such as burn wound, head injury and face injury should also be given.

Table 3: Triage revised trauma score (TRTS)

Respiratory rate	10-29	4
	>29	3
	6-9	2
	1-5	1
	0	0
Systolic blood pressure	≥ 90	4
	76-89	3
	50-75	2
	1-49	1
	0	0
Glascow coma scale	13-15	4
	9-12	3
	6-8	2
	4-5	1
	3	0

Table 4: Relationship between TRTS and T system triage

Category of patients	TRTS
T1	10
T2	11
T3	12
Death	0

Annex

EMERGENCY MEDICAL SERVICES ACT,

B.E. 2551 (2008)

BHUMIBOL ADULYADEJ, REX.

Given on the 23th Day of February B.E. 2551;

Being the 63rd Year of the Present Reign

His Majesty King Bhumibol Adulyadej is graciously pleased to proclaim that:

Whereas it is expedient to have a law on emergency medical service;

This Act contains certain provisions in relation to the restriction of right and liberty of person, in respect of which section 29 in conjunction with section 41 and section 43 of the Constitution of the Kingdom of Thailand so permit by virtue of law;

Be it, therefore, enacted by the King, by and with the advice and consent of the National Legislative Assembly, as follows:

Section 1 This Act is called the "Emergency Medical Services Act, B.E. 2551".

Section 2 This Act shall come into force as from the day following the date of its publication in the Government Gazette.

Section 3 In this Act,

"Emergency Medical Services" means any emergency operation, study, training and research in relation to evaluation, management, treatment and prevention of emergency patients;

"Patient" means an injured person or a person with acute symptom which threaten his/her being or the function of the vital organ, and requires prompt evaluation, management and treatment to prevent the loss of life or jeopardy caused by that injury or acute symptom;

"Health facility" means a public health facility, Thai red cross health facility, health facility according to the law of health facility and health facility assigned by the Royal Thai Cabinet;

"Public health facility" means a health facility under the control of the government;

"Emergency operation" means an operation since the recognition of the emergency condition till delivery of treatment to the patient to recover from the emergency condition including evaluation, management, coordination, control, supervision, communication, supply and transportation, diagnosis and treatment both inside and outside health facility;

"Emergency operational unit" means a unit or organization that operates emergency services;

"Operator" means a person who practices relevant to emergency medical service according to the appointment of the Emergency Medical Service Committee;

"Institute" means the National Institute of Emergency Medical Service system;

"Fund" means the Emergency Medical Service Fund;

“Committee” means the National Emergency Medical Service Committee;

“Permanent Secretary” means the Secretary of the National Institute of Emergency Medical Service system;

“Officer” means an officer of the National Institute of Emergency Medical Service system;

“Employee” means an employee of the National Institute of Emergency Medical Service system;

“Minister” means the Minister having charge and control of the execution of this Act.

Section 4 The Minister of Public Health shall have charge and control of the execution of this Act and shall have the power to appoint the competent officials and to issue the regulations and notifications for the execution of this Act. Such regulations and notifications shall come into force upon their publication in the Government Gazette.

CHAPTER I

The National Emergency Medical Service Board

Section 5 There shall be a National Emergency Medical Service Board consisting of:

(1) the Minister of Public Health, as Chairperson;

(2) the committee consists of four persons including the Permanent Secretary of the Ministry of Finance, the Permanent Secretary of the Ministry of Public Health, the Permanent Secretary of Office of Social Security, the Permanent Secretary of the National Health Security Office;

(3) two representative of the Medical Council with at least one specialized in practicing under the Thai Diplomatic Board of Emergency Medicine;

(4) one representative of the Nurse Council;

(5) two representatives of health facility; one from public health facility and one from private health facility;

(6) two representatives from local authority;

(7) two representatives from non-for-profit private sector with a role on pre-hospital emergency medical service;

(8) no more than four qualified persons appointed by the Minister from experts having apparent experience and works in finance, law, emergency medical service and the others.

The Permanent Secretary shall be member and secretary and not more than two civil appointed by the Permanent Secretary shall be assistant secretaries. The selection and appointment of the members under (4) and (5) shall.

Section 6 A member under section 5 (5) (6) (7) and (8) shall be in accordance with the regulations as notified by the Minister.

Section 7 A member under section 5 (5) (6) (7) and (8) shall have qualifications and not being under the prohibitions, as follows:

(1) being of Thai nationality;

(2) not being under thirty five years and over seventy of age;

(3) not having been sentenced by a final judgment of the Court to a term of imprisonment, except for an offence committed through negligence or a petty offense.

Section 8 A member under section 5 (5) (6) (7) and (8) holds office for a term of three years, but not more than two consecutive terms. In the case where the member under paragraph one vacates office at the expiration of the term of office, the appointment of the new member shall be made within ninety days. While the new member has not been appointed, the member who vacates office shall remain in office to continue his duties until the newly member have been appointed. In the case where the member under paragraph one vacates office before the expiration of the term of office, the new member shall be appointed to replace him within ninety days as from the date the office becomes vacant and such person shall remain in office for the unexpired term of office of the member he replaces. In the case where the remaining term of office of the member under paragraph one who vacates

office before the expiration of the term of office is less than ninety days, the appointment of the new member to replace the vacancy may not be made. In this case, the Board shall consist of the remaining members.

Section 9 In addition to vacating office at the end of the term of office, a member under section 5 (5) (6) (7) and (8) vacates office upon:

(1) death;

(2) resignation;

(3) being disqualified or being under any of the prohibitions under the section 7;

(4) being an incompetent or quasi-incompetent;

(5) being removed from office by the resolution of the Board by the vote of not less than two-thirds of the existing number of the members due to negligent in the discharge of duty, disgrace behavior or incapability;

Section 10 At a meeting of the Board, the presence of not less than one-half of the total number of the members shall constitute a quorum. The Chairperson shall preside over at the meeting. In the case where the Chairperson is not present at the meeting or is unable to perform his duty, the Vice Chairperson shall preside over at the meeting. If the Vice Chairperson is not present at the meeting or is unable to perform his duty, the members shall elect one among themselves to preside over at the meeting. The decision shall be made by the majority of votes. In casting vote, each member shall have one vote. In case of an equality of votes, the person who presides over at the meeting shall cast additional vote as a casting vote.

Section 11 The Board shall have the powers and duties as follows:

(1) to lay down policy and measure in relation to emergency medical service;

(2) to provision of consultation for the Royal Thai Cabinet in relation to emergency medical service policy;

(3) to provision of solution of a problem or obstacle in relation to emergency medical service;

(4) to prescribe administration rules and procedure and approve the budgetary plan of the Institute;

(5) to inspect and monitor the performance of the Institute in relation to administration, human resource, budgetary and finance;

(6) to prescribe rules or approval of training curriculum and to confer the certificate or professional remark for the emergency medical practitioners;

(7) to prescribe rules in relation to the Honorary Pin for whom supports the work of emergency medical service;

(8) to provision of a communication system and technology and information for the task coordination in relation to emergency medical service;

(9) to coordinate of related department to access the information for the benefit of the emergency medical service;

(10) to prescribe rules in relation to incomes, expenses, maintaining of the fund including the provision of benefit under the section 36;

(11) to approve the fees of medical services;

(12) to select, appoint, evaluation and impeachment of the permanent secretary;

(13) to carry out any duty as prescribed by this Act or by other laws or as entrusted by the Board.

The use of section 10 can be allow to grant**Section 13** The President of the board, committees, president of the sub-committee, sub-committee to receive the fringe benefit as stated by the rules assigned by the Royal Thai Cabinet

CHAPTER II

The National Institute of Emergency Medical Service System

Section 14 to appoint the National Institute of Emergency Medical Service System as an autonomous unit under the Control of Minister and shall not be under the Law of Labour Protection, Labour Relations Law, Law of Social Security and Law of Fringe Benefit

Section 15 the Institute shall have the powers and duties as follow

(1) to create the plan in relation to emergency medical service to present to the Board;

(2) to prescribe rules and regulations in relation to emergency medical service to present to the Board;

(3) to provision of the operational system for the emergency medical service covering administration and communication system;

(4) to study, search, research and distribute of knowledge in relation to emergency medical service;

(5) to provision of the training for the emergency medical service practitioner;

(6) to coordinate, follow up and evaluate of the emergency medical service;

(7) to be the coordination centre for public and private sectors both domestic and internal unit operate the emergency medical service;

(8) to collect the fee of the emergency medical service and the operation of the Institute;

(9) to respond for the administration work of the Board;

Section 16 The revenue of the institute shall include

(1) subsidy from the Royal Thai Government;

(2) money or asset from donation;

(3) money or asset belong to the Institute;

(4) revenue from the emergency medical service

(5) interest from money or asset as described in (1) (2) (3) and (4)

These revenue shall not be sent to the Ministry of Finance

Section 17 The asset of the institute shall not correspond to the legal execution. All assets shall belong to the Royal Treasury under the management of the Institute

Section 18 Expense of the Institute shall be under the regulation of the Board with the internal inspection and report to the Board at least once a year

The accounting balance shall be sent for accounting inspection within one hundred and twenty days after the end of the accounting year. The royal audit office or external audit appointed by the Board shall be perform the inspection and audit and report to the Board. Within 180 after the end of the accounting year, the Institute shall present the report to the Board and the Ministry.

Section 19 The Institute shall have one permanent secretary to response for the management of the Institute and to be in charge of the officers and employees of the institute under the direct control of the Board

Section 20 The Permanent Secretary shall have qualification and not being under the prohibitions as follow:

(1) being of Thai nationality;

(2) not being under thirty five years and no more than sixty years of age;

(3) being able to work for the Institute full time;

(4) not being an incompetent or quasi-incompetent;

(5) not being bankrupt;

(6) not having been sentenced by the final judgment of the Court to be bankrupt;

(7) not having been sentenced by a final judgment of the Court to a term of imprisonment, except for an offence committee through negligence or a petty offense;

(8) not being a person holding an administration position or officer of government enterprise;

(9) not being a civil servant, officer or employee of the central government, regional government or local authority;

(10) not being a person holding political position;

(11) not having been evicted from the government, government enterprise or public company due to dishonesty to the duty;

(12) being a person who prohibit according to what stated otherwise by the Board;

Section 21 The Permanent Secretary holds office for a term of four years, but not more than two consecutive terms. In the case where the Permanent Secretary under paragraph one vacates office at the expiration of the term of office, the appointment of one committee or officer of the Institute to take care of the position. In the case where the permanent secretary is not able to function, the Deputy of Permanent Secretary shall take care of the position. In the case where there is no Deputy of Permanent Secretary, the Board shall appoint an officer in the Institute to take care of the position.

Section 22 The Permanent Secretary vacates office upon;

(1) Death;

(2) Resignation;

(3) Being disqualified or being under any of the prohibitions under Section 20;

(4) Being removed from office by the resolution of the Board by the vote of not less than tow-thirds of existing number of the members due to the negligent in the discharge of duty, disgrace behaviour or incapability.

Section 23 Salary and income of the Permanent Secretary shall follow what stated by the Board.

Section 24 The Permanent Secretary shall have the powers and duties as follow:

(1) to administer the Institute follow law, regulation, declaration, resolution or policy of the Board;

(2) to create the operation plan and financial plan of the Institute and present for the approval of the Board;

(3) to perform the tasks in relation to personnel administration, finance, budget and the others under follow the control and regulation stated by the Board;

(4) to prescribe the regulation of the Institute that not contradict to laws, regulations, declaration, resolution or policy of the Board;

(5) to operation the works assigned by the Board.

Section 25 The Permanent Secretary shall be the representative of the Institute to contact with external individuals. No Legal commitment shall be applied in case of violation to resolution or regulation stated by the Board unless the ratification is given by the Permanent Secretary.

Section 26 For the benefit of the Institute, the Minister shall request the government officers including civil servants, officers at the Ministry, Department, regional government, local government and government enterprise to be the temporary officers or employees with the consent of the authority of those persons. And with the consent, those persons shall continue the benefit from the bonus and pension similar to what their usual benefit.

Section 27 In the case where those persons under the Section 27 request to resume their positions, they shall be able to do so

CHAPTER III

Emergency Medical Operation

Section 28 To protect the safety of the emergency patients, the operational unit, health facilities shall ensue the following principle:

(1) triage and prioritize the patients according to their severity;

(2) the emergency patients shall receive the highest capacity of the operational units or health facilities unless the doctors approve the transfer;

(3) the operation shall be based on necessity and medical indication without the concerning of insurances, registered health facilities, liability of the patients which may cause the delay of prompt action of the emergency medical operation.

Section 29 For the benefit follow the Section 28, the Board shall have powers to declare the following:

(1) categories, levels, powers and duties, limitations, responsibilities of the operational unit and health facilities;

(2) principles and conditions for the operation of the operational unit and health facility;

(3) standard of operational unit;

(4) principles and methods for coordination and report of the operational unit and health facility in the emergency operation including personnel, vehicles, sites and equipments.

The operational units that operate under the principles, conditions and standard of the Board may be approved or supported financially by the Fund. And those who violate the principles, conditions and standard of the Board shall be disapproved or limit the rights or liability in the emergency operation or cease the financial support. For health facility that violates the principles, conditions and standard of the Board shall be notify to its control or regulator.

Section 30 The Board shall supervise and regulate the operational unit and health facility to follow the stated principles, conditions and standards.

Section 31 In the case where the operator, operational unit or health facility violates the stated principles, conditions and standard, the Board shall investigate follow the Section 32. In the investigation, the Board shall have the powers to call individuals to give speech or notify individuals to submit documents or evidences that relevant to the investigation

Section 32 In the case of investigation under Section 31 which shows that the operator, operational unit or health facility violate the stated principles, conditions and standard, the Board shall precede one of the following:

(1) warn the operator, operational unit or health facility;

(2) notify the authority who control the operational unit;

(3) notify the authority for the discipline punishment for the facility of public and private sectors;

(4) notify the authority for the ethical punishment for the operator who practices medicine and public health

CHAPTER IV

Emergency Medical Fund

Section 33 The institute shall have the Fund call the "Emergency Medical Fund" which aims to support the practice of emergency medical services including reimbursement for the operator, operational unit and health facility under the concern of areas or geographies without sufficient operator, operational unit and health facilities.

For the readiness, suitability, necessity of the people in the community, the Board shall promote and coordinate with the local authority to determine the principles for the authority to undertake and administer the local emergency medical services at the community level with the subsidy from the Fund.

Section 34 The Fund consists of

(1) subsidy from the Royal Thai Government;

(2) money or asset from donation;

(3) money or asset from the operation of the Institute;

(4) fine from laws;

(5) money from the government institutes or other funds that have the aim to administer public health and medicine;

(6) additional money stated by laws;

(7) interest from money or asset as described in (1) (2) (3) (4) (5) and (6).

Section 35 For the benefit of the management of the Fund under Section 34 (5), the Board may pledge with government institutes or other funds which aim to administer public health and medicine for financial support the Fund.

Section 36 Money and asset under Section 34 shall belong to the Institute. Receiving, payment and keeping of the Fund as well as the management for benefit of the Fund shall follow regulation of the Board.

CHAPTER V

Ruling Punishment

Section 37 Who violate the declaration stated by the Board under Section 29 (1) shall be fined not exceed the amount of one hundred thousand Baht.

Section 38 Who use the communication system and informatics technology that provided for the emergency operation that may cause the liability to the operational unit shall be fined not exceed the amount of five thousand Baht.

Section 39 Determination of ruling punishment under Section 37 and 38, the Board shall be aware of severity of the behavior, damage caused by the action follow the principles, methods and rate stated by the Board.

Section 40 Who use the Honorary Pin without the right shall be fine not exceed the amount of fifty thousand Baht.

Transitory Provision

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Section 41 The powers and duties, businesses, assets, rights, debts and budget of the Office of Permanent Secretary specific to the National Institute of Emergency Medical Service System shall be transferred to the Instituted on the date of this Act comes into force.

Section 42 At the initial period, the Ministry of Public Health shall commence for the Board establishment within one hundred and twenty days since the date of this Act comes into force.

Without the Board according to this Act, the Board shall consist Minister of Public Health, Permanent Secretary of Ministry of Finance, Permanent Secretary of Ministry of Public Health, Permanent Secretary of National Health Security Office, Permanent Secretary of Social Security Office and the Permanent Secretary of the Institute under Section 43.

Section 43 The Director of the Institute on the date of this Act comes into force shall perform the duties of the Permanent Secretary until the Permanent Secretary takes office and shall not be exceed one hundred and twenty days since the date of this Act comes to force.

Section 44 Civil servants or employees of the government institutes wish to work as the officer or employee of the Institute shall present their aim as a letter to the Permanent Secretary and shall passed the screening and evaluation follow the principles stated by the Board within two years since this Act comes to force.

Section 45 Civil servants that work as the officers of the Institutes under Section 44 shall be assumed as resignation from the government and shall be rewarded with bonus and pensions regarding the appropriateness.

Employees that work as the employees of the Institutes under Section 44 shall be assumed as resignation from the government and shall be rewarded with bonus under the regulation of Ministry of Finance.

Countersigned by

General Surayud Chulanont

Prime Minister