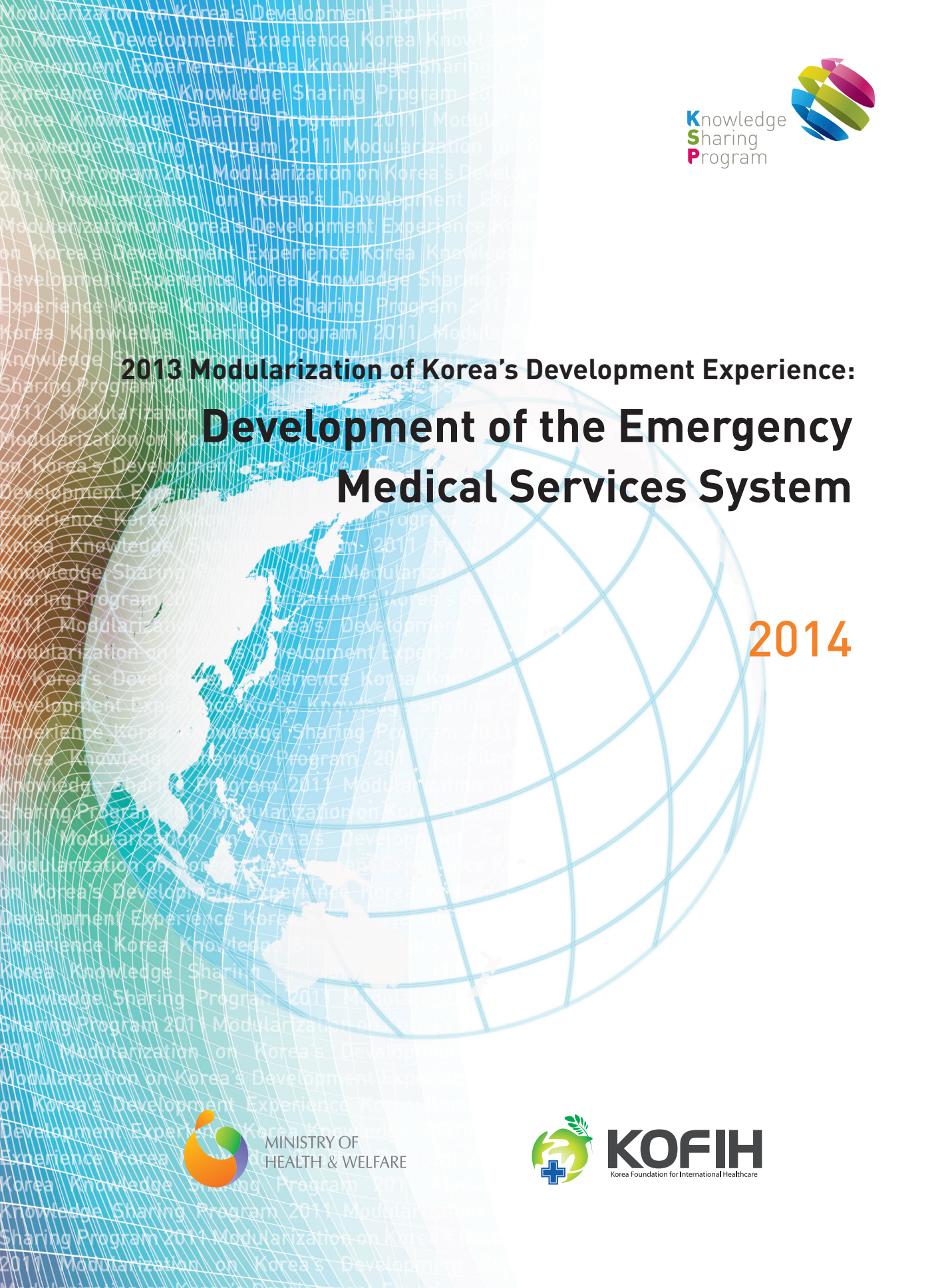
Knowledge Sharing Program

2013 Modularization of Korea's Development Experience:

# Development of the Emergency Medical Services System

2014



MINISTRY OF HEALTH & WELFARE

KOFIH
Korea Foundation for International Healthcare

2013 Modularization of Korea's Development Experience:

# Development of the Emergency Medical Services System

2013 Modularization of Korea's Development Experience

# Development of the Emergency Medical Services System


| | |
|---|---|
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# Preface

The study of Korea's economic and social transformation offers a unique window of opportunity to better understand the factors that drive development. Within one generation, Korea had transformed itself from a poor agrarian society to a modern industrial nation, a feat never seen before. What makes Korea's experience unique is that its rapid economic development was relatively broad-based, meaning that the fruits of Korea's rapid growth were shared by many. The challenge of course is unlocking the secrets behind Korea's rapid and broad-based development, which can offer invaluable insights, lessons and knowledge that can be shared with the rest of the international community.

Recognizing this, the Korean Ministry of Strategy and Finance (MOSF) and the Korea Development Institute (KDI) launched the Knowledge Sharing Program (KSP) in 2004 to share Korea's development experience and to assist its developing country partners. The body of work presented in this volume is part of a greater initiative launched in 2007 to systematically research and document Korea's development experience and to deliver standardized content as case studies. The goal of this undertaking is to offer a deeper and wider understanding of Korea's development experience in hopes that Korea's past can offer lessons for developing countries in search of sustainable and broad-based development. In furtherance of the plan to modularize 100 cases by 2012, this year's effort builds on the 20 case studies completed in 2010, 40 cases in 2011, and 41 cases in 2012. Building on the past three year's endeavor that saw publication of 101 reports, here we present 18 new studies that explore various development-oriented themes such as industrialization, energy, human capital development, government administration, Information and Communication Technology (ICT), agricultural development, and land development and environment.

In presenting these new studies, I would like to express my gratitude to all those involved in this great undertaking. It was their hard work and commitment that made this possible. Foremost, I would like to thank the Ministry of Strategy and Finance for their encouragement and full support of this project. I especially would like to thank KSP Executive Committee, composed of related ministries/departments, and the various Korean research institutes, for their involvement and the invaluable role they played in bringing this project together. I would also like to thank all the former public officials and senior practitioners for lending their time and keen insights and expertise in preparation of the case studies.

Indeed, the successful completion of the case studies was made possible by the dedicated efforts of the researchers from the public sector and academia involved in conducting the studies, which I believe will go a long way in advancing knowledge on not only Korea's own development but also development in general. Lastly, I would like to express my gratitude to Professors Kye Woo Lee, Jinsoo Lee, Taejong Kim and Changyong Choi for their stewardship of this enterprise, and to the Development Research Team for their hard work and dedication in successfully managing and completing this project.

As always, the views and opinions expressed by the authors in the body of work presented here do not necessary represent those of the KDI School of Public Policy and Management.

**April 2014**

**Joon-Kyung Kim**

**President**

**KDI School of Public Policy and Management**

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# Summary

In this paper, authors reviewed the development of an Emergency Medical Services(EMS) system in Korea and modularized this process for the development of EMS in middle and low income countries. EMS system is highly public area and governments have a lot responsibility for EMS system because it is simultaneously based on medical knowledge, public health system and community safety.

In Korea, the evolution of the EMS system has not been a slow process. A number of medical and social forces converged after the economic development in 1980s. To meet the demands of public, Korean government began in earnest to establish the modern EMS system. In this study, the development process of EMS was reviewed as four phases historically; basic infrastructure phase(1990~2000), quantitative growth phase(2001~2005), qualitative growth phase (2006~2010) and advanced system phase (2010~present). On the other aspect, the development was reviewed as three components systemically; prehospital EMS system, hospital EMS system and health care governance and system development.

In prehospital development, the major strategy was strengthening and expanding fire department agency. In hospital development, to designate Emergency Departments (ED) and monitor the capability and quality of ED has been the major policies. In health care governance and system development, Legislation of EMS System Act and Emergency Health Care Fund has been basis of EMS system development. Moreover authors found success factors of EMS system development; fire-based emergency medical services and systematized evaluation and medical direction in prehospital stage; evaluation of emergency medical facilities, emergency health care fund and national emergency medical center operation in hospital stage; EMS Act, 119 rescue and EMS Act and establishment and expansion of the emergency health care fund in governance stage. To develop EMS system in middle and low income countries, strategies and means of policies in Korea will be useful and considerable.

# Chapter 1

## Development of an Emergency Medical Services System: Purpose, Objectives and Achievements

# Development of an Emergency Medical Services System: Purpose, Objectives and Achievements

## 1. Evaluation of Achievement by Program

### 1.1. Purpose and Objectives of the EMS System

#### 1.1.1. Purpose of the EMS System

The purpose of an emergency medical services (EMS) system is to provide prompt and appropriate care to patients in medical emergency situations and transport them to properly-equipped facilities within local health care systems, thus improving the overall survival rate and patient health.

The purpose of constructing an EMS system in Korea is stated in the Emergency Medical Services Act (Article 1). The aim of the EMS system is to protect the health and lives of emergency patients and to deliver appropriate emergency care, thereby providing prompt and optimal treatment in emergency situations (Article 13). Government and organizations at the national, regional, and local levels should develop and implement approaches to: 1) protect emergency patients, 2) support, establish, and manage emergency medical facilities, 3) train emergency medical providers, and 4) secure access to transporting vehicles.

#### 1.1.2. Main Objectives of the EMS System

Since the 1990s, the Korea government has made efforts to construct a modern EMS system by developing and executing "The Basic Plan for Developing an EMS System." The Emergency Care Act was first enacted in 1993 and put into force by 1995. It was later revised in 2002, and Article 2 of 13 of the Act regarding plans for emergency care and yearly enforcement empowered the Ministry of Health and Welfare (MOHW) to establish plans

for emergency care every 5 years since 2005. Following the revision of the act, the MOHW announced the "2005~2010 Action Plan for Emergency Care," "2010~2012 Advancement Plan for Emergency Care," and "2013~2017 Action Plan for Emergency Care." Plans since 1995 have become more specific and strategic, focusing on advanced EMS systems at all levels – on-site protocols, transport, hospital treatment and management.

Table 1-1 | Main Objectives of EMS Action Plans by Developing Stage

<table>
<tr><th>Stage</th><th>1990</th><th>2005~2010</th><th>2010~2012</th><th>2013~2017</th></tr>
<tr><td rowspan="2">Scene</td><td rowspan="2">EMS vehicles</td><td rowspan="2">Empowering quality of emergency care</td><td>Reducing Blind Spots in EMS</td><td>Public information service for emergency conditions</td></tr>
<tr><td>Empowering citizen's performance</td><td>Layperson CPR performance</td></tr>
<tr><td rowspan="3">Transport</td><td rowspan="5">Emergency care providers</td><td rowspan="4">Accessibility to emergency care</td><td rowspan="3">Timeliness and advanced care</td><td>Improving EMS quality</td></tr>
<tr><td>Inter-hospital transport safety</td></tr>
<tr><td>Support transportation infrastructure in rural EMS</td></tr>
<tr><td rowspan="6">Hospital</td><td rowspan="3">High-quality emergency department</td><td>Revision of the hospital care system</td></tr>
<tr><td>Support rural hospital EDs</td></tr>
<tr><td rowspan="2">Coverage of emergency care</td><td>Trauma care system</td></tr>
<tr><td rowspan="3">Emergency care facilities</td><td rowspan="3">Specialty emergency care system</td><td>Specialty care system for critical emergency diseases</td></tr>
<tr><td>Improving accessibility of vulnerable populations</td></tr>
<tr><td>Emergency system infrastructure development</td><td>Renovation of emergency facility</td></tr>
<tr><td rowspan="4">Environment and Management</td><td rowspan="4">Emergency medical information center</td><td rowspan="2">Effective management program</td><td rowspan="4">Strengthening policy development and management</td><td>Empowering disaster medical service systems</td></tr>
<tr><td>Empowering regional and local performance in EMS system management</td></tr>
<tr><td>Reforming the emergency information system</td></tr>
<tr><td>Specialization of emergency medical information center</td><td>Reforming evaluation program</td></tr>
<tr><td></td><td></td><td></td><td></td><td>Education and deployment of emergency providers</td></tr>
<tr><td></td><td></td><td></td><td></td><td>Empowering infrastructure of emergency planning and policy making</td></tr>
</table>

Source: Ministry of Health and Welfare.

## 1.2. Socioeconomic Background before 1990

### 1.2.1. National Demographic Indicators

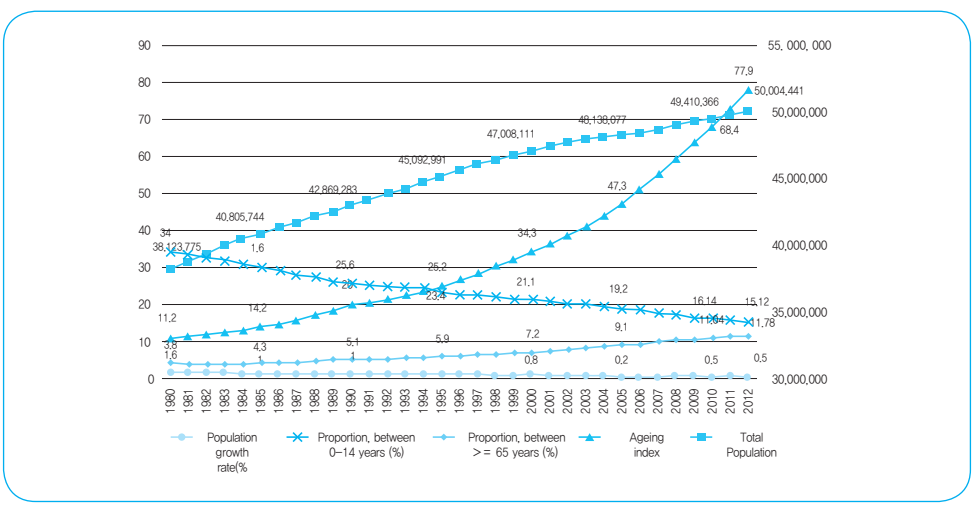
In 1980, the national population was 38,123,775 with a woman to man ratio of 100:101.8 and a population growth rate of 1.6%. Approximately 34.0% were under 15 years of age, and 3.8% were 65 or older. The ageing index was 11.2, with a median age of 21.8 (21.2 for men and 22.4 for women) and mean age of 25.9. In 1990, the national population statistic was 42,868,289 with a woman to man ratio of 100:101.3 and a population growth rate of 1.0%. About 25.6% were under 15 years of age, and 5.1% were 65 years or older. The ageing index was 20.0 with a median age of 27 (26.3 for men and 27.7 for women) and mean age of 29.5.

Around the time the EMS system was implemented, demographic data pointed to a an overall population increase, due in part to a decrease in the proportion of young children and an increase in the senior population. The rate of population growth had steadily decreased from a level of 1.6%.

### 1.2.2. National Economic Indicators

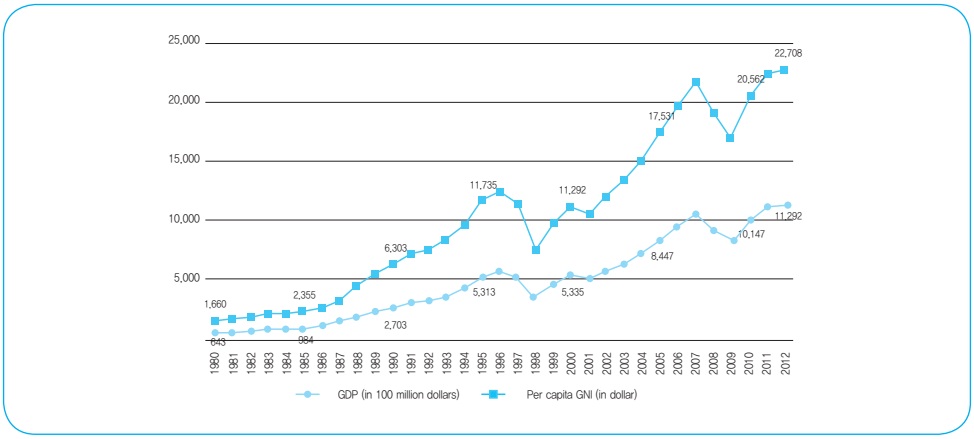
In 1980, the Korean economy was valued at a GDP of USD64.3 billion and GNI of USD63.3 billion (USD1,660 per capita). The GDP growth rate had stabilized at -1.9%. Ten years later, the national GDP increased to USD270.3 billion, with a GNI of USD270.2 billion (USD6,303 dollars per capita), and a GDP growth rate of 9.3%.

Figure 1-1 | Trends in National Population Statistics, 1980~2012




Source: Statistics Korea.

Figure 1-2 | Trend of GDP and per Capita GNI, 1980~2012



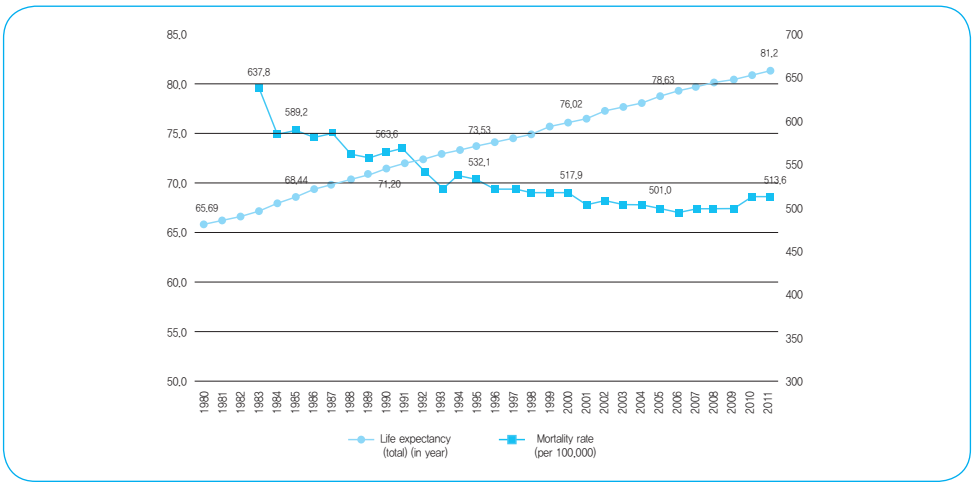

Source: Statistics Korea.

When the EMS system was implemented, the Korean economy showed rapid increases in GDP, GNI, and per capita GNI. The GDP growth rate went from negative to positive, resulting in an average of a 7~10% growth rate from 1981 to the early 1990s.

### 1.2.3. National Health Indicators

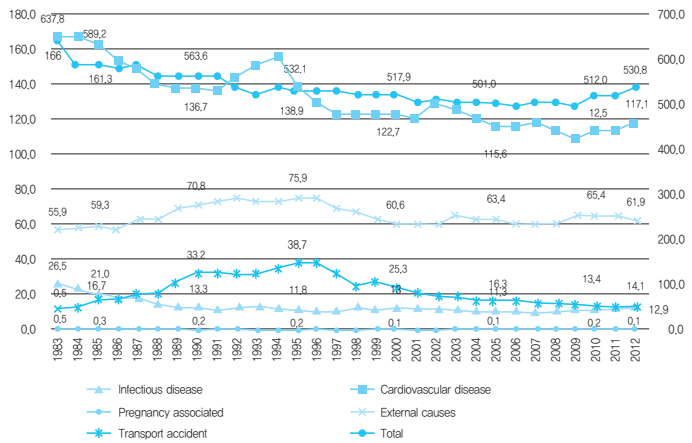
Infants born in 1980 and 1990 had a life expectancy of 65.7 years and 71.3 years, respectively. The mortality rate per 100,000 persons was 637.8 in 1983 and 563.6 in 1990.

Figure 1-3 | Life Expectancy and Mortality Rates (per 100,000), 1980~2010




Source: Statistics Korea.

Figure 1-4 | Mortality Rate (per 100,000) by Cause of Death, 1983~2012




Source: Statistics Korea.

At the time of implementing the EMS system, life expectancy was increasing at a high rate, and the mortality rate per 100,000 was rapidly decreasing. Overall mortality and cardiovascular mortality rates were decreasing, while the change in maternal mortality rate was insignificant. From the 1980s to mid-1990s, the mortality rates for external causes and transport accidents also rapidly increased.

Between 1980 and 1990, which was around the time of implementing the EMS system, all demographic and economic indicators showed rapid growth. The overall population and number of baby boomers increased, as well as the working age population, the national GDP and per capital GNI. Furthermore, due to a decrease in mortality rates and an increase in life expectancy, public interest in health and quality of life began to rise. This era observed rapid industrial growth and high vehicle usage, and the mortality rates of external causes and transport accidents increased – underscoring the importance of emergency care and the need for an efficient emergency care system.

## 1.3. Major Measures of Achievement in Emergency Care

### 1.3.1. Public Health Medical Service

Performance standards measurements should reflect in detail service objectives with a high level of specificity and objectivity. EMS systems and medical care services, however, are characterized by their inability to realize meaningful achievements within a short period of time (Korean Health Industry Development Institute, 2011).

Donabedian's structure-process-outcome model is a widely used framework for assessing the quality of a public health service. The model has been adapted through consideration of the model's assessment indicators such as equity, efficacy, accessibility, and quality. And within this framework, the structure of public health service was assessed in terms of the facility's accessibility, personnel, and equipment.

Table 1-2 | Essential Components of Public Health Assessment

| | Structure | Process | Outcome |
|---|---|---|---|
| Definition | Characteristics of the environment in which the health service is provided | Health services being provided to patients, in addition to the process by which providers provide services to patients | Influence of health services on patient and population health (encompassing patient satisfaction, health status, and change in knowledge) |
| Indicators | 5 As<br>Availability<br>Accessibility<br>Affordability<br>Adequacy<br>Acceptability | Safe (medical error)<br>Effective<br>Patient-centered<br>Timely<br>Efficient<br>Equitable | 6 Ds<br>Death (preventable or crude)<br>Disease<br>Disability<br>Discomfort<br>Dissatisfaction<br>Destitution |

### 1.3.2. Quality Assessment of Emergency Care Service

Multiple approaches can be taken in determining measurements for assessing EMS. A gradual approach can be taken in which patient care is divided by timely sequence into pre-hospital and hospital care. Furthermore, additional indicators can be created according to the sub-components of EMS, such as education and training, information, communication system and pre-hospital transport (Ministry of Health and Welfare, 2009).

Each measure of assessment for EMS performance was selected for practicality based on literature review and measurements of public health service assessments. The main framework for the emergency care action plan in 2013~2017 was built around measures of assessment for patient-centeredness, efficiency, effectiveness, availability and equity. In addition, the importance of each measure of assessment, potential for improvements, scientific acceptability, practicality and enforceability are expected to be considered (Ministry of Health and Welfare, 2007).

## Table 1-3 | Measurement Index of Achievement by EMS Development

(S: Structure, P: Process, O: Outcome)

| Stage | Measurement Area | Achievement Index | S | P | O |
|---|---|---|---|---|---|
| Pre-hospital | Pre-hospital Facilities | Number of ambulances per population | ○ | | |
| | | Number of transports per population | ○ | ○ | |
| | | Number of ambulance calls per population | ○ | ○ | |
| | | Ambulance utilization rate | ○ | ○ | |
| | | Ambulance utilization rate for critical emergencies | ○ | ○ | |
| | Pre-hospital Human Resources | Number of EMTs (level 1 and 2) per population | ○ | | |
| | | Number of medical directors | ○ | | |
| | | Proportion of EMTs among crews in ambulance | ○ | ○ | |
| | EMS Medical Oversight and Monitoring | Ambulance response time interval | | ○ | |
| | | Proportion of extra-jurisdictional dispatch | | ○ | |
| | | Completeness of EMS record | | ○ | |
| | | Time interval for basic life support | | ○ | |
| | | Time interval for advanced life support | | ○ | |
| | | Proportion of ambulance arrival to ED within 30 min. | | ○ | |
| | | Proportion of ambulance arrival to the scene within 20 min. | | ○ | |
| | | Proportion of ambulance arrival to the scene in severe trauma within 10 min. | | ○ | |
| | | Proportion of request for direct medical control for cardiac arrest | | ○ | |
| | | Proportion of optimal care of pre-hospital care | | ○ | |
| | | Appropriate destination to ED (over-triage) | | ○ | |
| | | Appropriate destination to ED (under-triage) | | ○ | |
| | | Proportion of Dispatch-assisted CPR | | ○ | |
| | | Pre-hospital ROSC after OHCA | | ○ | ○ |
| | | Satisfaction of ambulance service | | ○ | ○ |
| | Communication | Proportion of utilization of information service | ○ | ○ | ○ |
| | | Successful inter-hospital transport via information service | | ○ | ○ |
| Hospital | Human Resources | Number of emergency physicians per population | ○ | | |

| Stage | Measurement Area | Achievement Index | S | P | O |
|---|---|---|---|---|---|
| Hospital | Human Resources | Number of certified EM physicians per population | ○ | | |
| | | Number of advanced emergency nurses per population | ○ | | |
| | ED Facilities | Number of emergency facilities per population | ○ | | |
| | | Number of ED visits per population | ○ | ○ | |
| | | Number of local areas without emergency facilities | ○ | | |
| | | Proportion of emergency facilities meeting criteria for ED level | ○ | ○ | |
| | | Number of ED beds | ○ | | |
| | | Proportion of occupancy rate of emergency beds | ○ | ○ | |
| | ED Evaluation and Monitoring | ED length of stay | | ○ | |
| | | ED overcrowding index | | ○ | |
| | | Proportion of admission to hospital | | ○ | |
| | | Optimal reperfusion therapy for acute myocardial infarction | | ○ | |
| | | Optimal reperfusion therapy for acute stroke | | ○ | |
| | | Timeliness of brain image for acute stroke | | ○ | |
| | | Appropriate assessment for unstable patients | | ○ | |
| | | Specialty care ED quality | | ○ | |
| | | Satisfaction on ED care and experience | | ○ | ○ |
| | Hospital Monitoring and Outcome Evaluation | Preventable trauma death rate | | ○ | ○ |
| | | Survival to discharge rate after OHCA | | | ○ |
| | | Severity adjusted mortality rate after severe trauma | | | ○ |
| | | Severity adjusted mortality rate after AMI | | | ○ |
| | | Severity adjusted mortality rate after acute stroke | | | ○ |
| | | Standardized mortality rate due to suicide | | | ○ |
| | | Standardized mortality rate due to traffic accident | | | ○ |
| | Disaster Preparedness | Hospital bed preparedness for disaster | ○ | | |
| | | Education and training for disaster response | ○ | ○ | |

| Stage | Measurement Area | Achievement Index | S | P | O |
|---|---|---|---|---|---|
| Hospital | Disaster Preparedness | Proportion of appropriate response after disaster | | ○ | ○ |
| | Communication | Utilization rate of emergency information service | ○ | ○ | ○ |
| | | Successful inter-hospital transport via emergency information service | | ○ | ○ |
| | Emergency Information System | Index of emergency medical information | ○ | ○ | |
| | | Accuracy of National ED information system | | ○ | |
| | | Reliability of hospital resources for emergency care | | ○ | |
| | Inter-hospital Transport | Proportion of inter-hospital transport | | ○ | ○ |
| | | Proportion of inter-hospital transport of critical patients | | ○ | ○ |
| | | Proportion of re-transfer of transferred patients | | ○ | ○ |
| | | Pre-arrival death rate during inter-hospital transport | | ○ | ○ |
| | | Proportion of hospital staff riding along inter-hosptial transport ambulance | ○ | ○ | |
| | Citizen Education and Advocacy | Utilization of public emergency information service | ○ | ○ | |
| | | Rate of citizen CPR training | ○ | ○ | |
| | | Proportion of patients with 3 major emergency diseases arrived within optimal time interval | | ○ | ○ |
| | | Recognition rate of CPR | | ○ | |
| | | Number of citizens to provide CPR per population | | ○ | |
| | | Bystander CPR rate | | ○ | ○ |
| Governance and Environment | Emergency Medical Services Legislation | | | | |
| | Budget and Fund | Budget for emergency care | ○ | | |
| | | Proportion of budget allocated to regional government | ○ | | |
| | | budget for research and development for emergency care | ○ | | |
| | | Amount of substitution and reimbursement | ○ | | ○ |
| | | Amount of patient pocket money for emergency care | ○ | | ○ |

| Stage | Measurement Area | Achievement Index | S | P | O |
|---|---|---|---|---|---|
| Governance and Environment | Budget and Fund | Total cost for emergency care per patient | ○ | | ○ |
| | Governance | Regional action plan for emergency care | | ○ | |
| | | Organization supporting emergency care management | | ○ | |
| | Regionalization | | | | |

## 2. Achievements by EMS System Development Phase

After constructing a list of assessment measures, nine key measurement tools for EMS performance evaluations were selected based on a structure-process-outcome model and pre-hospital-hospital-EMS governance model. Previous literature was reviewed in an effort to understand the achievements of an EMS system using primary assessment measures.

Table 1-4 | Key Measures for Assessing EMS System Achievements

| Achievement Index | Structure | Process | Outcome |
|---|---|---|---|
| Number of transports per population | ○ | ○ | |
| Number of EMTs (level 1 and 2) per population | ○ | | |
| Ambulance response time interval | | ○ | |
| Pre-hospital ROSC after OHCA | | ○ | ○ |
| Number of emergency facilities per population | ○ | | |
| Satisfaction on ED care and experience | | ○ | ○ |
| Preventable trauma death rate | | ○ | ○ |
| Survival to discharge rate after OHCA | | | ○ |
| Bystander CPR rate | | ○ | ○ |

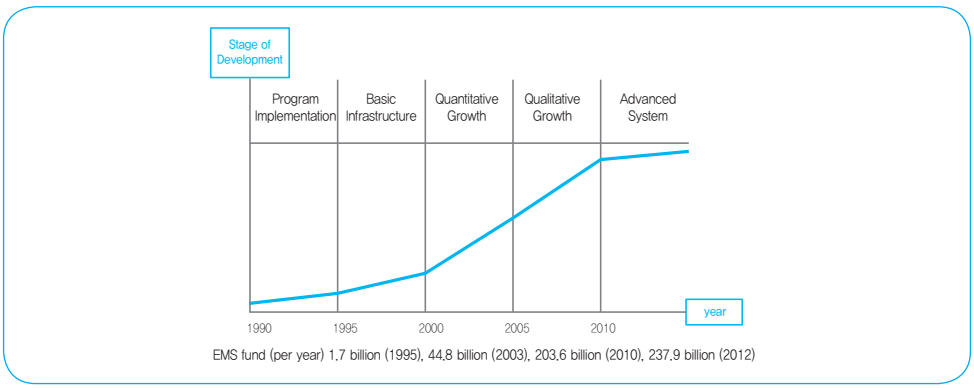
There was an effort to identify trends based on specific by EMS development stages in Korea, but data was limited in the early phases of service implementation and development, making it difficult to extrapolate or conclude any findings.

## 2.1. Basic Infrastructure Phase (1995~2000)

Since the introduction of the emergency medicine specialist program in 1996, the number of emergency medicine specialists has been steadily increasing. The number of working emergency medicine specialists was 71 in 1997 and consistently increased to 185 in 2000 and 1,605 in 2012. The number of Emergency Medicine Technicians (EMTs) increased from 853 in 1996 to 5,461 in 2000 and 19,286 in 2012.

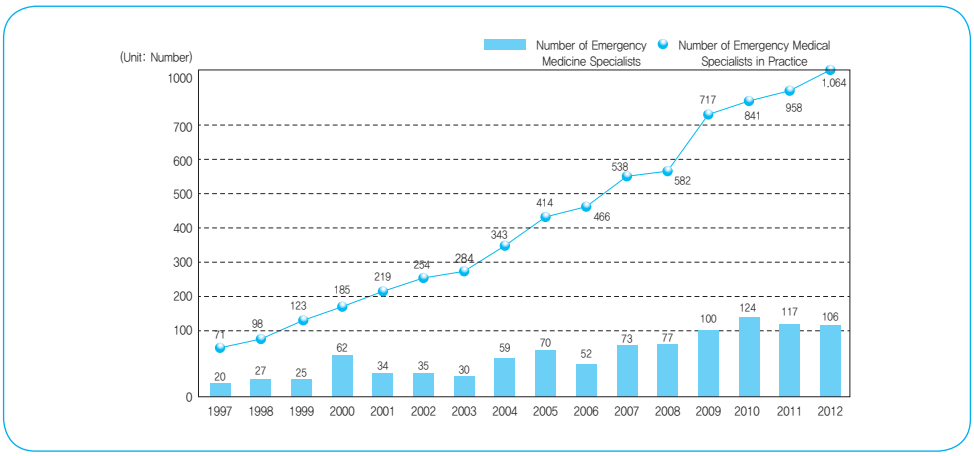
## 2.2. Quantitative Growth Phase (2001~2005)

**Figure 1-5 |** Development Stages of Korea's Emergency Medical Service System




Source: Ministry of Health and Welfare.

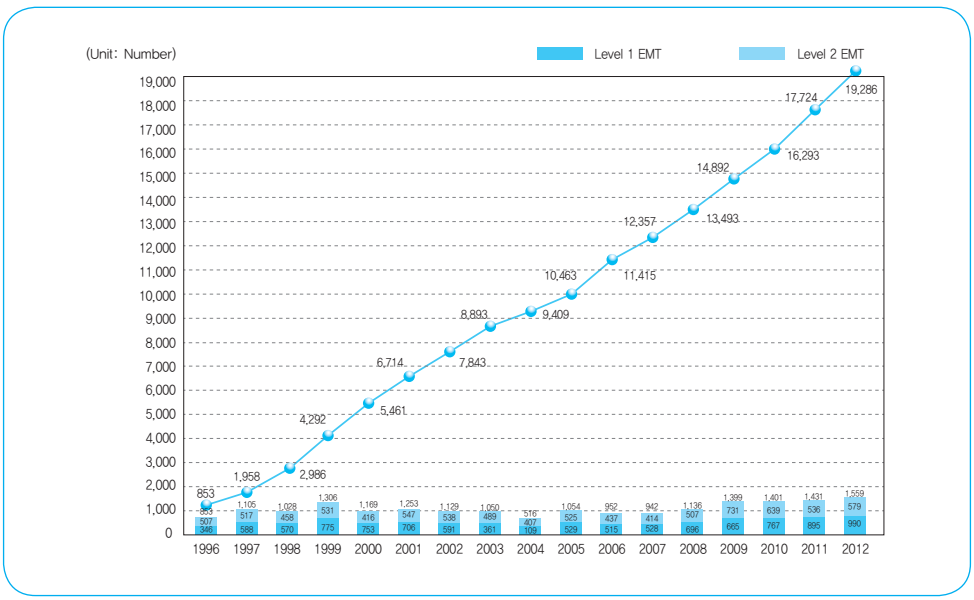
**Figure 1-6 |** Trends in Emergency Medical Specialists




Source: Korean Society of Emergency Medicine.

The number of EMS vehicles and transports relative to population are shown in following Table. Numbers relative to population were extrapolated based on the estimated population size obtained from the National Statistics Agency. The number of 119 EMS vehicles was 6 in 1981, and steadily increased to 270 in 1990 and over 1,000 in 1998; and the number of patient transports using these EMS vehicles totaled 24,291 in 1985 and increased to 322,051 in 1995, 899,004 in 2000, 1,058,996 in 2005, and 1,428,275 in 2010. In 1985, the number of patients transported by EMS vehicles per 100,000 persons was 63 and increased to 743 in 1995, 2,012 in 2000, 2,287 in 2005, and 2,998 in 2010.

**Figure 1-7 |** Trends in Emergency Medical Technicians




Source: Korean Society of Emergency Medical Technicians.

**Table 1-5 |** Trends in Ambulance Transports

| | Ambulance Station | Ambulance Call | Transport | Number per 100,000 | | |
|---|---|---|---|---|---|---|
| | | | | Ambulance | Patient Transported | Patient per Day |
| 1985 | 78 | 31,298 | 25,880 | 0.2 | 63 | 0.2 |
| 1986 | 94 | 37,557 | 31,632 | 0.2 | 77 | 0.2 |
| 1987 | 117 | 45,068 | 39,027 | 0.3 | 94 | 0.3 |
| 1988 | 128 | 54,081 | 49,493 | 0.3 | 118 | 0.3 |

| | Ambulance Station | Ambulance Call | Transport | Number per 100,000 | | |
|---|---|---|---|---|---|---|
| | | | | Ambulance | Patient Transported | Patient per Day |
| 1989 | 151 | 69,962 | 57,444 | 0.4 | 135 | 0.4 |
| 1990 | 207 | 85,657 | 70,247 | 0.5 | 164 | 0.4 |
| 1991 | 281 | 106,508 | 87,657 | 0.6 | 202 | 0.6 |
| 1992 | 353 | 116,560 | 95,491 | 0.8 | 218 | 0.6 |
| 1993 | 406 | 153,606 | 125,202 | 0.9 | 283 | 0.8 |
| 1994 | 505 | 210,692 | 167,252 | 1.1 | 375 | 1.0 |
| 1995 | 619 | 425,017 | 335,086 | 1.4 | 743 | 2.0 |
| 1996 | 857 | 592,267 | 463,884 | 1.9 | 1,019 | 2.8 |
| 1997 | 967 | 722,054 | 567,750 | 2.1 | 1,235 | 3.4 |
| 1998 | 1,031 | 911,318 | 709,184 | 2.2 | 1,532 | 4.2 |
| 1999 | 1,071 | 1,186,627 | 951,867 | 2.3 | 2,042 | 5.6 |
| 2000 | 1,083 | 1,211,810 | 945,834 | 2.3 | 2,012 | 5.5 |
| 2001 | 1,095 | 1,280,144 | 985,618 | 2.3 | 2,081 | 5.7 |
| 2002 | 1,107 | 1,290,332 | 982,697 | 2.3 | 2,064 | 5.7 |
| 2003 | 1,154 | 1,373,141 | 1,013,874 | 2.4 | 2,118 | 5.8 |
| 2004 | 1,181 | 1,452,366 | 1,076,932 | 2.5 | 2,242 | 6.1 |
| 2005 | 1,209 | 1,493,416 | 1,100,737 | 2.5 | 2,287 | 6.3 |
| 2006 | 1,255 | 1,566,010 | 1,153,553 | 2.6 | 2,385 | 6.5 |
| 2007 | 1,301 | 1,686,138 | 1,235,609 | 2.7 | 2,543 | 7.0 |
| 2008 | 1,310 | 1,809,176 | 1,316,942 | 2.7 | 2,690 | 7.4 |
| 2009 | 1,283 | 1,998,314 | 1,439,688 | 2.6 | 2,927 | 8.0 |
| 2010 | 1,254 | 2,045,097 | 1,481,379 | 2.5 | 2,998 | 8.2 |

Source: National Emergency Medical Center.

The number of emergency care facilities relative to population has also grown. In 2002, 411 emergency care facilities were available, and the number increased to 663 in 2006 and 562 in 2012. For every 100,000 persons, the number of emergency care facilities was 8.9 in 2002 and 11.8 in 2006, decreasing to 8.7 in 2012. But the number of emergency care facilities offering high quality care, such as specialized regional and local emergency care centers, has steadily increased from 2.3 per 100,000 in 2004. Such centers continue to maintain high standards of care through quality management.

Table 1-6 | Trend of Emergency Care Facility

| Year | Total | Regional ED | Specialty ED | Local ED | Emergency Facility | Other Emergency Room | Total Number 1 Million | ED per 1 Million |
|---|---|---|---|---|---|---|---|---|
| 2002 | 411 | 15 | 1 | 106 | 289 | | 8.9 | |
| 2003 | 419 | 15 | 1 | 106 | 297 | | 9.1 | 2.5 |
| 2004 | 481 | 16 | 2 | 93 | 319 | 51 | 9.3 | 2.3 |
| 2005 | 549 | 16 | 3 | 98 | 324 | 108 | 11.5 | 2.4 |
| 2006 | 663 | 16 | 4 | 100 | 327 | 106 | 11.8 | 2.5 |
| 2007 | 556 | 16 | 4 | 100 | 329 | 107 | 9.3 | 2.5 |
| 2008 | 592 | 16 | 4 | 105 | 329 | 138 | 11.5 | 2.6 |
| 2009 | 593 | 16 | 4 | 112 | 328 | 133 | 11.2 | 2.7 |
| 2010 | 593 | 16 | 4 | 117 | 329 | 127 | 9.2 | 2.8 |
| 2011 | 593 | 21 | 2 | 115 | 323 | 132 | 9.1 | 2.8 |
| 2012 | 562 | 21 | 2 | 113 | 304 | 122 | 8.7 | 2.7 |

Source: National Emergency Medical Center.

## 2.3. Qualitative Growth Phase (2006~2010)

The number of level 1 and 2 EMTs relative to population also increased. In 2003, 2.4 EMS vehicles were served by 5.6 EMTs per 100,000. In 2012, 2.6 EMS vehicles were served by 11.5 EMTs per 100,000. The ratio of level 1 EMTs increased from 31.9% in 2004 to 44.9% in 2012 and, as a result, more professional EMTs were in service.

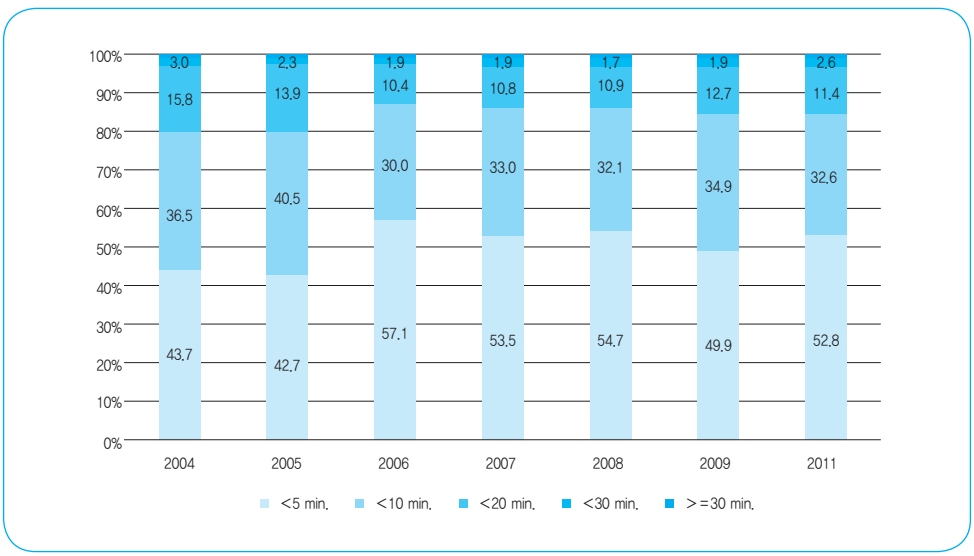
Table 1-7 | Ambulance and EMTs per Population

| Year | Ambulance | Ambulance per 100,000 | EMTs | | | |
|---|---|---|---|---|---|---|
| | | | Total | Level 1 | Level 2 | Per 100,000 |
| 1981 | 6 | 0.02 | | | | |
| 1985 | 78 | 0.2 | | | | |
| 1990 | 207 | 0.5 | | | | |
| 1995 | 619 | 1.4 | | | | |
| 2000 | 1,083 | 2.3 | | | | |
| 2003 | 1,125 | 2.4 | 2,690 | | | 5.6 |
| 2004 | 1,181 | 2.5 | 2,617 | 835 | 1,782 | 5.4 |

| Year | Ambulance | Ambulance per 100,000 | EMTs | | | |
|---|---|---|---|---|---|---|
| | | | Total | Level 1 | Level 2 | Per 100,000 |
| 2005 | 1,209 | 2.5 | 2,876 | 957 | 1,919 | 6.0 |
| 2006 | 1,267 | 2.6 | 3,076 | 1,217 | 1,859 | 6.4 |
| 2007 | 1,355 | 2.8 | 3,406 | 1,325 | 2,081 | 7.0 |
| 2008 | 1,273 | 2.6 | 3,450 | 1,473 | 1,977 | 7.0 |
| 2009 | 1,282 | 2.6 | 4,256 | 1,763 | 2,493 | 8.7 |
| 2010 | 1,254 | 2.5 | 4,772 | 2,077 | 2,695 | 9.7 |
| 2011 | 1,254 | 2.5 | 5,154 | 2,304 | 2,850 | 10.4 |
| 2012 | 1,277 | 2.6 | 5,763 | 2,590 | 3,173 | 11.5 |

Response time of 5 minutes or less was 43.7% in 2004 and 52.8% in 2011.
Source: National Emergency Medical Center.

Figure 1-8 | Response Time of EMS Ambulance by Year

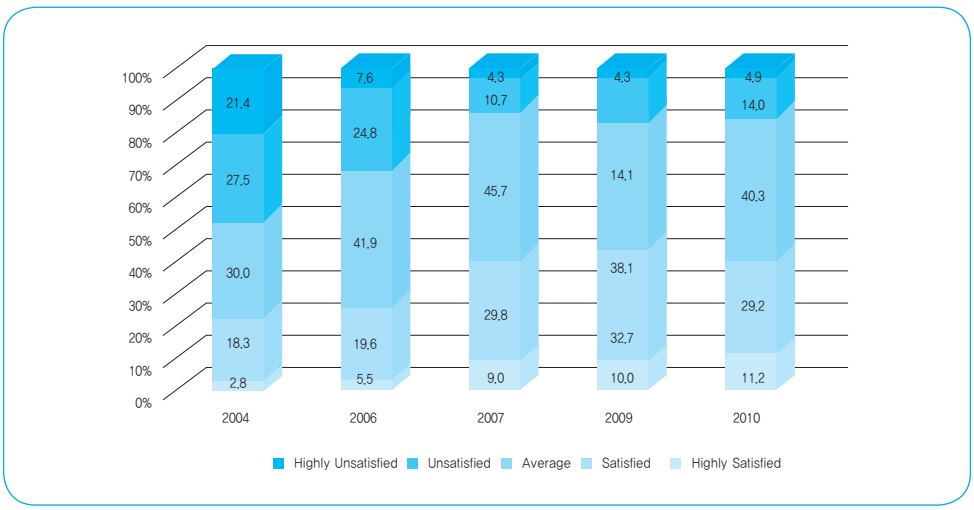



Source: National Emergency Medical Center.

The EMS and ED rates of satisfaction are shown below. The percentage of people having more than a satisfactory ED experience increased from 21.1% in 2004 and 25.1% in 2006 to 40.4% in 2010. The percentage of dissatisfaction decreased significantly from 48.9% in 2004 to 18.9% in 2010.

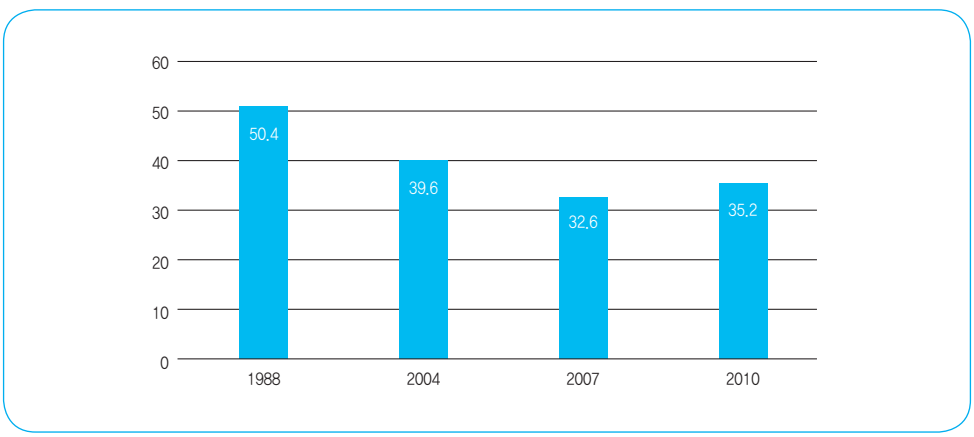
The below figure presents trends in preventable trauma deaths. A direct comparison of preventable trauma mortalities by year is difficult due to the different methods of data extrapolation used; however, preventable mortality decreased from 50.4% in 1998 to 32.6% in 2007, while continuous efforts to further decrease the rates are underway.

**Figure 1-9 |** Satisfaction Rates for Emergency Care and Emergency Department by Year




Source: National Emergency Medical Center.

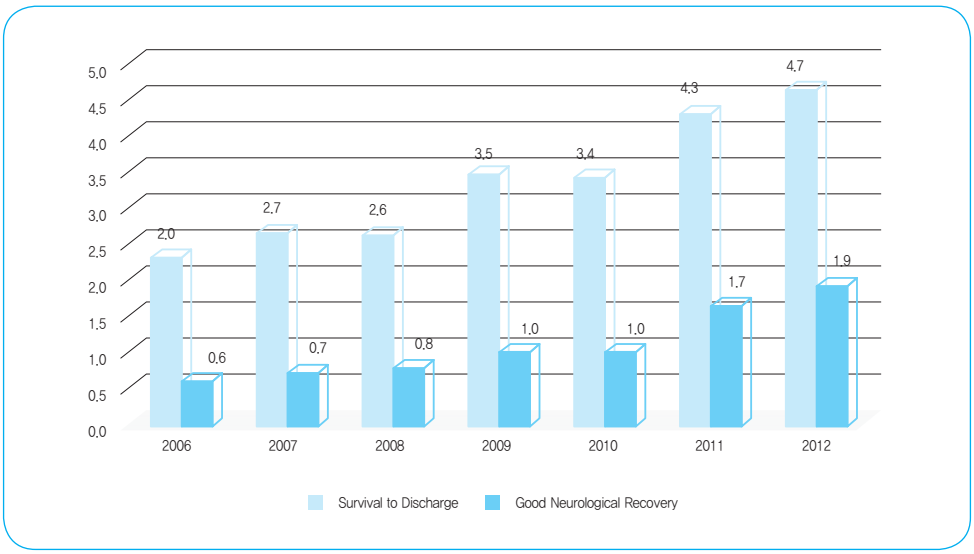
**Figure 1-10 |** Trends in Preventable Trauma Mortality Rates (%) by Year




Source: Ministry of Health and Welfare.

Out-of-Hospital Cardiac Arrest (OHCA) cases have witnessed varied outcomes. The survival to discharge rate has increased from 2.3% in 2006 to 3.4% in 2010, and 4.7% in 2012. The rate of good neurological recovery has also rapidly increased from 0.6% in 2006 to 1.0% in 2010, and again to 1.9% in 2012.

Figure 1-11 | Out-of-hospital Cardiac Arrest Outcomes by Year




Source: Korea Centers For Disease Control and Prevention.

Table 1-8 | Out-of-hospital Cardiac Arrest Outcomes

| | Year | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Total | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
| Pre-hospital ROSC | 1.6 | 0.8 | 0.8 | 0.9 | 1.4 | 1.3 | 2.3 | 2.7 |
| ROSC | 17.3 | 12.4 | 14.8 | 17.3 | 17.1 | 16.5 | 19.9 | 20.7 |
| Survival to Admission | 10.0 | 7.8 | 8.9 | 9.4 | 10.1 | 9.9 | 11.2 | 11.5 |
| Survival to Discharge | 3.5 | 2.3 | 2.7 | 2.6 | 3.5 | 3.4 | 4.3 | 4.7 |
| Good Brain Function | 1.2 | 0.6 | 0.7 | 0.8 | 1.0 | 1.0 | 1.7 | 1.9 |

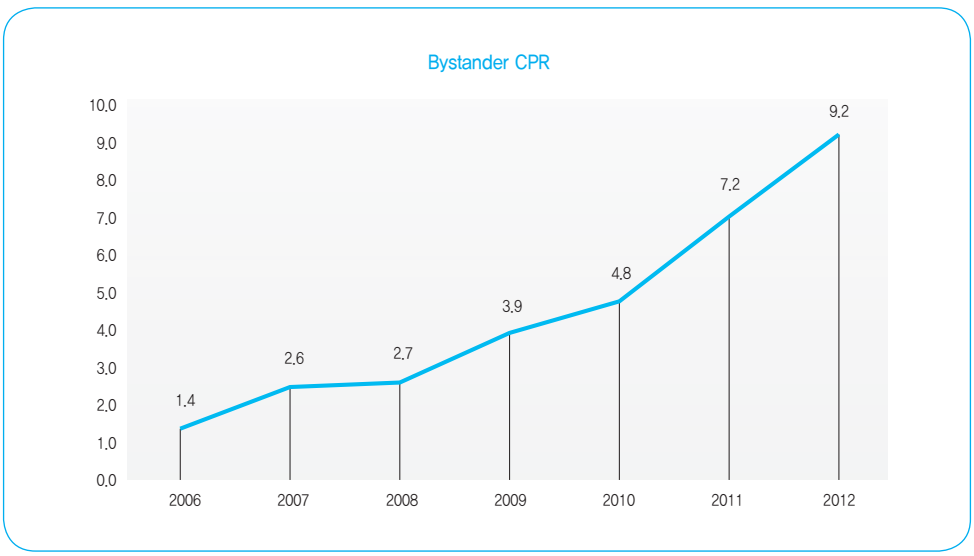
ROSC, return of spontaneous circulation.

Source: Korea Centers For Disease Control and Prevention.

## 2.4. Advanced System Phase

As a result of more available education and CPR training for the public, the rate of CPRs administered by bystanders increased rapidly from 1.4% in 2006 to 4.8% in 2010, and 9.2% in 2012.

Figure 1-12 | Rate of CPRs Administered by Non-hospital Staff (Bystanders)




Source: Korea Centers For Disease Control and Prevention.

# Chapter 2

## Background and Rationale of Constructing an EMS System

1. State Prior to Implementation of the EMS System
2. Historical Summary of the EMS
3. Decision-making Process behind the EMS System
4. EMS Systems in Developed Countries

# Background and Rationale of Constructing an EMS System

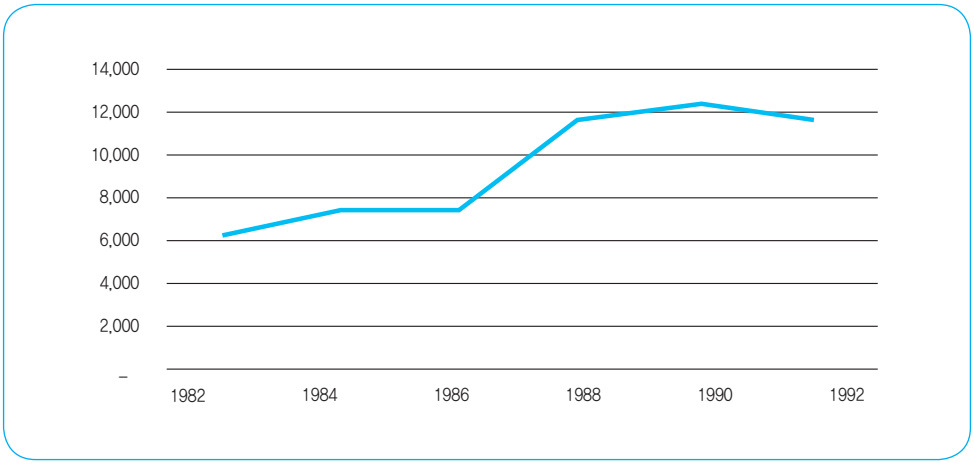
## 1. State Prior to Implementation of the EMS System

### 1.1. Increasing Need for General Emergency Care

In the late 1980s, the media made the public increasingly aware of cases involving inadequately treated emergency patients. As a result, social demand for emergency care, especially for patients admitted at night, heightened.[1] Furthermore, as the mortality rate of transport accidents exceeded 10,000 in 1988, the proportion of chronic degenerative illnesses increased, as well as the need for emergency medicine.[2] In Korea, the leading cause of mortality in 1988 was malignant neoplasm, followed by unexpected accidents, neurovascular diseases and cardiac illnesses, all of which require immediate emergency treatment.[3]

1. The Dong-A Ilbo. "Emergency patient rejected by three hospitals died." June 30, 1989 (Korean).
2. The Korea Institute for Health and Social Affairs. Evaluation of Emergency Medical Services System. 1993. Seoul (Korean).
3. The Korea Society of Emergency Medicine. Proposal for Establishment of New Specialty Medicine. The Journal of Korea Society of Emergency Medicine. 1992;3(2):5~9 (Korean).

Figure 2-1 | Number of Deaths by Motor Vehicle Injury (1882~1992)




Source: KIHASA.

Table 2-1 | Trends in Cause of Death by Year

| Year | '84 | '89 | '91 |
|---|---|---|---|
| 1 | Neurovascular Disease | Neurovascular Disease | Neurovascular Disease |
| 2 | Hypertensive Disease | Hypertensive Disease | Motor Vehicle Injury |
| 3 | Gastric Cancer | Motor Vehicle Injury | Hypertensive Disease |
| 4 | Chronic Liver Disease | Gastric Cancer | Gastric Cancer |
| 5 | Tuberculosis | Chronic Liver Disease | Chronic Liver Disease |
| 6 | Hepatic Cancer | Hepatic Cancer | Hepatic Cancer |
| 7 | Motor Vehicle Injury | Lung Cancer | Lung Cancer |
| 8 | Lung Cancer | Tuberculosis | Diabetes |
| 9 | Suicide | Diabetes | Ischemic Heart Disease |
| 10 | Poisoning | Ischemic Heart Disease | Tuberculosis |

Source: Statistics Korea and KIHASA.

## 1.2. Large-scale Disasters

Major catastrophes that occurred in Korea triggered increased social awareness of the need for a solid EMS system. The numerous incidents that took place during the early 1990s include the Gupo station train collision (1993), Mokpo airplane crash (1993), West sea vessel sinkage (1993), collapse of Sungsoo bridge (1994), Choongju lake ferry conflagration (1994), A-hyun dong gas explosion (1994), Daegu subway station gas explosion (1995), and Sampoong department store cave in (1995). These tragedies brought society's attention to construct and stressed the importance of not only the emergency medical system of hospitals but also that of pre-hospital facilities.[4]

## 1.3. Necessity of Pre-hospital Emergency Care

The number of persons utilizing 119 ambulance services steadily increased after the service of transferring patients to medical facilities after normal business hours became institutionalized in 1982.[5] The 119 ambulance services gradually expanded and, in the 1990s, were offered at no cost nationwide given the rapid increase in usage. During the early stages, the service focused on transferring patients requiring urgent care. However, in the late 1990s, the need for patient transport increased, evolving into a primary duty for fire departments. The quality of service, however, had not improved.[6] The inability to properly react during an emergency, as well as the inability to provide the required treatment whilst on site or during the transfer of patients raised the need to adopt a pre-hospital emergency care system.

## 1.4. Need for an Independent Emergency Care System

Within the national medical care system, emergency medical care is required to adapt to the unpredictable needs of emergency patients. However, because most hospitals in the country were privatized, there was no rationale or economic advantage for the medical system to mandate Emergency Room (ER) operation. As a matter of fact, although implementation of an EMS system in 1991 set standards for emergency departments, most hospitals did not meet the requirements.[7] Because of the public nature of the emergency care system, there was a need to develop a separate management system for assuring public

4. The Korea Society of Emergency Medicine. Proposal for Establishment of New Specialty Medicine. The Journal of Korea Society of Emergency Medicine. 1992;3(2):5~9 (Korean).
5. The Hangyorye Shinmun. " Increase in number of EMS use." August 5, 1990.
6. The Dong-A Ilbo. "Urban disasters increase but very old EMS equipments." November 17, 1997 (Korean).
7. Jong Gil Lee. What is the problem for preparing hospital emergency care? The Journal of Korea Society of Emergency Medicine. 1993;4(1);8-14 (Korean).

usage.[8] Furthermore, in the early stages of EMS system operation, the lack of connection between hospitals and pre-hospital care was pointed out as an issue. Therefore, there was the perception that a consistent process was necessary.[9]

## 2. Historical Summary of the EMS

In response to social demand following the increase in patients requiring urgent care, awareness of inadequate treatment processes, and occurrence of large-scale accidents, the Ministry of Health and Social Service established the "Plan for an Emergency Care System" in 1990, which entailed the designation and management of 54 emergency care hospitals throughout the country.[10] In the midst of a lack of policies or laws regarding urgent patient treatment, facilities, or personnel, however, the said approach itself was inadequate to solve the problems associated with urgent patients. On that account, the Ministry held an EMS system construction committee in 1990 and established a "Basic Plan for Emergency Care System" that outlined an EMS communication system, EMS information center, and designation of emergency medicine hospitals. According to this plan,[11] EMS information centers were established and managed in major servicing areas such as Seoul, Incheon, Jeju and Chuncheon. About 79 designated emergency medicine hospitals were established to provide urgent patients access to care 24 hours a day. Furthermore, in an effort to corroborate on urgent patient care, actions were taken to manage 30 ambulance centers, open military hospitals to the public, utilize military helicopters, and train emergency medicine specialists.11 Accordingly, on July 1, 1991, 11 designated emergency medical hospitals opened "129 Emergency Information Centers" and marked the official start of the EMS system[12] (Emergency Care Management Regulation, Ministry of Health and Social Services Regulation No. 869, 1991). The system entailed the following standards for designating emergency departments and hospitals.

8. The Korea Institute for Health and Social Affairs. Evaluation of Emergency Medical Services System. 1993. Seoul (Korean).
9. The Korea Institute for Health and Social Affairs. Evaluation of Emergency Medical Services System. 1993. Seoul (Korean).
10. The Kyounghyang Shinmun. "Designating 54 hospitals for emergency medical facility." March 28, 1990 (Korean).
11. The Dong-A Ilbo. "Designating 79 hospitals for emergency medical facility." July 25, 1990 (Korean).
12. he Kyounghyang Shinmun. "Emergency medical services system will be operated for 24 hours 7 days" July 1, 1991 (Korean).

Table 2-2 | Emergency Care Management Regulation, Ministry of Health and Social Services Regulation No. 869, 1991

| Emergency Care Management Regulation |
|---|
| 1. Purpose |
| The aim is to build a legal basis for EMS system management to provide timely and appropriate treatment to emergency patients via: 1) development and operation of "129 Emergency Medical Information Centers," 2) designation of an emergency department, and 3) operation of EMS vehicles |
| 2. Main Contents |
| A. Red Cross develops and operates "129 Emergency Medical Information Centers"<br>B. Hospitals in charge of emergency patients are designated as emergency departments or emergency care hospitals<br>C. Those that wish to be designated as emergency departments must meet the requirements of the policy and submit applications to the Mayor of Seoul, Busan, or governors of provinces<br>D. Ambulances can only be operated by the national, regional governments, established hospitals, and non-profit organizations authorized to transfer patients<br>E. Those who operate ambulances must report to the directors of community health centers<br>F. Upon transport of patients and emergency treatment during transport by EMS vehicles, a prescribed amount is charged for treatment<br>G. Those who transport patients must be a non-profit organization authorized by the head of public health centers and have at least 15 EMS vehicles<br>H. EMTs in charge of treatment in the EMS vehicle must be a certified nursing assistant or equivalent with at least 1 year of clinical practice and certification<br>I. EMS vehicles at the time of this policy in force must report in accordance with the standards by December 31, 1991 |
| 3. Comments and Feedback Submission |
| For facilities, organizations and individuals who have comments and feedback about this policy text, please send a completed form with the following elements to the Minister of Health and Social Services<br>A. Comments regarding the policy (comments for and against)<br>B. Name and address (For organizations, please provide the name of the organization and name and address of the representative) |

Source: Ministry of Government Legislation.

## Table 2-3 | Initial Standards for an Emergency Department

| [Annex 1] Standard Requirements for Emergency Departments (Article 5 No 2) | | | |
|---|---|---|---|
| 1. Emergency Room and Annex Facilities | | | |
| Annex facilities should be located near emergency rooms which should be used only for emergency patients. | | | |
| Facilities | N | Standards | Comments |
| A. Emergency room | 1 | Larger than 66.5 m² and having more than 15 beds | Standards can be optional according to region |
| B. Operation room and procedure room | 1 | Space equipped with beds, anesthesia machine, medical devices for simple operation and procedure | |
| C. Hyperbaric oxygen chamber | 1 | Space for hyperbaric oxygen therapy | |
| D. Doctors' room | 1 | Room for doctors' night duty | |
| E. Nurses' room | 1 | Room for more than three nurses | |
| F. Waiting room for family | 1 | Space with public phone which more than 15 people can wait at the same time | |
| 2. Equipment | | | |
| Every emergency room should be equipped for emergency care. The following devices should only be used for emergency patents. | | | |
| Devices | Standards | Comments | |
| A. Laryngoscope | Curved or non-curved blade for endotracheal intubation | Standards can be optional according to region | |
| B. EKG monitor | Device for ECG monitor | | |
| C. Ventilator | Automatic ventilator machine for supporting patient ventilation | | |
| D. Defibrillator | Defibrillator attached to ECG monitor or to ventilator | | |
| E. Hyperbaric oxygen chamber | | | |
| F. Suction Aspirator | | | |
| G. Thomas Splint | | | |
| H. Central venous monitor | | | |
| I. Venous infusion pump | | | |
| J. Syringe pump | | | |
| K. Ambulance | 2 ambulances | | |
| L. Radio communication devices | 1 fixed and 3 mobile | | |
| 3. Human Resources | | | |
| Staff | Standards | Comments | |
| Doctor | More than 4 | More than 1 specialty board certified doctor | |
| Nurse | More than 8 | | |
| Emergency medical technician | More than 2 | | |

Source: Ministry of Health and Social Services Regulation No. 869, 1991

Due to the shortage of emergency medicine specialists, equipment and communication systems, however, the policy was criticized for insufficient planning and preparation. As urgent patients continued to die as a result of inadequate treatment, the social backlash led the Ministry to find solutions for reinforcing the EMS system. The establishment of the Emergency Healthcare Fund and enactment of the Emergency Medical Service (EMS) Act in 1993, official designation of emergency medicine as a specialty in 1994, and the creation of programs for training emergency medical technicians in 1995 set the foundation for a more robust EMS system.[13]

Considering the progression of Emergency Healthcare Fund management, the initial source of funding in 1995 consisted of: 1) penalties for National Health Insurance Law paid by medical care facilities (50%), 2) donations from EMS-related facilities or organizations, and 3) profits earned on the fund, with penalties constituting the main source of the Emergency Healthcare Fund. The fund totaled KRW 1.7 billion and was managed by the Health Insurance Review & Assessment Service agency from 1995 to 2002. The fund was mostly used for emergency care substitution and substitution and reimbursement programs.

## 2.1. Emergency Care System Assessment

The first assessment of the emergency care system was conducted in 1993 and highlighted the following problems about the EMS system:[14]

① Absence of an appropriate emergency care delivery model

② Absence of a pre-hospital care system

③ Weaknesses in information communication services and management

④ Inadequate supply and inefficient use of public EMS vehicles

⑤ Shortage of emergency care professionals

⑥ Absence of public education

⑦ Inefficient management of EDs

⑧ Weaknesses in the disaster medical care system

⑨ Insufficient efforts to publicize the EMS system

⑩ Absence of Emergency Healthcare Funds

⑪ Low cost-effectiveness in current emergency care

13. The Kyounghyang Shinmun. "The Top 10 news of medical society in 1991" December 20, 1991 (Korean).

14. The Korea Institute for Health and Social Affairs. Evaluation of Emergency Medical Services System. 1993. Seoul (Korean).

The following solutions were suggested for a short-term impact:

① Training emergency medicine professionals

② Educating the public

③ More efficient hospital management system

④ Increase fees for emergency services in national health insurance premiums

⑤ Functional systematization of emergency care facilities

⑥ Reconstruction of the information communication management system

⑦ Reconstruction of the disaster medical care system

The following solutions were suggested for a long-term impact:

① Gradually increasing the number of public EMS vehicles

② Establishing trauma centers

③ Establishing an Emergency Healthcare Fund

④ Encouraging private emergency departments to provide emergency care

### 2.2. Expected Benefits of a Systematic EMS System

Emergency care professionals were prohibited from refusing treatment to urgent patients and were incentivized to prioritize emergency patient care, thus contributing to more efficient treatment facilities for emergency patients. Efforts to train emergency care professionals were undertaken, and work expectations for these professionals were established. Furthermore, standardization of emergency medical information systems was enforced to develop an efficient EMS delivery system.

## 3. Decision-making Process behind the EMS System

### 3.1. Emergency Medical Services (EMS) Act

The background and details of the first EMS Act passed in the national assembly on January 7, 1994, are as follows.

The aim of the Act is to solve problems that arose with the management of the EMS system since July 1991 by developing legal reinforcements and policies for prompt implementation and development of the EMS system. As a result, the Act will allow urgent patients to receive appropriate emergency care within a desirable time frame and protect the nation's health and lives.

① Medical providers and emergency medical providers are prohibited from declining treatment to urgent patients, and policies will be developed for medical professionals to prioritize care and treatment of urgent patients.

② For adequate treatment of urgent patients, general hospitals will be mandated to equip emergency medicine facilities, maintain alert treatment systems, and designate after-hours medical care facilities.

③ EMTs certified by the Ministry of Health and Social Services will be allowed to rescue urgent patients on-site and provide emergency treatment during transport.

④ Develop a legal foundation for establishing an Emergency Medical Information Center (EMIC) that would be in charge of receiving calls, counseling, caring for urgent patients, and collaborating with other medical and administrative facilities.

⑤ An Emergency Healthcare Fund will be established within the Ministry of Health and Services, and the fund will consist of contributions from national and municipal governments and penalties paid by emergency medical facilities. The fund will be used for purposes such as loans for uncollected emergency care fees.

⑥ Eradicate illegal ambulance operations, provide regulations about ambulance management, and establish businesses for urgent patient transport.

## 3.2. Certification Program for Emergency Medical Professionals

### 3.2.1. Emergency Medicine Certification Program

In 1987, one private hospital opened the first department of emergency medicine in the country and began a training program for emergency medicine specialists in 1989. Upon founding the Korean Society of Emergency Medicine in December 1989, and with the implementation of a nationwide EMS system in 1990, overseas emergency medicine models were introduced. In 1995, emergency medicine was approved as a specialty and produced 51 emergency medicine specialists via the first board certification examination in February 1996.

### 3.2.2. Emergency Medical Technician Program

With the approval of designating emergency medicine as a specialty field in 1995, the education program for level 1 EMT was also established within colleges to improve treatment of urgent patients in the pre-hospital stage. In December 1995, the 1st EMT certification examination produced 347 level 1 and 363 level 2 EMTs.

## 4. EMS Systems in Developed Countries

The experiences of developed countries in establishing their own EMS systems offer much insight.[15] First, an increase in motor vehicle accidents triggered the initial development of EMS systems. While an increase in motor vehicle accidents indicates an increased number of patients requiring urgent care for acute injuries, it also indicates certain levels of economic development, industrialization and urbanization. In the U.S. and Japan, in particular, reconstruction of the EMS system took place after motor vehicle accidents led to the deaths of more than 10,000 people. Second, public participation is recognized as a fundamental element of the system. The other similarities of foreign systems include: 1) training alternative professionals in the place of physicians, 2) reconstructing an emergency medical information system, and 3) developing a government-led public initiative system.

### 4.1. United States

In the U.S., the need for an emergency care system was first addressed in 1966 but, until 1970, individual efforts were made at the state level. The problems discussed in 1966 included: 1) reinforcement and standardization of emergency care equipment, 2) a need for timely communication between EMTs at the scene or in EMS vehicles with physicians at hospitals, 3) standardized certification and continuous education for EMTs, nurses and physicians, and 4) defining the roles of EMTs and emergency medicine specialists, as well as the need for training such professionals. Later in 1973, after the EMS Act was passed, multiple government agencies considered the need for emergency care and provided opportunities for implementing emergency care systems.

15. The Korea Institute for Health and Social Affairs. Evaluation of Emergency Medical Services System. 1993. Seoul (Korean).

Table 2-4 | Core Components of Emergency Medical Services System as Outlined in the U.S. EMS Act

- Manpower
- Training
- Communication
- Transportation
- Emergency Facilities
- Critical Care Units
- Consumer Participation
- Access to Care
- Patient Transfers
- Standardized Record Keeping
- Public Information and Education
- System Review and Evaluation
- Disaster Planning
- Mutual Aid
- Public Safety Agencies

Source: Tintinalli's Emergency Medicine: A Comprehensive Study Guide, 7e.

This Act highlighted 15 components compromising four tiers depending on the level of emergency service quality offered by hospitals: 1) comprehensive emergency service, 2) major emergency service, 3) general emergency service, and 4) basic emergency service. The association of U.S. surgeons provided an on-call system for emergency care and developed specialties for emergency care, which served as the basis for emergency room operations. For EMTs, a National Training Course Guide was developed to categorize EMTs by their service levels and develop training courses. Initially, emergency services began as treatment of trauma patients and later encompassed treatment of all emergency patients including non-traumatic illnesses. As the need for emergency care specialists increased, the American College of Emergency Physicians was founded in 1972, and the American Board of Emergency Medicine was founded in 1976. As a result, emergency medicine became a medical specialty in 1979, and training modules for emergency medicine specialists were developed between 1987 and 1988.

## 4.2. Japan

The rationale for the development of an EMS system in Japan consisted of the increase in the number of vehicles and transport accidents in the 1950s along with economic growth. With the revision of fire department laws in 1963, emergency patient transport was legally enforced, and fire departments became responsible for emergency services. In accordance with the said revision, laws to select and designate emergency care facilities

were enforced in 1964. Most facilities that submitted applications and were approved were private. Thereafter, in the 1970s, significant problems arose in these facilities as patients were rejected for admission. As a result, the problems were reorganized in the late 1970s. In 1979, the EMS system was executed, resulting in the development of level 1, 2 and 3 emergency facilities, as well as the establishment of the EMIC as a continuum between emergency medical facilities and fire departments. Furthermore, efforts to repair the EMS system continued to motivate industry workers and facilities. Later in 1991, the Emergency Medical Technicians Act was developed to build an infrastructure for human resources expansion. Upon foundation of the Japanese Association of Acute Medicine (JAAM) in 1973, it formed the basis of specialist training, and an emergency medical training program was established in the 1980s.[16]

## 4.3. Comparing the U.S., Japanese and Korean EMS Systems

The following table compares the process of EMS system development in the three countries.

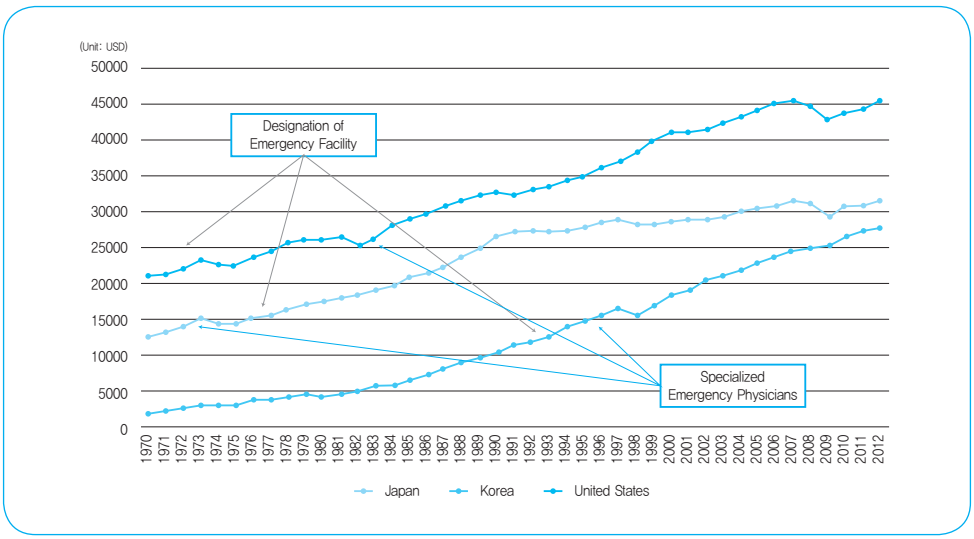
**Table 2-5 |** Process of EMS System Development in the U.S., Japan, and Korea

| | U.S. | Japan | Korea |
|---|---|---|---|
| Issues | Increase in motor vehicle injuries | Increase in motor vehicle injuries<br>Suboptimal emergency care | Increase in motor vehicle injuries<br>Suboptimal emergency care |
| EMS Act | 1973 | 1964 | 1995 |
| Hospital Designation | Level 1 ~ 4 in 1973 | Emergency Hospital in 1964<br>Level 1, 2, and 3 ED in 1979 | Emergency Department and Emergency Hospital in 1991 |
| Specialty Board Emergency Physician | Approved in 1979 | 1973 Japanese Association for Acute Medicine (JAAM)<br>Approved in 1980s | Approved in 1995 |
| Emergency Medical Technician | Paramedic | Life Saving Medical Technician in 1991 | Emergency Medical Technicians in 1995 |
| Pre-hospital Transport | Developed by State Governments | Fire-based Program Legislation in 1963 | Fire-based Program Legislation in 1982 |

Source: KiHASA.

16. Hori S. Keio. Emergency medicine in Japan. J Med. 2010;59(4):131~9.

**Figure 2-2 |** GDP per Capita and EMS System Development Policies in the U.S., Japan, and Korea




Source: OECD and KiHASA.

Comparing the time of EMS system development in the U.S., Japan and Korea by economic development, it was observed that practical implementation of emergency care service, such as training of emergency care specialists and designation of emergency care facilities, occurred when the approximate income per person was USD15,000 to USD20,000.

2013 Modularization of Korea's Development Experience
Development of the Emergency Medical Services System

# Chapter 3

## Strategies for Developing the EMS System

1. Key Strategies for Developing the EMS System
2. Methods for Financially Supporting Policy Implementation

# Strategies for Developing the EMS System

## 1. Key Strategies for Developing the EMS System

### 1.1. Emergency Medical Services (EMS) Act

Prior to the EMS Act in 1994, multiple policies and efforts were made to manage emergency care services – the majority of which failed. As the EMS Act allowed standardization of personnel, facilities, and equipment associated with emergency care, development of basic infrastructure for emergency care management became possible. In an effort to establish the basic infrastructure to develop emergency care services, it is very important to present ways to transform social agreement into actualization. Although this stage may differ depending on the country, Korea was very successful by creating the necessary laws.

### 1.2. Providing Pre-hospital Emergency Care via Reinforcement of Fire Department System

Management of EMS vehicles by the fire department was an extension of service efforts for after-hours emergency hospital patients. Furthermore, because fire departments are governed at the national level, the government covered all expenses, making EMS available and accessible to the public. Furthermore, as fire departments were already well-established at the local level throughout the country, emergency services that utilized fire resources were successfully implemented at the municipal levels. As a result, pre-hospital emergency care in Korea, compared to hospital-level care, underwent local-friendly development and enjoyed higher public interest. Although there is no need for all pre-hospital emergency services to be public, many countries provide public emergency services or incur part of the expenses for privately-owned emergency services to support public use. Because EMS usage

by emergency patients is mandatory rather than optional, it is not optimal to place financial limitations on such medical services. As a result, development of pre-hospital services in Korea via fire departments ensured efficient public use of the service. Furthermore, because pre-hospital emergency care services mandate time-efficient usage, optimal dispersion of facilities throughout the country was crucial. Having multiple EMS vehicles onsite effectively reduced response time. Consequently, development of the EMS system with fire departments presented significant advantages. Different systems exist within a given society or country. For example, public polices or Red Cross organizations throughout the country would facilitate implementation of public EMS systems. When developing a pre-hospital emergency care service system, methods to make the system public-centered and time-efficient must be considered.

▷ Public-centered: A transport service that is freely available to the public.

▷ Time-efficient: Fire departments were already familiar to the public, and a fast response was possible.

▷ Locality: Fire departments are already well-dispersed at local and regional levels.

## 1.3. Process for Designating Emergency Care Facilities and Evaluation Programs

In the early 1990s, when emergency care services were first implemented in Korea, patients were concentrated in large hospitals and often were not able to receive optimal care. In addition, medium-sized hospitals could not treat emergency patients due to the shortage of emergency care professionals and/or facilities. Utilizing a designated protocol stipulated by the EMS Act motivated selected hospitals to manage emergency rooms regardless of specific economic or management benefits. Following the designation of emergency care facilities, financial support became available with the establishment of the Emergency Healthcare Fund, which created the basis for performance evaluation of these facilities. Assessment was critical to meet qualifications once the financial support was provided. Through this process, the quality of emergency care facilities improved and, in turn, facilitated the development of an emergency care system at the national level.

▷ Motivation for ED management: Localization of EDs at large hospitals, non-profitable management of EDs, national designation and financial support.

▷ Assessment of EDs: Performance evaluation based on selection and financial support, supporting the increased quality of ED facilities and development of an emergency care system at the national level.

## 2. Methods for Financially Supporting Policy Implementation

### 2.1. Emergency Healthcare Fund

Although emergency care is a fundamental determinant in a nation's quality of life, private investment is difficult to attract because of low financial profitability. As a result, there was a need to develop an emergency care system under government control. Using the Emergency Healthcare Fund, a "substitution and reimbursement program for emergency care" supported the objective of eradicating deaths resulting from the inability to afford medical care. The fundamental goal of the substitution and reimbursement program was to allow prompt utilization of emergency care for patients with limited resources and provide treatment at certain levels, thereby assuring the nation's right to receive emergency care.

2013 Modularization of Korea's Development Experience
Development of the Emergency Medical Services System

# Chapter 4

## Details and Progress of the Emergency Medical Services System

1. Development of a Pre-hospital EMS System
2. Development of a Hospital Emergency Care System
3. Emergency Healthcare System Governance and System Development

# Details and Progress of the Emergency Medical Services System

## 1. Development of a Pre-hospital EMS System

### 1.1. Pre-hospital EMS System Development

#### 1.1.1. Training and Education of EMTs

When the EMS Act was passed in 1994, the EMT certification program was introduced, designating professional emergency care providers for pre-hospital treatment and patient transport. By law, every EMS vehicle is required to have at least 1 EMT.

**a. Certification and Training Program of EMTs**

Based on work expectations, EMTs are categorized into levels 1 and 2. Upon completion of the training program or qualifications, individuals can apply for a national certification examination and receive certification from the Ministry of Health and Welfare. Training facilities are designated by the government; level 1 EMTs hold a degree from a 4-year university or 2- or 3-year college programs specializing in emergency care, and level 2 EMTs are mostly trained in fire departments or other facilities (military academy, coast guard academy, specialized colleges, etc.). Training organizations for level 2 EMTs are designated based on availability of training facilities for accidents and water rescue, types of training instruments, ratio of instructors to students, and availability of teaching physicians (1 emergency medicine specialist per 400 students a year).

The curriculums and training modules for EMT training are determined by the government and entail a total of 343 hours of training – including 50 practicum hours in EMS vehicles and another 50 hours in emergency medical facilities (for a total of 100 practicum hours). For level 1 EMTs, each university or college runs its own curriculum. In

addition to graduates of the schools, persons holding EMS certifications and level 2 EMTs with at least 3 years of experience can apply to take a level 1 EMT certification examination. For level 2 EMTs, persons who have completed at least a high school education and EMT training can apply to take the level 2 EMT certification examination. The first level 1 EMT certification examination was held in November 1995 and resulted in 347 level 1 EMTs; and every year, approximately 500 to 700 EMTs are certified, for a total of 9,592 level 1 EMTs in the country (18.9 level 1 EMTs per 100,000 persons). The first level 2 EMT certification was held in 1995 and resulted in 363 certified EMTs; and every year, approximately 400 to 600 level 2 EMTs are trained for a total of 8.132 level 2 EMTs in the country (16.0 level 2 EMTs per 100,000 persons).

Table 4-1 | Requirements for EMT Training Facilities (EMS Act. Article 24)

| Category | Content | Criteria | Notes |
|---|---|---|---|
| Facility | Lecture hall and training room | 1m²×(number of students)+16.5m² | In case of separate installation, each room must meet the criteria |
| | (Can be equipped separately) | | |
| | Training room for specialized emergency rescues | Must have transportation | |
| | Training room for accident scenes | Must have a pool | |
| | Training room for rescuing drowning victims | | |
| | Desk and chair | Equivalent to number of students | |
| | Rest room | Adequate number (flush toilets separate for men and women) | |
| | Audio-visual facility for other training; light and electric facilities | | |
| Equipment | Mannequin | 1 per 2 students | |
| | Splint | 〃 | |
| | Fixation device | 〃 | |
| | Airway support device | 1 per 5 students | |
| | Oxygen therapy device | 〃 | |

| Category | Content | Criteria | Notes |
|---|---|---|---|
| Equipment | CPR device | 〃 | |
| | AED | 〃 | |
| | Automated CPR machine | 〃 | |
| | Automatic ventilator | 〃 | |
| | Bleeding control device | 〃 | |
| | Slide and beam projector | 1 set | 1 set including screen |
| | Video | 1 set | 1 set including screen |
| | Ambulance | 1 to 10 students | Generic ambulance |
| Human Resources | Advising physician in charge of overall training module management and medical education | At least 1 emergency medical specialist per every 400 students produced a year | Must submit a contract for full-time instructor |
| | Instructor | At least 1 instructor for every 200 students produced a year | Possess teacher's certification at or above middle school education level; must submit a contract for full-time instructor |
| | Teaching assistant | At least 1 TA for every 10 students | Must possess level 1 or 2 EMT certification |
| Other | Appropriate indoor and outdoor facilities for leisure | | |

Source: Ministry of Government Legislation.

### b. Education and Training

In order to maintain EMT certification, the law requires 4 hours of annual supplementary education. As part of such supplementary education, the National Emergency Medical Center (NEMC) provides 6 types of specialized education modules (e.g. specialized AED training) in 9 regional districts in the country for EMTs currently working in the field. Furthermore, 9-week EMT hospital clinical training modules have been implemented since 2006, a program managed by both the NEMC and National Fire Academy. For this program, level 1 EMTs of fire departments receive training in one of 12 to 15 emergency medical facilities, and approximately 200 to 300 EMTs complete this training every year. The National Emergency Management Agency (NEMA) offers overseas training programs for EMTs in an effort to acquire the techniques of emergency care professionals in other developed countries, as well as to benchmark their emergency care service systems. EMTs visit the University of Pittsburgh or the Georgia School of Medicine for 3 months

to complete their EMT training programs. Since the launch of this program in 1996, 177 persons completed the overseas training by 2011. With the revision of the EMS Act in 2011, training of EMTs is being reinforced by mandating at least 20 hours of clinical practice and specialized emergency care education every 6 months.

### 1.1.2. Development of Pre-hospital Emergency Care Facilities

**a. Ground Ambulances**

In the 1980s, in an effort to relieve problems associated with emergency patient transport in the midst of a nationwide curfew, a pilot project was executed to discharge EMS vehicles from fire departments. Later on, positive feedback from the nation allowed expansion of the system in 1983 from Seoul and Busan to 6 major provinces and 7 cities. Between 1994 and 1995, large scale disasters such as the Asiana Airline plane crash and the collapse of the Sungsu bridge placed a spotlight on emergency care systems, and the EMS Act was established. In fire departments, a 7-year Rescue and EMS plan to recruit emergency care professionals was executed from 1995 to 2001, and EMS services were established within each fire station. One EMS vehicle is allocated for an average of 30,000 persons, and an additional EMS vehicle can be added for every 50,000 persons or emergency calls. In general, 2 EMS vehicles are allocated for directly controlled 119 ambulance stations under the EMS agency; while for other ambulance stations, 1 EMS vehicle is arranged. Ambulance stations are set up in place considering population density, and different standards are selected in regards to the size and population density of each municipality. A local EMS corps is set up in areas in which a rapid response is difficult and a small staff is on duty. Different types of EMS vehicles are dispatched depending on the type of dispatch call (fire or emergency), but the same EMTs are dispatched to all events. As of 2013, EMS vehicles can be dispatched to all areas of the country with the exception of a few islands. From 1996 to 2008, 50% of the budget for amplifying EMS vehicles and instruments was aided by the national budget. After 2003, financial support was received from the Emergency Healthcare Fund. Starting in 2005, specialized emergency teams for seniors were facilitated in response to the aging society; and in January 2011, 109 EMS vehicles were in place. In 2008, a transport system was implemented for emergency blind spots in rural areas, and policies are being pushed forward to introduce 226 critical care transport EMS vehicles with telemedicine and ECG monitoring equipment during pre-hospital transport. Currently, specialized EMS vehicles are operated targeting pregnant women, motorcycles, bicycles and summer heat.

**b. Helicopter EMS**

Helicopter EMS began with 2 helicopters used by the Seoul Metropolitan Fire and Disaster Headquarters for saving victims from fires in a high-rise building in 1979. In 2004, with the enactment of fire laws, one or more aerial emergency teams were put in place for

every ministry of fire prevention and municipal fire departments. In 2011, the Rescue and Emergency Medical Services (R-EMS) Act was renamed the "Air Rescue EMS Team." If an area is under the authority of NEMA, the entire country is under the scope of rescue; and if under the command of the municipal fire departments, the scope is the corresponding city or province. In 2012, there were 15 aviation departments consisting of 27 helicopters – three of which were under the jurisdiction of NEMA. Fourteen cities and provinces have departments of aviation except for Daejeon and Jeju. Each aviation department is mandated to own 1 helicopter, 1 gasoline transport vehicle and 1 tow truck. The responsibilities of the Air Rescue EMS Team consists of saving lives, transporting emergency patients (including inter-hospital transport of patients with physicians), and transporting organs for transplants.

### 1.1.3. Public Advocacy and Communication and Disaster Response System

**a. Public Advocacy**

The 119 telephone number has been used since the Japanese colonial period – historically for reporting fire accidents and now for an increasing list of emergency services. As a result, public awareness of the 119 number in Korea is very high. In 2010, non-profit public advertisements were broadcasted to promote the "rules of the road" for approaching EMS vehicles. After the EMS Dispatch and Management Center (EDMC) was developed in 2012, the public received information regarding the capacity of the 119 line for emergency medical consultations. According to the emergency medical plan for 2013 to 2017, nationwide publicity efforts will be made by the Ministry of Health and Welfare, National Emergency Management Agency (NEMA) and at local levels to promote methods for responding to emergency situations. The public will also receive information on assessing emergency care facilities, treating trauma patients, and requesting EMS vehicles.

**b. Communication**

The EMS Act states that for transport of information between emergency care facilities and information centers, 1) the government and provincial departments should set up Emergency Medical Information Centers (EMIC), and 2) EMS vehicles should have communication equipment. The role of communication in EMS by service stage is as follows.

Table 4-2 | Role of Communication in EMS by Service Stage

| Stage | Communication | Communication Content | Communication Means |
|---|---|---|---|
| Call | Patient-dispatch Center | Request Assistance/ Ambulance | On-line Telephone Wireless |
| | Witness-dispatch Center | Pre-arrival Instruction | |
| Dispatch | Dispatch Center-rescue Squad | Ambulance Dispatch | Telephone Network Wireless Command System Pager/Computer |
| Field | Rescue Squad-medical Team | Medical Guidance on Scene | Wireless |
| Transport | Rescue Squad-dispatch Center | Confirming Information of Destination Hospital | Wireless |
| | Rescue Squad-medical Team | Medical Guidance during Transport | Portable Wireless Communicator |
| | Dispatch Center-medical Team | Notice prior to Arrival | Remote Audiovisual Communication Device |
| Hospital | Dispatch Center-medical Team | Sharing Patient Information | Telephone/Wireless Portable Wireless Radio Communicator |
| Return | Rescue Squad-dispatch Center | Preparation for Next Dispatch | Wireless Portable Wireless Communicator |

Source: Emergency Medical Service Act.

*a) Unification of Call for Ambulance*

In order to allow efficient use of EMS for the public, all emergency calls related to emergency patients and accidents should be received by one comprehensive call center, free of charge, and have no differences in use between regions. In Korea, emergency calls are currently received by 119 (used by fire departments). Previously, they were received by the 129 Emergency Patient Information Center (EPIC) (prior to 1997) and the 1339 Emergency Medical Information Center (EMIC) (1998~2012). As a result, information on patient incidences was dispersed, and there was confusion among departments. As the 119 fire dispatch center became responsible for information management of emergency treatment and patient transport, a pre-hospital emergency reporting system was incorporated into the 119 fire dispatch center, EMS Dispatch and Management Center (EDMC). Communication

facilities at fire departments were first established in 2004 with the development of the "Fire Department and Fire Station's Dispatch Center Installation and Management Standards." The previous communication system, which was individually operated by dispatch centers within every fire department, was changed to an integrated system at the provincial level. Consequently, as of 2012, the dispatch centers of 18 fire headquarters and 35 fire departments were in charge of receiving reports and dispatching EMTs in 2013.

*b) Ambulance, EMICs, and Hospitals*

In an effort to develop emergency medical communication systems between organizations, several wireless communication systems had been implemented but proved unsuccessful due to management and technical problems such as limited cooperation and intermittent frequency connections. Presently, cellular phones, which have been widely used since 2000, are the most frequently utilized communication equipment for pre-hospital emergency medical communication systems.

**c. Disaster Preparation**

In the event of a domestic disaster, the responsibilities of emergency rescue fall under the fire department. Medical assistance in such emergencies was the responsibility of the central or local emergency disaster control department, and was delivered by emergency medical teams or emergency medical facilities in the field. Mobile emergency medical facilities were distributed among regional emergency departments. By 2012, 19 mobile emergency medical facilities were placed throughout the country. Disaster Medical Assistance Teams (DMAT) based in local medical facilities numbered an average of four teams per province (totaling 64 teams in the country), and each team is composed of five medical providers and three health management professionals (equipment, public relations, and communication) who support the activities of field emergency medical facilities or medical examinations at emergency medical agencies in the event of a disaster. Guidelines for prompt response and emergency support for the above teams were developed in 2012, and an annual training for these teams has since been provided. However, there is a tendency for prompt communication, request for cooperation and assistance to be delayed due to inefficiencies in cooperation systems among organizations.

### 1.1.4. Evaluation of Pre-hospital Care and Medical Oversight System

According to a 2005 research report presented by the Korea Health Industry Development Institute, the rate of appropriate emergency care for six major emergency conditions in the field and during transport including cardiac arrest and trauma of multiple causes, was reported at 19.3%; and in research conducted by the NEMC in 2009, the same rate had increased to 36.8%. These figures came as a shock to the public and were the result of a lack

of expertise among 119 EMS providers, as well as the absence of systems for conducting medical oversight and direction, and managing quality.

**a. Assessment of Pre-hospital Emergency Care**

A partial assessment of pre-hospital emergency care prior to 2005 was conducted for research purposes. In 2006, a measurement index for a pre-hospital assessment model was developed by the "Emergency Medical Services Index and Evaluation/Appraisal Method Development Research" (Ministry of Health and Welfare, 2006). The output has been incorporated into emergency quality management since 2006 in Seoul (Seoul, 2006). The assessment was conducted for major emergency conditions (cardiac arrest, sever trauma, respiratory difficulty, chest pain, and stroke) based on 4 levels of management appropriateness: very low, low, average, and high. Afterwards, in 2008, NEMA began producing an emergency medical services index (EMS index) at a national level. The EMS index, a fundamental resource, utilizes NEMA's EMS run sheet (ambulance patient record) database. The EMS run sheet utilizes a nationally uniform format, but a different database is used and managed for the headquarters of each province. Because the EMS run sheet itself does not allow comprehensive collection of resources and production of an index, the "In-depth Cardiac Arrest Registry" was revised in 2011 and adopted in-depth registries for severe trauma and cardio/neurovascular emergencies in 2013 to collect additional information from these patients. In order to integrate this data with hospital level information such as treatment outcomes, an assessment of emergency treatment in the field has been conducted since 2012 using information provided by cooperative hospitals. In the future, as part of the informatics business, integration of data at all times will be promoted.

**b. Development of Medical Oversight and Direction System**

The EMS Act enforces that during airway intubation or medicine administration, Level 1 EMT providers should receive direct orders from physicians except for special circumstances of limited communication. In this context, direct orders from physicians indicate medical direction. Despite the act's provisions, a medical direction system had not been established for a long time for multiple reasons. First, there was an understaffed pool of professionals and EMS providers available to carry out emergency treatments in the field. In 2004, 35.7% of 119 EMS providers were level 2 EMTs, and only 16.7% were level 1, thereby resulting in a shortage of professionals to call for medical direction. Secondly, there were not enough EMS physicians available to provide medical direction. In 2004, there were a total of 45 public health physicians at the EMICs; and among them, only 14 (approximately 1/3) were emergency medicine physicians (Korea Health and Industry Development Institute, 2005). Because a 119 emergency team is not required to allocate physicians, only a number of fire departments had 1 or 2 physicians. In the Seoul fire department, a medical direction room

was set up, and three contract physicians were hired to provide medical guidance. But only 4.5% of total transfers in Seoul utilized the direct medical direction service (NEMA, 2005). Even for cases in which medical direction was provided, standardized guidance and medical treatment was not easily carried out because there was no EMS protocol. Although the Ministry of Health and Welfare developed an EMS protocol, the rate of usage was very low because the protocol was a mere translation of foreign publications and had failed to reflect the types of emergency patients and laws of Korea's EMS system. In 2011, the enactment of the Rescue and EMS Act stipulated development of a standardized EMS protocol by NEMA; and as a result, the said protocol was distributed and became a standard for pre-hospital emergency care in 2012.

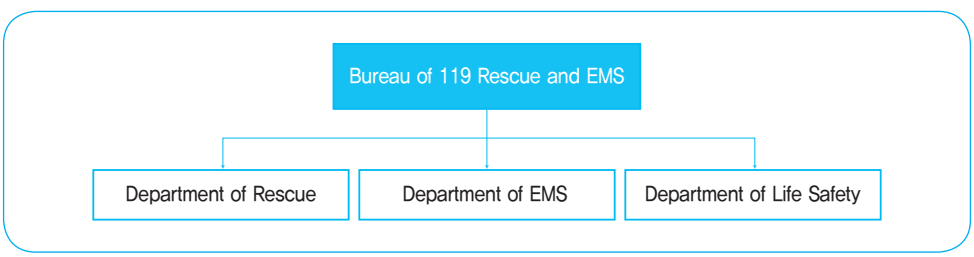
### 1.1.5. Emergency Dispatch and Management Center

In June 2012, the existing responsibilities of emergency treatment counseling at the 1339 EMIC were transferred to the 119 dispatch center. As a result, the Emergency Dispatch and Management Center (EDMC) was established in each city and province. Responsibilities of the EDMC include: 1) consulting and coaching in regards to emergency patients, 2) coaching persons transporting urgent patients and directing them to hospitals, 3) providing and utilizing relevant information, and 4) development and management of an EMS information system. The center must maintain 24-hour on-call physicians, EMTs (level 1 or 2), and consultants with 2 or more years of experience at the EMIC. After the merger of two centers in July 2012, a total of 145 (20 public health physicians, 82 public health workers, 21 data processing and 21 correspondence) are in service. Since then, 1,652,454 counseling services were recorded for the year. About 15.7% were for pre-arrival instruction, and 15.2% were illness counseling (Press release by NEMA, 2013.7.1.).

## 1.2. EMS Organization System Expansion

### 1.2.1. Establishment of the Bureau of 119 Rescue and EMS

Figure 4-1 | Establishment of the Bureau of 119 Rescue and EMS




Source: National Emergency Management Agency.

In 2012, the EMS organization in NEMA was expanded to the Bureau of 119 Rescue and EMS from the Department of Rescue and EMS under the Bureau of Fire Service Policy. The new Bureau has three departments – Rescue, EMS, and Life Safety.

### 1.2.2. EMS Medical Direction and Oversight

Since 2007, the Korean Council of EMS Physicians (KCEMSP) held training programs to produce EMS medical directors in response to the shortage of EMS physicians. The first program led to certification of 65 physicians in 2008 and, as of 2012, a total of 430 emergency teaching physicians were certified. In 2011, the EMS Act stipulated hiring EMS medical directors at every EMS agency. Accordingly, the engaged EMS medical directors are in charge of educating and training EMTs, as well as for providing indirect medical control via a review process and individual feedback for EMTs on the EMS run sheet and in-depth registries.

## 1.3. Process of Pre-hospital EMS System Development

### 1.3.1. Program Implementation (1991~1995)

Prior to the 1990s, a test drive of the 119 EMS system took place intermittently within certain cities. With the execution of policies for EMS system operation, installation of the EMS system was planned for each police station (presently the 119 safety center). Furthermore, a number of nationwide catastrophes from the early 1990s and the enactment of the EMS Act heightened social interest in the EMS system, resulting in plans for developing an urgent rescue and EMS system.

### 1.3.2. Basic Infrastructure (1996~2000)

Since 1995, the number of EMS vehicles increased rapidly every year. In 2000, over 1,000 EMS vehicles were under the control of EMS, corresponding to 1.15 vehicles per 50,000 persons, exceeding the EMS vehicle disposition standard (1 vehicle per 50,000 persons). In 2000, every 119 Safety Center was equipped with an EMS vehicle with the exception of a few limited locations.

Since the introduction of the EMT certification program in 1994, the Fire Department has been promoting specialization of emergency personnel by hiring physicians, nurses, and level 1 and 2 EMTs with 2 or more years of relevant experience. The Seoul Fire Department hired 36 nurses between 1995 and 1996 and, in 1999, 20 level 1 EMTs were hired.

### 1.3.3. Quantitative Growth (2001~2005)

Since 2000, the number of emergency transports and patients transported has increased every year, leading to more than a million transports in 2004 alone.

Table 4-3 | Quantitative Growth in EMS Transport by Year

| Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|
| Transport | 944,435 | 944,775 | 973,475 | 1,035,139 | 1,058,996 | 1,111,171 | 1,189,122 | 1,269,189 | 1,387,396 | 1,428,275 |
| Change (%) | 5.1 | 0.0 | 3.0 | 6.3 | 2.3 | 4.9 | 7.0 | 6.7 | 10.5 | 2.9 |
| Patient | 985,618 | 982,697 | 1,013,874 | 1,076,932 | 1,100,737 | 1,153,553 | 1,235,609 | 1,316,942 | 1,439,688 | 1,481,379 |
| Change (%) | 4.2 | -0.3 | 3.2 | 6.2 | 2.2 | 4.8 | 7.1 | 6.6 | 9.3 | 2.9 |

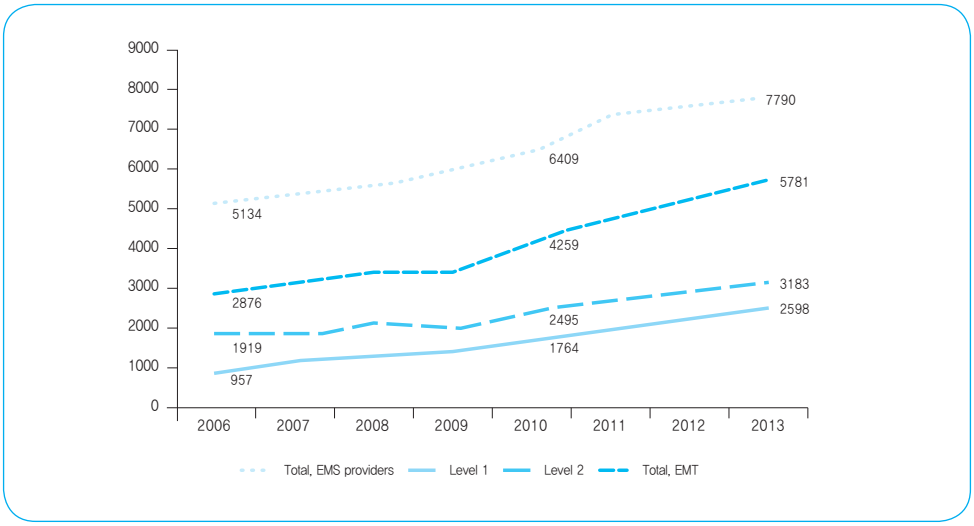
Source: National Emergency Management Agency.

In 2004, the National Emergency Management Agency was opened, and the EMS response team organization was legally designated. Since 2003, the Emergency Healthcare Fund provided financial aid for purchasing emergency equipment. In 2005, the head of the National Emergency Management Agency announced a standard for equipping EMS vehicles.

### 1.3.4. Qualitative Growth (2006~2010)

In the late 2000s, EMTs began to become specialized in certain areas. Disposition criteria for EMTs placed 6 EMTs and 3 drivers per EMS vehicle with 1 captain of the EMS team along with integration of EMS into fire departments in 2011. Previously, qualifications for EMTs required completion of a 2-week emergency education course. But enactment of the EMS Act in 2011 divided licensing of EMTs into level 1, level 2 EMTs, and those who completed the emergency education course – this last group being solely in charge of driving EMS vehicles. Since 2006, more EMTs, especially those in level 1, were recruited. As of 2011, the average probability of having level 1 EMTs on board was 62%.

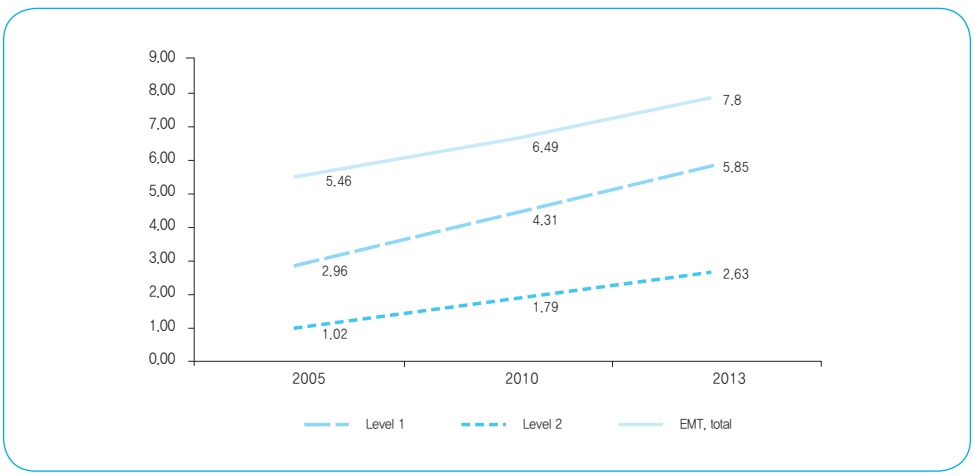
Figure 4-2 | Increase in Number of EMTs in Fire Department by Year




Source: National Emergency Management Agency.

For specialization of an EMS system, a clinical training module for EMTs was put in place in 2006. About 200-300 persons completed the program each year. Since 2007, training programs for EMS medical directors have been conducted by the NEMC under the Ministry of Health and Welfare. Since 2008, a monitoring and evaluation system for EMS was also implemented.

Figure 4-3 | Increase in Higher Level EMTs per 50,000 Population




Source: National Emergency Management Agency.

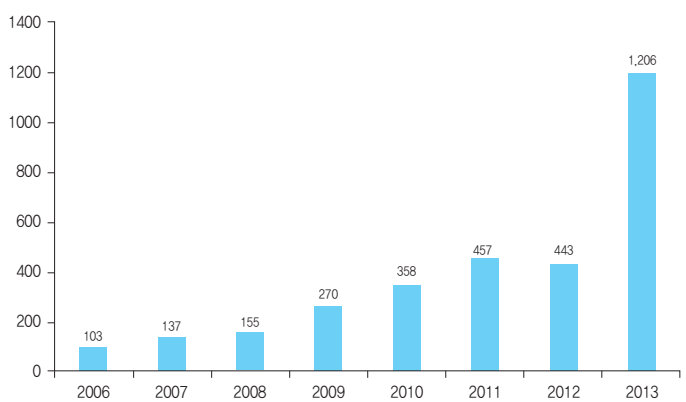
Campaigns for public education had also been initiated. A rescue and emergency education program was launched by the 1339 EMIC, resulting in a high number of participants since 2008. More than 100,000 civilians were educated annually. A separate public education program is continuously being offered by the NEMA and, as of 2012, 1,136 instructors are lecturing at 202 EMS education centers throughout the country.

### 1.3.5. Advanced System (2011~2015)

Upon establishment of the Rescue and EMS Act in 2011, EMS directors were assigned at each EMS agency, commencing development of a medical direction system. As the consulting duties of 1339 EMICs were transferred to the fire department, EDMCs were developed within fire-based dispatch centers, leading to specialization of the 119 EMS.

Among the helicopters that were operated for rescue and fire fighting duties in mountainous regions, seven were exclusively designated for transporting urgent patients. They signed an agreement regarding physicians to run with 10 hospitals in the country for patient transport. Thereafter, patient transport using helicopters showed a more than threefold increase in performance.

Figure 4-4 | Increase in Patients Transported by Helicopter EMS




Source: Ministry of Health and Welfare.

In response to the 2010~2012 plan for an advanced emergency care system, political movements surrounding a disaster response system began. The main elements of these movements were: 1) supporting a disaster health care system at home and abroad, 2) replacing mobile emergency care sets, 3) establishing a wireless communication system

for disaster medical service, 4) supporting the management of a regional disaster medical response team, 5) managing a disaster medical service program, 6) reserving stockpiles of disaster medical service (new in 2012), and 7) expanding emergency underground medical facilities (new in 2012). A total of 18,760,956,000 won (5.8% composed of the Emergency Healthcare Fund) was utilized for these purposes. In 2012, the Ministry of Health and Welfare executed a project for developing a standard manual for constructing and managing a national disaster medical service system.

## 1.4. Overcoming the Obstacles of Pre-hospital EMS System Development

### 1.4.1. Merging Pre-hospital Service Systems (119 vs. 129)

In the 1980s, at the time of the initial implementation of pre-hospital EMS services, the 119 fire service was separated from a private EMS vehicle service – which was operated by organizations such as the Korea Lifesaving Service (founded in 1984) with the permission of the Ministry of Health and Social Services. However, illegal use of the official 129 phone line by private vehicle services, although not officially prohibited by the Ministry, led the Ministry to respond to social criticism of this practice by private companies by discontinuing the 129 number, as well as opening the 1339 EMIC in 1998. This move by the Ministry inadvertently placed the 119 EMS program in charge of the entire EMS program for Pre-hospital services.

According to the EMS statistics report in 2011, a total of 6,940 EMS vehicles are in service in Korea, 4,541 (65.4%) of which are privately operated, and 1,254 (18.1%) belonging to the 119 EMS. Furthermore, data from the National Emergency Department Information System (NEDIS) states that out of those self-admitted patients who were transported by EMS vehicles, 88.7% use 119 EMS service, while the remaining 6.2% and 5.1% use private and hospital EMS vehicles, respectively. Factors that have allowed the 119 EMS to be the primary means of transport include: 1) gratuitous service at no cost to users, 2) an existing communication and dispatch service, 3) expeditious service using GPS, and 4) specialized service via EMT training and securing emergency treatment equipment.

### 1.4.2. Evaluation Program for Pre-hospital Care (Ministry of Health and Welfare vs. National Emergency Management Agency)

Under the supervision of the Ministry of Health and Welfare, in 2005, the Korea Health Industry Development Institute reported that the appropriateness of pre-hospital emergency care by the EMS was 0% for cardiac arrests, and 19% for all other urgent illnesses combined. In this regard, the National Emergency Management Agency (NEMA) raised concerns

about the representation and research methods of the data. Hence, the two institutions debated the introduction of a pre-hospital quality management program but did not reach an agreement and failed to introduce the program. The quality assessment program was in flux until recently when the EMS Act in 2011 put NEMA in charge of quality management. In 2012 and 2013, the said agency executed services for emergency quality management and developed defined methods of surveillance for quality measurement. Additionally, nationwide measures of assessment were created, thereby overcoming concerns raised for the representation of the program. This achievement was made possible due to the practice of a standardized EMS run sheet and availability of an electronic database system, which had existed since 2006. Furthermore, the National Emergency Management Agency corroborated and modified a pre-existing cardiac arrest registry according to the latest CPR instructions. In conjunction with this, introduction of a severe trauma in-depth registry enabled collection of data for categorizing patients by degree of severity on site. The in-depth registries are all collected onto an electronic database, allowing extrapolation, assessment, and feedback of the variables.

### 1.4.3. Specialization of the Dispatch Center

The absence of a specialized EMS dispatch system and inadequate medical oversight posed the biggest challenges for the fire-based EMS system. And a shortage of higher level EMTs was the main obstacle. For example, critical care ambulances programmed for severe illnesses could not staff enough higher level EMTs.

Due to the shortage of level 1 EMTs and their inadequate stationing, only 0% to 14.3% of level 1 EMTs were positioned at 119 dispatch centers of 7 cities and provinces as of 2010. Such shortage of human resources interfered with the implementation of a triage dispatch system widely accepted in other developed countries.

For implementation of a multi-tiered dispatch system, an execution plan for the advancement of a pre-hospital EMS system (2008) and Korean medical priority dispatch system (K-MPDS) (2009) were developed. In November 2010, a pilot program of the system was initiated in two metropolitan regions. In June 2012, the consulting duties of 1339 EMICs were transferred to the 119 dispatch center. In addition, the establishment of the 119 Emergency Dispatch Management Center (EDMC) within the 119 dispatch center allowed expansion of human resources for level 1 EMTs and nurses. Since 2012, the EDMC has developed guidelines for directing pre-hospital CPR, and quality assessments are continuously being conducted.

### 1.4.4. EMS Medical Direction and Oversight

Despite existing regulation for the medical direction of EMS contained in the EMS Act of 1994, in practice, the infrastructure was insufficient to support this advancement. In 2005, the Ministry of Health and Welfare and the National Emergency Management Agency agreed on plans for improving EMS service on the scene and during transport, one element of which entailed managing a volunteer group of medical direction physicians belonging to 119 and emergency medical facilities. Although EMS managed the physician group of between 562 and 719 physicians every year from 2005 to 2007, no guidelines were available for the qualifications, rights, responsibilities, and benefits of the physicians; often, the system was operated through the voluntary participation of physicians and without intermediary centers between EMTs and physicians, thereby requiring EMTs to call physicians directly. In addition, problems arose with the performance and response rates of the physicians when requesting direct medical control of calls by EMTs. This volunteer-based medical direction program was not successful.

Since 2007, the Korean Council of EMS Physicians organized in 2006 held training programs to produce professional and certified EMS physicians in response to the shortage of such physicians. The program was approved by the Korean Society of Emergency Medicine and supported by the Ministry of Health and Welfare. The first program led to the certification of 65 people and, as of 2012, a total of 430 EMS physicians were certified as medical directors. In 2011, the Rescue and EMS Act stipulated hiring certified EMS physicians at every EMS agency of fire departments. The Act also states full-time or part-time salaries and specific duties for the EMS directors, such as education of EMTs, quality assurance programs for pre-hospital care by EMTs, and development of EMS protocol. At present, the establishment of a research program is underway to corroborate EMS protocols for direct and indirect medical control.

## 2. Development of a Hospital Emergency Care System

### 2.1. Development of a Hospital Emergency Care System

#### 2.1.1. Development of Emergency Department Personnel

The EMS established in 1993, developed appropriate standards for human resources, equipment and facilities, as well as enforced maintaining a state of emergency for treatment at all times including holidays and late at night.

In 2000, all EDs were shaped by scale into 3 levels – the regional ED (1st level), local ED (2nd level), and emergency facility (3rd level). These were determined by the new EMS Act which described the criteria for each ED level. This new category of ED has been a fundamental infrastructure of the hospital emergency care system in Korea.

Recent revisions of the EMS Act in August 2012 further reinforced the administration and supervisory functions of EDs by grading health insurance premiums based on a performance evaluation program. Particularly in the area of human resources, the revision called for an on-call staffing for specialty care providers.

The EMS Act states providers of ED, namely emergency medical professionals who solely assume ED duties and no other, are set as standards of EDs. For doctors, the number, qualification and certification of specialty are added into the standard, resting on the admission capacity of patients. As for emergency medicine specialists, the expected supply is lower than demand until 2020, but alternative approaches are being reviewed to allow physicians of other specialties to provide medical services at ED and address supply shortages. As the current EMS Act allows physicians with other specialties to take the place of emergency medicine specialists, the plan opposes any shortage of emergency medicine specialists and encourages other specialists to serve at EDs temporarily.

Table 4-4 | Personnel Standards by Level of Emergency Department (Physician)

| Category | Criteria | Notes |
|---|---|---|
| Regional ED | The following positions should be filled in response to number of ED visits in previous year.<br>1. 30,000 or more ED visits in previous year<br>- 6 or more specialists including 4 or more emergency medicine specialists<br>2. Between 20,000 and 29,999 ED visits in previous year<br>- 5 or more specialists including 3 or more emergency medicine specialists<br>3. Between 10,000 and 19,999 ED visits in previous year<br>- 4 or more specialists including 2 or more emergency medicine specialists | At least 1 specialist is on duty 24 hours a day |

| Category | Criteria | Notes |
|---|---|---|
| Trauma Specialty ED | - 3 or more emergency medicine specialists at ED<br>- 3 or more trauma specialists in department of surgery | At least 1 specialist at ED on duty 24-hours a day<br>Trauma specialist must be able to arrive within 20 minutes of receiving treatment request from a senior resident of the department of surgery |
| Burn Care ED | - 2 or more emergency medicine specialists<br>- 1 or more surgery specialist<br>- 2 or more plastic surgery specialists | At least 1 specialist at ED on duty 24-hours a day |
| Local ED | - 4 or more physicians including 2 or more emergency medicine specialists | At least 1 specialist or a trainee with 3 or more years of experience is on duty 24 hours a day |
| Emergency Facility | The following positions should be filled in response to number of ED visits<br>1. 10,000 or more ED visits in previous year<br>- 2 or more ER physicians<br>2. Less than 10,000 ED visits in previous year<br>- 1 or more ED physician | At least 1 ED physician or an on-call physician must be on duty 24-hours a day |

Source: Emergency Medical Service Act.

### 2.1.2. Hospital Emergency Care Facility Development

An EMS system should provide fully equipped emergency medical facilities that provide adequate diagnosis and treatment 24-hours a day and minimize mortality and morbidity. In addition to facility resources for treatment, the ED facilities should also have information communication devices for contacting other EMS as well as EMS vehicles for patient transport. EDs within the facilities should be well structured to carry out adequate emergency medical treatments via triage rooms and resuscitation rooms. In most countries, it is common to categorize emergency medical facilities by availability of resources and potential for using special treatment resources. Recently, a growing number of specialized emergency care centers is being observed, such as pediatric specialty EDs, trauma EDs, poisoning centers, spine injury EDs, burn care centers, stroke care EDs, and cardiac care EDs.

Subsequent to the establishment of the EMS Act of 1994 and continuous revisions, general EDs and specialized emergency facilities were designated at 3 levels. Overall, EDs were expanded via development of standards and political and financial support.

According to EMS statistics data of the NEMC in 2004, the number and function of emergency medical facility expansion by level is as follows.

Table 4-5 | Number and Function of Emergency Departments (in 2004)

| ED level (number) | Function |
|---|---|
| National Emergency Medical Center (1) | 1. Support research and policy development for emergency care<br>2. Support evaluation and quality improvement of emergency departments<br>3. Develop guidelines and data for emergency care<br>4. Support operation and activity of the National Emergency Care Committee<br>5. Support and coordinate activities of each regional ED<br>6. Train emergency care providers<br>7. Support and supervise 1139 emergency medical information center<br>8. Development and operation of EMS information and communication system<br>9. Support and coordinate activities during disasters |
| Regional Emergency Department (16) | 1. Treatment of emergency patients<br>2. Provide emergency medical care in disaster<br>3. Train regional emergency care providers<br>4. Other tasks for regional emergency service determined by the Minister of Health and Welfare |
| Specialty Emergency Department (2) | 1. Specialized treatment of burns and trauma |
| Local Emergency Department (93) | 1. Treatment of emergency patients<br>2. Provide emergency medical care in disaster<br>3. Train local emergency care providers |
| Local Emergency Facility (319) | 1. Cooperation with emergency departments at higher levels<br>2. Other tasks for local emergency service determined by the Minister of Health and Welfare |

Source: National Emergency Medical Center.

### 2.1.3. Monitoring and Evaluation of Emergency Department

For the Korean EMS system, pre-hospital monitoring and evaluation is conducted via emergency medical facility assessments by the NEMC under the Ministry of Health and Welfare.

In accordance with the expansion of the Emergency Healthcare Fund in 2003, designation of local and regional emergency departments and sponsorship of operating funds were initiated. Upon designation and sponsorship of emergency departments, expansion of personnel, facilities, and equipment at emergency medical facilities was underway, followed by the need for assessing essential measures of infrastructure.

Afterwards, revision of qualitative measures, such as the optimal emergency care rate and mortality rate, was required for improved service quality. Since 2005, ED performance evaluations were implemented and operated for the advancement of EMS quality improvement.

Evaluation of emergency medicine facilities divides and separately assesses the four areas of mandatory, structural, process, and public domains. Based on the development of basic infrastructure and assessment for mandatory and structural areas, the extent of evaluation was expanded to include process and public domain areas.

Organizations and management systems in charge of government-conducted monitoring and evaluations of hospital EDs were established. Areas and measures of assessment at the hospital level were developed and applied.

Areas and measures of assessment were developed in accordance with the growth level of emergency medical facilities and plans during the later stages. The assessment tools began with an assessment of facilities and personnel and establishing an infrastructure with such an assessment, eventually progressing to expanding the structural, process, and public domain areas.

Table 4-6 | Emergency Department Evaluation Program Major Contents

| Area of Assessment | Contents |
|---|---|
| Mandatory | Development of a minimum infrastructure of legal standards |
| Structure | Evaluation of facility, personnel, equipment and appropriateness |
| Process | Evaluation of treatment process |
| Public domain | Evaluation of public contribution |

Source: National Emergency Medical Center.

## 2.2. Hospital Stage Emergency Healthcare Development

### 2.2.1. Program Implementation (1990~1995)

**a. Emergency Medical Facility Status**

During the program implementation stage, a legal support system for emergency medical facility development was to be established and modified.

The South Korean government and the health care society saw the necessity for a separate entity in medical emergency response during the 1986 Asian Games and the 1988 Seoul Olympics. In December 1989, the Korean Society of Emergency Medicine was founded. Since early 1990, nationwide efforts to establish an emergency medical services system were modeled after Western emergency healthcare systems. Multiple natural disasters that led to tragic consequences in the 1990s further increased the need for a more systemized emergency healthcare system.

*a) "Emergency Medical Service Act" in the 1990s*

In the past, a legal system and facility regarding emergency healthcare fell under medical law. Upon the initial "Emergency Healthcare System Development" proposal in 1990, a fundamental system for such development was instituted.

The enactment of the "Emergency Medical Service Act" in 1994 pivoted the effort to separate emergency healthcare and progress. The emergency room was to be classified as an emergency department, and other emergency treatment facilities and standardized guidelines were established for emergency medical facilities and equipment in general hospitals. Additionally, the Emergency Healthcare Fund was established to reconcile outstanding accounts, which also induced its entry into the emergency medical care system.

The "Emergency Healthcare Administration and Management Regulation" in 1991 designates the following regulations in regards to the emergency department:

<Emergency Medicine Administration and Management Regulation, 1991>

Article 5 (Designating an emergency department)

① To administer and manage an emergency department or Designated Emergency Treatment Hospital (hereafter called "emergency department"), one must acquire approval from the city mayor or the state governor.

② To be designated as an emergency department, the medical facility must be a general hospital with more than 200 beds and satisfy all qualifications listed under annex 1.

③ To be designated as an emergency department, the medical facility must have departments of internal medicine, surgery, obstetrics gynecology, anesthesiology, and orthopedics with qualifying specialists and satisfy all qualifications listed under annex 2.

*b) Emergency Medicine Policy and Legislation Enactment (1994)*

The enactment took place in order to resolve emerging issues and complications from administration and management of the emergency medical care system since July 1991. The legal basis of the emergency medical care system was reinforced, and regulations were strengthened for prompt establishment and improvement of the emergency healthcare system.

In order to provide appropriate care and treatment to emergency patients, the general hospital was to be equipped with emergency medical facilities and maintain an emergency treatment system. Additionally, the hospital was designated and managed as "on-call medical facility" for holidays and after hours treatment.

*c) Emergency Medical Service Act Enforcement Regulation (1994)*

Upon the enactment and promulgation of the "Emergency Medical Service Act," the enforcement regulation was to specify mandatory requirements and subsequent regulations to enforce them.

The total bed availability to be prepared to provide adequate emergency treatment to patients at a given time was set to be 1/100 of the total beds in the hospital. Additionally, the enforcement regulation also proposed the standardized requirements for emergency facilities and equipment in 1994 (see appendix for the detailed requirement list).

### 2.2.2. Basic Infrastructure (1996~2000)

**a. Implementation of Emergency Medicine Specialist Certification**

*a) Emergency Medicine as a New Specialty*

The Korea Society of Emergency Medicine (KSEM) was founded in 1989, and preparations for an emergency healthcare system began in 1990. In 1991, the KSEM arranged the standard protocol for emergency medicine resident training programs. In 1992, a public hearing was held to classify emergency medicine as a specialized subject, which resulted in appointing the KSEM as an associate member of the Korean Academy of Medical Sciences. In 1995, to reflect the social consensus on the importance of emergency medicine, emergency medicine was recognized as a specialized medical science. The first specialist certification exam was administered in 1996. In 1997, 20 emergency medicine specialists were certified and, as of 2012, a total of 106 emergency medicine specialists have been certified.

Table 4-7 | Trends in Certified Specialists in Emergency Medicine by Year

| Year | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 |
|---|---|---|---|---|---|---|---|---|
| Certified Specialists per Year | 20 | 27 | 25 | 62 | 34 | 35 | 31 | 59 |
| Cumulative Number in Practice | 71 | 98 | 123 | 185 | 219 | 254 | 284 | 343 |
| **Year** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** |
| Certified Specialists per Year | 70 | 52 | 73 | 77 | 100 | 124 | 117 | 106 |
| Cumulative Number in Practice | 414 | 466 | 538 | 582 | 717 | 841 | 958 | 1064 |

Source: National Emergency Medical Center.

The "Emergency Medical Service Act" of 1994 listed the standard requirements for human resources, equipment, and facilities, while also specifying that there must be an established emergency care and treatment system for on-call medical professionals to provide appropriate care during the holidays and after hours. In 2000, the emergency departments were categorized into three distinct stages – the national regional emergency department, local emergency department, and local emergency facility. The required number and qualification of staffing professionals were specified respectively depending on size and capacity.

Since 1996, the number of emergency medicine specialists designated to provide care in the emergency department has been increasing (emergency medicine specialists per 100,000 population: 1.66 (2010) → 2.09 (2012)).

Table 4-8 | Emergency Medicine Specialists and Residents per Year

| Year | Emergency Medicine Specialists | | | Emergency Medicine Residents | |
|---|---|---|---|---|---|
| | Certified | In practice | per 100,000 | In Training | In Practice |
| 2008 | 77 | 582 | | 447 | |
| 2009 | 100 | 717 | | 464 | |
| 2010 | 124 | 841 | 1.66 | 445 | 0.88 |
| 2011 | | 958 | | | |
| 2012 | | 1,064 | 2.09 | | |

Source: Korean Society of Emergency Medicine.

**b. Designation of Emergency Department**

In 1999, three new regional emergency departments were designated to conduct medical seminars and training to emergency care providers, as well as to provide care to major trauma patients. Also, a new trauma center was funded to provide specialized trauma care and treatment.

In 2000, with the amendments to the "Emergency Medical Service Act," the medical delivery system was formally classified to follow the order of regional emergency department, specialized emergency department, local emergency department, and local emergency medical facility.

Currently, there are three levels in the emergency healthcare delivery system, including 21 regional emergency departments, 114 local emergency departments, and 302 local emergency medical facilities. Critical cases are to be treated at the regional level, moderate cases at the local level, and minor cases at local facilities.

Table 4-9 | Designation of Emergency Care Facility in Basic Infrastructure Phase

| Year | Content |
|---|---|
| 1999 | Regional emergency department (3),<br>specialized trauma emergency department (1) |
| 2000 | Revision of EMS Act<br>Add regional emergency departments (4) |
| 2001 | National Emergency Medical Center (1)<br>Local emergency departments and local medical facilities |
| 2002 | Add more regional emergency departments |

According to prior legislation, the emergency room was categorized into two stages, including the emergency department and other affiliated facilities. Respective facility and equipment standards were assigned. However, with the amendments in 2000, the National Emergency Medical Center was newly established as the executive center in emergency healthcare.

Also, medical establishments that provide emergency care were reorganized into three levels, including regional EDs, local EDs, and local EMFs. Respective facility and equipment standards were also reassigned. In addition, a specialized ED with new regulations was assigned to treat complex medical conditions.

Table 4-10 | Level, Designation, and Function of Emergency Departments

| Level | Designated by | Severity |
|---|---|---|
| Regional ED | Minister of the Ministry of Health and Welfare | Severe |
| Specialized ED | Minister of the Ministry of Health and Welfare and Governor of provinces | Trauma, Burn, and Poisoning |
| Local ED | Governor of provinces | Moderate |
| Local EMF | Mayor of local government | Mild |

Source: National Emergency Medical Center.

### 2.2.3. Quantitative Growth (2001~2005)

**a. Evaluation Program of Emergency Departments**

The history behind the introduction of the evaluation system and its legal basis has been narrated. This chapter will discuss the major objectives behind the emergency department evaluation program during the quantitative growth period.

- 2003 evaluation performed in regional EDs; and evaluation implemented (anticipated) in local ED
- 2004 primary and secondary evaluations performed in regional and local EDs; and evaluation implemented (anticipated) in specialized EDs and local EMFs

※ Secondary evaluation was performed to rationalize operational grant

- 2005 pilot functional evaluation performed in 2 regional EDs

The Ministry of Health and Welfare managed the evaluation administration including proposal approval, contracting, expense budgeting, and issuing execution standards. The NEMC conducted the overall evaluation and established the pilot evaluation plan to be approved by the Ministry of Health and Welfare. Upon approval, the center announced the evaluation implementation, held a presentation to describe the plan, received feedback, and presented interim findings where it then recommended revisions to be made. The Ministry reviewed the finalized proposal revision and issued program budget and execution standards. The process was consulted by the evaluation committee of expert groups and hospitals.

All emergency departments in the nation were subject to the evaluation. The evaluation period would be one year.

The emergency department evaluation program was conducted to secure and expand Emergency Healthcare Funds and improve the overall emergency medical services system. In addition, the evaluation was necessary in order to measure the quality of the overall emergency department structure, process, and service and improve on assessed shortcomings.

The monitoring of whether or not the initial infrastructure was meeting the basic legal standards of emergency department facilities, human resources, and equipment was able to accelerate the nationwide process of infrastructure establishment in a relatively short period of time.

The monitoring and evaluation supported improving the basic infrastructure establishment. Based on yearly monitoring and evaluation reporting, approximately KRW 12 billion was awarded depending on a graded scale reflective of the evaluation results (KRW 100 million per facility on average). From 2004 to 2008, a total of KRW 63.8 billion was granted to financially aid 120 out of 450 emergency medical facilities throughout the nation. Through the monitoring and evaluation process and financial support, there were 42.4% of emergency medical facilities satisfying the legal criteria in 2008, reflecting a significant improvement from 30.4% in 2004.

**b. Emergency Department Information Network**

In the late 1980s, beginning with the "National Basic Information System," other projects to expand the information network have been pursued, including the establishment of the "Primary Administrative Information Database," "Administrative Information System" (early 1990s), and "High Speed Information Communications Infrastructure" (late 1990s). With the foundation of the research on establishing the "Health and Welfare Information Plan," the Ministry of Health and Welfare aimed to provide definitive and feasible strategies on the informatization of health and medical services along with the health industry, social insurance, social welfare service, and health and welfare administration. In 2005, NEMA initiated efforts to establish a rescue and emergency medical service information system based on the "Secondary National Disaster Response Information Plan" of 2005.

Through the National Emergency Department Information System (NEDIS) database, the information system on patient treatment in the emergency room is extracted from the Order Communicating System (OCS) or the Electronic Medical Record (EMR). The information is then sent to the National Emergency Medical Center's NEDIS server in real-time, enabling the immediate monitoring and analysis of treatment information and quality in each emergency department. This information system is composed of a "standard registration system," "emergency cardiovascular disease registration system," "emergency neurovascular disease registration system," "cardiac arrest registration system," and "major

trauma registration system." This information system is also designed to prevent and manage critical emergency medical conditions, as well as to contribute to establishing the foundation for an integrated information network.

Table 4-11 | National Emergency Department Information System

| Classification | Variables |
|---|---|
| Patient Demographic and Medical Facility Information | Emergency medical center code, patient registration number, birth date, name, sex, insurance, nursing home registration number, doctor license number |
| Outpatient Information | Visit date, date of first symptom, visit symptoms, visit route and method, transfer medical facility, emergency service run sheet number, traffic accident information |
| Initial Examination and Emergency Room Treatment Information | Main symptoms, emergency symptoms, patient reaction to visit, vital sign information, post-admission results, ER discharge time, ER examination, diagnosis at discharge |
| Admitted Patient and Inpatient Treatment Information and Result | Post-admission results, transfer medical facility classification, discharge date and time, post-admission examination, treatment and operation information, diagnosis at discharge |

Source: National Emergency Medical Center.

Table 4-12 | Development of the National Emergency Department Information System (NEDIS)

(Unit: 1 million won)

| Stage | Main Purpose | Budget | Aim |
|---|---|---|---|
| 1st (2003.6~2004.7) | National Emergency Department Information System (s/w) Standardization of treatment information and pilot operation | 115 | Establish foundation for the NEDIS |
| 2nd (2004.10~2005.2) | Establishment of administrative system and implementation Establishment of 16 EDs and administrative support | 735 | Establish foundation for the NEDIS |
| 3rd (2005.12~2006.6) | Development of monitoring system Establishment of 45 EDs and administrative support | 400 | Reinforcement and strengthening of the NEDIS |

| Stage | Main Purpose | Budget | Aim |
|---|---|---|---|
| 4th (2006.12~2007.6) | OLAP (Online analytical processing) system development, establishment of 56 EDs and administrative support | 610 | Reinforcement and strengthening of the NEDIS |
| 5th (2007.11~2008.5) | Establishment of cardiac arrest registration system (in 30 EDs)<br>Standardization of cardiac arrest treatment variables | 500 | Reinforcement of the system in cardiac arrest patients |
| 6th (2008.12~2009.8) | Establishment of critical emergency condition registration system (in 81 EDs)<br>Establishment of emergency neurovascular disease registration system (28 EDs)<br>Establishment of emergency cardiovascular disease registration system (28 EDs)<br>Establishment of major trauma registration system (25 EDs)<br>Administration of cardiac arrest registration system in beta | 850 | Reinforcement of the system in critical emergency condition patients |
| 7th (2009~present ) | Major trauma registration system expansion<br>Cardiac arrest registration system expansion<br>Integration of related organization information network and system<br>Establishment and advancement of NEDIS | 240 | Utilization Activation of the NEDIS |

Source: National Emergency Medical Center.

When the emergency medical facility enters treatable medical conditions into the system, the information gets delivered to the EMTs' portable mobile device wirelessly. With the information network (National Ambulance Information System, NAIS), the EMT can browse the information and make an informed decision on promptly treating and transferring the patient in the field. In addition, the EMT is able to send real-time information on the patient's condition while in transit to the receiving emergency medical facility, which then allows preparation for immediate medical treatment upon ambulance arrival.

The primary function of this NAIS is to determine the emergency medical facility's capacity in treating a brain hemorrhage or critical burn injury; or performing an emergency endoscopy, abdominal operation, or emergency dialysis. Another function is to browse bed and resource availability in nearby facilities, 119 response information (call time, departure time, field arrival time, field departure time, and patient information), and ambulatory transport information.

Table 4-13 | Development of the National Ambulance Information System

(Unit: KRW million)

| Development Stage | Target Area | Main Aims | Budget |
|---|---|---|---|
| 1st (2003.12~2004.7) | Incheon (pilot) | Distribution of ambulance terminals and other h/w<br>Interdepartmental s/w development | 348 |
| 2nd (2006. 12~2007. 6) | Daegu, Ulsan, Jeonnam, Jeju | | 892 |
| 3rd (2007. 12~2008. 5) | Kwangju, Kangwon, Jeonbook | | 849 |
| 4th (2008. 11~2009. 7) | Gyeonggi, Busan, Chungnam | | 1,272 |
| Total | 823 terminals installed (526 119 ambulances, 296 emergency medical facilities, 11 emergency medicine information center, state and local fire departments) | | 3,361 |

Source: National Emergency Medical Center.

The Emergency Medical Information System (EMIS) aims to provide real-time information, extracted from 348 emergency medical facilities nationwide, on emergency room bed availability and treatability of critical emergency conditions (entered by emergency medical coordinators) to the public and 119 response departments through the internet. EMIS also serves to respond to medical emergencies as quickly as possible. By having a comprehensive insight of treatment areas in each emergency medical facility, the system allows the emergency patients to be transferred to the appropriate facility. Also, the system provides prompt and accurate emergency medical information by offering a searchable list of facilities that specialize in certain surgical procedures or medical treatments.

The National Emergency Management Agency has established the standardized Emergency Rescue Information System, which attempts to address the process of a 119 call: records → dispatch order → dispatch to site → emergency rescue response and fire suppression → follow-up management. The system has many tiered divisions and integrates all functions from each level, allowing for comprehensive computerized information, including: resolution of non-response during a 119 call, locating the caller, approximation of incident scale, dispatch order, incident resolution upon arrival, incident report until analysis, operation management, operation control, ambulatory vehicle control, and support management.

The 119 response information, which is the predominant part of the pre-hospital stage of emergency medical care system, is recorded by the 119 EMTs in the EMS run sheet. This protocol is stipulated in the "operation and management of emergency rescue response team" regulation. The report includes treatment and transfer information of the emergency patient. The record is then entered and computerized in the Emergency Rescue Information System database.

**c. Promoting Public Advocacy of EMS**

The emergency healthcare system recognized the importance and necessity of educating and promoting to the public the process of requesting help in case of an emergency and using pre-hospital or hospital stage emergency medical services.

It was as important to provide education on administering CPR, first aid, and a basic disaster response. As such education directly influences survival probability and determines the initial action taken in case of a medical emergency, it was a significant part of improving the quality of emergency medical service.

The emergency healthcare system was established in 1995, but efforts to promote and educate the public about recognizing medical emergency symptoms and reporting emergencies were inadequate.

In 2000, the National Emergency Medical Center was founded and began a national public campaign. In 2006, the "Familiarization of Emergency Healthcare" initiative was launched with emergency medical service information appearing on TV, the radio, internet, and in print.

In 2010, the "National Campaign for a Healthy Heart" was announced. Each regional Emergency Medical Information Center developed campaign material on emergency medical symptom recognition and provided treatment processes.

In response to the increasing number of 119 emergency calls, the National Emergency Management Agency attempted to raise public awareness regarding how to access and utilize 119 services appropriately by posting related information on its website.

There was relatively little public awareness in the early years of establishing the emergency healthcare system during the late 1990s. After 2000, there were deliberate efforts by the National Emergency Medical Center to raise public awareness and understanding of the emergency healthcare system. In 2003, the Center printed and distributed brochures about how to access emergency medical services. The organization also pursued a "Familiarization of Emergency Healthcare" campaign and promoted emergency healthcare systems through various channels of mass media.

Emergency rescue response and first aid training were important functions of the "Emergency Medical Service Act" of 1994. Ambulance drivers, taxi and bus drivers, school nurses, police officers, paramedics, industrial safety officers, physical education instructors, and lifeguards comprised the main target audience of the training. The education process was primarily carried out by private institutions such as the Korea Red Cross. According to statistics, there were 5,624 people who received first aid training in 1996, and 5,859 people in 1997. This figure has been increasing ever since.

In 2000, the National Emergency Medical Center was founded along with regional EMICs, and the center has been taking the lead on providing emergency rescue response and first aid training.

The center pursued qualitative and quantitative growth of the training program. The program was expanded to include training professionals who frequently face emergency situations such as police officers. From 2004 to 2008, a total of 104,472 selected professionals were trained, and portable educational materials and equipment were funded for this purpose. Also, according to the Emergency Medical Service Act revision (2008. 6. 15), Automated External Defibrillators (AED) were required to be installed in airports, large ships, and trains. A new elementary school level subject of "public health" was created, which included CPR training and later first aid training (elementary school public health subject: required subject matter for 5$^{th}$ and 6$^{th}$ graders from 2009; middle and high school public health subject: optional subject matter from 2010).[17]

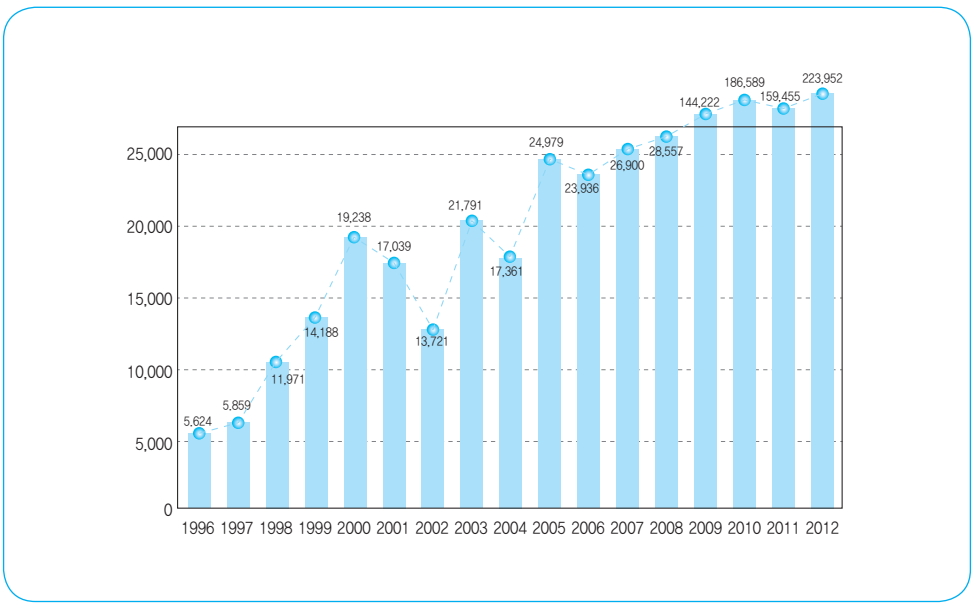
In 2009, the Ministry for Health, Welfare and Family Affairs signed the "Advancement of Emergency Healthcare Proposal," aiming to improve the response rate of medical emergencies in public places by installing AEDs in public facilities and raising awareness of and expanding first aid training. From 2010 to 2012, as a result of the "Advancement of Emergency Healthcare Proposal," a total budget of KRW14.9 billion was invested toward this initiative, result in a significant improvement in the performance level of first responders, including police officers. About 125,562 people among the general public were trained, and the number of AED installations increased from 2,139 in 2009 to 5,340 in 2011.

The "Basic Emergency Healthcare Plan 2013~2017" stipulates continued expansion of first aid training among the general public with stronger promotional campaigns through 2017 (expanding emergency medical consultations and information availability, and enhancing public capability to perform CPR). Regionally, the city of Seoul trained a group of citizens as "CPR Supporters," and other cities also expanded CPR training and launched awareness campaigns.

17. The Ministry of Health and Welfare. 2010~2012 Advancement of Emergency Healthcare Proposal. 2009. Seoul (Korean).

By 1996, there were 5,624 people who received emergency rescue response and first aid training, and the number has been increasing ever since. The number of trainings conducted increased even more after the National Emergency Medical Center and regional EMICs were set up in 2000. Since 2008, with the increase in the number of trained eligible professionals, the number of trainees drastically increased to more than 100,000 people being trained yearly. As of 2012, there were 223,952 people who completed the training.

Figure 4-5 | Rescue and First Aid Training for Non-professionals




Source: 2011 National EMS statistics, National Emergency Medical Center, 2012.

### d. Designation of Specialized Emergency Medical Facilities

Facilities that can also serve as an emergency room are reclassified into three stages – a regional ED, local ED and local emergency medical facility. There are also respective standards for the facilities and equipment. In addition, specialized emergency medical facilities were designated, and new regulations regarding complex medical conditions were established.

The range of those classified as emergency patients include having conditions that may progress to an altered mental status, bleeding or other emergency symptoms, difficulty breathing, and pediatric seizures. The Minister of Health and Welfare may assign one or more regional EDs per province depending on environmental factors. To be designated as a regional ED, the general hospital must satisfy minimum qualifications such as having four or more emergency medicine specialists and two or more other specialists on staff.

**e. 1339 Emergency Medical Information Center**

With the basis of the Emergency Medical Service Act, Emergency Healthcare Fund and emergency healthcare service fees, Korea was able to prepare a foundation for an emergency healthcare communication system through the primary "Basic Emergency Healthcare Plan."

In 1997, the Ministry of Health and Welfare banned the usage of the 129 number, which had historically been used as an emergency phone line and was readily visible from the "Korean Rescue and Lifesaving Team" ambulance vehicles. The number 1339 was to be used in its place and was renamed the "1339 Emergency Patient Information Center." In 2000, the service was again renamed the "Emergency Medical Information Center (EMIC)" and transferred to the regional emergency department from the Korea Red Cross. The "1339 EMIC" included 16 regional emergency departments, four specialized emergency departments and 430 local emergency departments. There were designated hospitals within its communication network with connected wireless capabilities and an information system connected to regional and local fire departments, emergency patient transportation agencies, and emergency medical facilities.

In affiliation with the Ministry of Health and Welfare, 1339 EMIC were established to collect and organize information on an emergency healthcare system and provide information to ambulance management agencies and the public by establishing both wire and wireless communication networks with 119 fire departments, designated emergency medical facilities, and emergency patient transportation agencies. Through the wire network, there were 40 circuits nationwide that provided over-the-phone consultations and dispatcher operation, and local fire departments and police stations maintained their own phone lines – 119 and 112 – and an exclusive hotline for timely transfers. After the National Emergency Medical Center and regional EMICs were established in 2000, emergency rescue response and first aid training were conducted, resulting in a dramatic increase in the number of trainees. In 2002, the target audience was extended to those who worked in the tourism industry. Over-the-phone consultations regarding emergency medical conditions were conducted 24 hours a day, year-round. The consultation was executed by emergency healthcare experts including emergency medical technicians. In regards to emergency medical facility evaluations and quality control, the National Emergency Medical Center provided document investigations, evaluated processes and education at the local level.

### 2.2.4. Qualitative Growth (2006~2010)

**a. Emergency Department Evaluation and Support Program**

Through an emergency medical facility evaluation in 2002, the foundation for emergency medical infrastructure began to form; however, the monitoring and evaluation system

to accurately assess quality was insufficient. Therefore, the Ministry sought to enhance monitoring and the evaluation system with the purpose of decreasing preventable deaths at the hospital stage and strengthening the treatment competency of the three major emergency diseases – cardiovascular disorder, neurovascular disorder, and major trauma.

To initiate the quality improvement process, indicators such as the timeliness of care in the emergency room and mortality rates needed to be improved. To accomplish this, performance evaluations were implemented and aggressively administered.

Since the beginning of the implementation of emergency medical facility evaluations, services were assessed based on quality, compliance with requirements, and overall structure.

Table 4-14 | Performance Evaluation of the Emergency Department

| Indicator Variables | Description |
|---|---|
| Appropriate reperfusion therapy in acute myocardial infarction | Percentage of Acute Myocardial Infarction patients who were given reperfusion therapy among those who were admitted to the ER within 6 hours of onset |
| Brain image scanned on acute cerebrovascular disease | Average time to checking initial brain image in acute cerebrovascular disease patients among those who were admitted to the ER within 6 hours of onset |
| Appropriate transfer rate of critical emergency patients | Percentage of patients who were admitted to the ER and transferred based on a standardized guideline |
| ER length of stay for critical emergency patients | Time from arrival time to discharge time |
| Admission rate of critical emergency patients | Admission rate of patients who were admitted to the ER with acute emergency symptoms |
| Appropriate triage rate | Whether the severity of the illness was measured among patients who were admitted to the ER |

Source: National Emergency Medical Center.

The evaluation assessed the quality of emergency care by reviewing the emergency medical communication network, length of stay in emergency rooms, wait times, percentage of appropriate examinations, and other factors. Through the process, indicators such as timeliness of care and mortality rates improved. The percent of preventable deaths in trauma patients by providing proper treatment decreased from 43% in 2004 to 32% in 2007, and the timeliness of scanning brain images in stroke patients improved two-fold from 55 minutes in 2006 to 25 minutes in 2008.

Table 4-15 | Improvement in Quality of Emergency Care, 2007~2008

| Year | 2007 | 2008 |
|---|---|---|
| Appropriate reperfusion therapy in acute myocardial infarction | 55.30% | 56.80% |
| Time to brain image scanned on acute cerebrovascular disease | 6.0±6.3 hours, median 3.5 hours | 4.8±4.2 hours, median 3.4 hours |
| Appropriate transfer rate of critical emergency patients | 77.9%: 6.3% | 81.5%: 5.1% |
| ER length of stay for critical emergency patients | Median 30.0 minutes | Median 22.0 minutes |
| Admission rate of critical emergency patients | 64.90% | 79.90% |

Source: National Emergency Medical Center.

Based on the performance evaluation results, administrative support to emergency departments was awarded proportionally. The EDs in the 10th percentile constituted the top performers, followed by the 15th percentile, and 25th percentile. These groups received grants worth KRW 50~200 million, while the ungraded centers within the 50th percentile were funded proportionally. The EDs that did not satisfy the legal criteria as an emergency medical facility were penalized and excluded from receiving any national financial support. Depending on the percentage of centers falling short of the legal criteria in each city or province, emergency medical facility aid was cut in order to encourage strengthened provincial management and a more rigorous designation process.

**b. Promotion of the Specialty Emergency Department Program**

Deaths resulting from neurovascular and cardiac diseases, which are directly related to emergency healthcare, have been increasing. In the case of patients with ischemic heart disease, the mortality rate doubled from 13.3 per 100,000 in 1993 to 24.6 per 100,000 in 2003. Overall, industrialization contributed to the increasing number of trauma cases including those resulting from accidents during transportation. Also, with emergency healthcare-related deaths, including suicides, being the number one cause of death of those 40 years of age, there were other negative implications such as loss of a productive working force, calling for increased action by emergency healthcare facilities.

The intention of the program was to designate specialized emergency departments in trauma and cardiovascular disease care. The local ED was to strengthen its treatment competency in treating neuro- and cardiovascular diseases and major trauma. The regional ED was to act as the ultimate treatment facility within the region where advanced medical technology such as cardiac surgery or aneurysm treatment were needed. As of 2008, EDs were nominated to provide special care in trauma, heart and brain diseases, and a total of

41 major trauma EDs, 28 cardiovascular EDs, and 28 neurovascular EDs were designated.

Specialized EDs to treat complex emergency conditions such as burn or poison ingestion were also designated. One additional major trauma ED was added to one existing center, and a designated burn care ED remained as well. One center in providing care for poisoning incidents was newly established, and KRW 150 to KRW 250 million were granted per specialized ED. In order to promptly care for poison ingestion, a poison information center was established. The center provided information on toxic chemical substances, treatment methods, and agencies that retained antidotes 24 hours a day to medical professionals.

**c. Support Rural Emergency Departments**

There were 43 rural counties that lacked emergency medical facilities. These areas were granted funds to develop emergency medical services:

① 1 rural medical service center, 12 public health centers, 13 counties with public medical centers → financial support to expand the facility, equipment, and administration to develop as emergency medical facilities

② 25 counties with hospital-level private medical facilities → those selected were supported to be designated as emergency medical facilities

③ 5 counties without hospitals:

- 2 counties to have a reinforced military hospital (labor and administrative cost not supported)

- 3 counties supported to establish a clinic-level local emergency medical facility

Financial support was given to respective local emergency departments in 6 regions with poor access to emergency medical services:

① 4 regions to establish local emergency departments within an existing general hospital-level local emergency medical facility

② 1 region without a local clinic to select and support among private general hospital-level local emergency medical facilities

③ 1 region without any general hospital-level clinic to select and develop among hospital-level local emergency medical facilities

**d. On-site Disaster Medical Service System**

Korea witnessed several unfortunate disasters such as the collapse of the Sampoong Department Store in 1995, the Daegu subway fire in 2002, typhoon Maemi in 2003, and the oil spill in the Taean Peninsula in 2007. In addition to such catastrophic disasters, there has been an increase in accidents resulting from other small or large disasters. In such disastrous

circumstances, emergency medical services require much larger and coordinated efforts to relieve suffering, as well as a well-organized emergency response system. Also, in order to achieve the existing disaster relief strategy, consistent and repetitive training and education was necessary. Local communities were expected to have an emergency preparedness strategy, including all stages of preparation, a timely response, recovery, relief, and pursue consistent training.

In the case of a major disaster, the purpose of the system is to protect public health and life and minimize preventable mortality and disability. A brief outline of the disaster response is as follows: rescue (fire service) → on-site first aid and hospital transfer decision (public health) → transfer (EMS). In the domestic disaster response system, on-site emergency rescue and first aid are unified under the role of the fire department. The emergency medical service is provided by the emergency medical team or on-site emergency medical tent under the command of the national and local emergency relief administration unit. As of 2012, there were 19 mobile emergency medical centers with portable emergency medical sets, located around each regional emergency department.

The National Emergency Medical Center has been providing disaster relief services during national level events such as the Nuclear Security Summit of 2012 in Seoul and the Yeosu Expo of 2012. Additionally, the Center has also been responsible for disaster relief supply management, administration, and storage, providing both domestic and foreign disaster relief response training and education, and also providing physical examinations and vaccinations to emergency service teams serving as part of a foreign disaster relief response.

The Advancement of the Emergency Healthcare Proposal 2010~2012 stipulates disaster response-related policies. From the Emergency Healthcare Fund program, this proposal was part of the Emergency Healthcare Security Network and Familiarization policy and included the following aspects: providing medical services in case of a domestic or foreign disaster, providing national support in case of a domestic or foreign disaster, replacing expired portable emergency medical sets, establishing a wireless network of disaster medical services, providing local on-site disaster response teams, administrating and managing disaster medical services, securing adequate supplies for disaster medical services (new in 2012), and expanding emergency underground medical facilities (new in 2012). In achieving the aforementioned goals, a total budget of KRW 18.7 billion (5.8% of the total fund) was spent. The yearly average of the total disaster relief expenditure increased from KRW 364 million (0.8%) in 2007-2009 to KRW 10.7 billion (5.8%) in 2010~2011. The Ministry of Health and Welfare also developed the“National Disaster Response Medical Service Administrative System” and “Manual for Disaster Medical Service Administration Development”in 2012.

Table 4-16 | Mobile Emergency Care Sets

| | 2010 | 2011 | 2012 |
|---|---|---|---|
| | 19 | 19 | 19 |
| Total | 126 | 129 | 96 |
| Response | 5 | 16 | 2 |
| Mass Gathering | 34 | 14 | 10 |
| Drill, Individual | 34 | 41 | 29 |
| Drill, Integrated | 47 | 49 | 39 |
| Other | 6 | 9 | 16 |

Source: National Emergency Medical Center.

### 2.2.5. Advanced System (2011~2013)

**a. Implementation of the Regional Trauma Care System**

The rationale behind regionalization is that because all hospitals within the local community are not able to provide state-of-the-art medical technology and resources (labor, facility, equipment), in the cases of certain emergency conditions such as major trauma, poisoning, and cardio- and neurovascular diseases, the patient should be transferred to the hospital that is able to provide the most optimal and specialized care specific to the condition instead of to the nearest hospital.

The basic concepts of having three stages in the emergency healthcare delivery system were maintained in the "2005~2010 Basic Emergency Healthcare Plan"and "2010~2012 Advancement of Emergency Healthcare Proposal." However, beginning with the development of specialized emergency departments in 2010, regionalization of core emergency conditions including trauma is being pursued.

Considering the absence of specialized major trauma care centers and the relatively small number of trauma specialists in Korea, the Ministry of Health and Welfare identified the lack of trauma care units and trauma specialists as an immediate problem. Therefore, the Ministry proposed to establish an emergency trauma care system to reduce preventable deaths in trauma patients to 20% by 2020. Approximately KRW 200 billion from the Emergency Healthcare Fund is budgeted to establish 17 regional trauma centers annually and provide support in recruiting and educating trauma specialists by 2016.

Table 4-17 | Preventable Trauma Death Rate

| Year | 1998 | 2004 | 2007 |
|---|---|---|---|
| Total | 50.4% | 39.6% | 32.6% |
| Pre-hospital Cause | 9.9% | 14.0% | 8.3% |
| Hospital Cause | 40.5% | 25.6% | 24.3% |

Source: National Emergency Medical Center.

There were three to five level 1 trauma centers established around major metropolitan cities that are able to provide treatment and care for trauma injuries from incidents such as falls or car accidents. Also, it was proposed to have general surgery, trauma surgery, and cardiothoracic surgery teams on duty 24 hours a day, as well as to equip heliports for helicopter landings.

There was a pilot demonstration of the newly developed dispatch system of a specialized trauma care team via a trauma case-exclusive helicopter. Additionally, the program reviewed implementing a supplemental emergency medical fee system for major trauma cases. Promoting approximately 20 to 30 EDs nationwide to level 2 trauma centers through extended support was also proposed. Through the program, supporting the administration and management of medical specialists will promote prompt and proper treatment of major trauma patients.

The Ministry of Health and Welfare selected one hospital in each region as regional trauma centers after inviting hospital participation during the initial selection process in 2012. Subsequentlly, trauma centers were established in the regions of Incheon, Daegu, Chungnam, Jeonnam, and Kangwon and are being developed to house advanced trauma care systems. In respective medical centers, funding up to KRW 8 billion is granted to equip trauma care facilities including expanding intensive care units for trauma patients, operation rooms, and bed availability. There will be an additional KRW 700 million to KRW 2,700 million annually available to support the labor cost depending on the supply of trauma specialists.

After the initial establishment of five regional trauma centers in 2012-2013, more centers will be eligible to be receive grants to expand their trauma centers to provide 24-hour year-round care to major trauma patients. Budgeting is also being forecast to include the designation of additional centers.

**b. Hospital Disaster Preparedness**

In the case of a disaster, in addition to fire departments and existing regional mobile emergency medical centers, hospital-level units that are able to respond to medical emergencies have been established. The Disaster Medical Assistance Team (DMAT) includes

1~2 doctors, 2 nurses, and 2 administrators and are coordinated to immediately form an on-site emergency medical service tent to be responsible for providing first aid, supporting medical treatment, and facilitating communication. The DMAT is based in the regional medical facility, and there are 4 teams on average per province. Each team includes 5 medical professionals and 3 public health administrators (supply, promotion, communication), and is responsible for supporting on-site emergency medical services or local emergency medical facilities. Guidelines for the first-order response team and the DMAT were established in 2012, and proper training has been provided at least once a year since 2012.

## 2.3. Problems in Establishing Hospital Stage Emergency Healthcare

### 2.3.1. Designation of Specialized Emergency Departments

In many countries, it is typical to rank emergency medical facilities depending on the capacity, available resources, or availability of specialized treatment centers of the emergency room. Recently, there has been an increase in specialized centers such as children's hospitals, trauma centers, poison centers, spine centers, burn centers, stroke centers, and heart centers. After making major revisions to the "Emergency Medical Service Act" in 2000, the National Emergency Medical Center was established, and the 3-stage emergency healthcare system (regional emergency department/ local emergency department/ local emergency medical facility) was organized with respective facility/equipment standards. During the process, specialized emergency departments were designated to treat complex emergency medical conditions with newly established regulations. As a result, one burn center and two trauma centers capable of providing specialized emergency medical treatments were established.

However, the process was rather limited in the sense that it established few specialized emergency departments instead of creating a systemized specialized emergency healthcare system. Funding was insufficient in developing a trauma center model suitable to Korea, and the capability to perform surgeries 24 hours a day was not achieved. However, efforts were divided to make progress on establishing specialized emergency medical facilities in trauma care and establishing candidate centers.

### 2.3.2. Regionalized Specialty EMS Program

With the intention of establishing a regional and specialized emergency healthcare system to treat core emergency medical conditions such as trauma, neurovascular and cardiovascular diseases, specialized emergency departments were designated. The system aimed to reduce preventable mortality from trauma, 30-day mortality in hospital patients with myocardial infarction, 30-day mortality in hospital patients with cerebral infarction and improve emergency medical service quality.

However, with limited resources distributed in multiple facilities nationwide, providing specialized care including 24-hour surgery availability is not feasible. There are only a few emergency departments that are able to provide immediate emergency medical service in major trauma (24%), cardiovascular disease (32%), and neurovascular disease (18%) situations. And with limited resources, performing around-the-clock surgery is not possible with the existing budget distribution.

Additionally, while specialized centers and specialized emergency departments are included in the Emergency Medical Service Act, the policy tends to overlap in other medical acts or policies that designate cardio- and neurovascular centers such as the Comprehensive Cardiovascular Disease Action Plan.

### 2.3.3. Overcrowding in Emergency Healthcare

In order to reduce the number of unnecessary transfers between hospitals and provide timely and proper medical treatment to emergency patients, the EMTs responsible for transferring the patient, the patient, and the patient's guardians need to be able to properly decide the initial transfer. However, there is a limited number of medical facilities with adequate medical technology or medical professionals available to provide proper care in the cases of critical patients with major trauma or cerebral stroke.

When patients with minor conditions such as the common cold or other mild illnesses are transferred to higher level hospitals, this creates overcrowding in the emergency department, which delays emergency treatment to critical patients with more serious conditions.

As there is no differentiation between emergency medical facilities despite different levels of resource availability, the major-to-mild condition patient ratio is similar in many EDs (9.8% in regional EDs, 7.8% in local EDs). In addition, the regional EDs who should prioritize treating critical emergency patients are suffering from ED overcrowding due to the excessive number of patients with minor illnesses.

# 3. Emergency Healthcare System Governance and System Development

## 3.1. Introduction to Emergency Healthcare System Governance and System Development

### 3.1.1. Emergency Medical Service Act

The case revealed a fatal shortcoming in the existing emergency healthcare system, which prompted the government to establish the "Basic Framework for Emergency Healthcare System Development" in 1990 and subsequently supplement it by signing the Emergency Medical Service Act in 1994. The enactment took place in 1995 and stimulated further development of the emergency healthcare system.

The Emergency Medical Service Act aims to administer regulations in providing proper emergency medical services at the right time to emergency patients in order to protect public health and life and maintain public health at an optimal level. The Act lists the following regulations:

① The Act forbids refusal or denial of emergency medical service by a medical professional, emergency healthcare technician, or other emergency healthcare professionals to emergency patients and regulates corrective measures in prioritizing medical treatment by the health care provider.

② The Act supports the general hospital to be prepared with emergency medical facilities and equipment to be able to provide proper treatment to the emergency patient, to maintain an emergency treatment system and to designate on-call medical facilities to provide medical treatment during holidays and after hours.

③ The emergency medical technician who has been certified by the Minister of Health and Welfare is to perform emergency duties on site where there is an emergency patient and be able to provide first aid during transfer.

④ The legal basis for emergency patient information centers responsible for registering, consulting, guiding, and administering emergency calls is contained in the Act and demands assistance and accommodations to the information center from the medical facilities and government administrative agencies.

⑤ The Ministry of Health and Welfare is to establish the Emergency Healthcare Fund where the fund is collected from national and state level governments and medical facilities. The fund is to be used for purposes including paying for outstanding emergency medical bill.

⑥ The Act forbids management of illegal ambulatory vehicles and puts forth regulations regarding the administration of ambulances for optimal performance. The Act establishes transfer services whose primary function is to transfer emergency patients.

### 3.1.2. Emergency Healthcare Fund

The modern welfare state prioritizes the value of respecting and protecting the life and health of the people. With rapid changes in the modern lifestyle, society, and environment, there is a drastic increase in chronic diseases. Also, with an increase in injury and disease from various disasters, accidents, and poisoning, the demand for emergency medical service is proportionally increasing.

The current emergency healthcare system in the nation is the "East Asian Model" and mimics the "Franco-German Model" where the public is in charge of the emergency healthcare system. Therefore, it is important for the nation to maintain and improve the emergency healthcare system at an adequate level, at which securing sufficient financial funding is essential.[18] It is important to note that in the U.S., the responsibility of managing the emergency healthcare system is consolidated by both public and private institutions, and the American government established a national fund to directly invest in developing the emergency healthcare system and reach the golden age of emergency healthcare system development.[19]

After the enactment of the Emergency Medical Service Act in 1995, a fund managed by the Health Insurance Review and Assessment Service in which the primary source of revenue was from collecting a 50% fee from nursing homes was created, and a substitution and reimbursement program for emergency care was initiated. After the revisions in 2002, 20% of the revenue from traffic citation fines was added as an additional source to the fund. The additional source rapidly increased the scale of the fund, and the Ministry of Health and Welfare took charge of managing the fund with the exception of a substitution and reimbursement program for emergency care. In 2010, 20% of traffic violation fines were additionally added to supplement the fund, which then again increased the scale of the fund.

18. Korea Foundation for International Health. ODA model development of emergency medical services system in developing country. 2013. Seoul (Korean).

19. Judith Tintinalli et al. Tintinalli's Emergency Medicine: A Comprehensive Study Guide, 7e.

## Table 4-18 | Change in Emergency Healthcare Fund Program

| Year | Description | Source |
|---|---|---|
| 1994 | Emergency Medical Service Act signed | |
| 1995 | Emergency Medical Service Act enacted | 50% of medical facility penalties |
| | Emergency Medical Fund established and financed | |
| | Substitution and reimbursement program for emergency care begins | |
| | Health Insurance Review and Assessment Service manages and operates the fund | |
| | Fund operation limited to substitution and reimbursement program for emergency care | |
| 2002 | Revisions made to the Emergency Medical Service Act | |
| | 20% of revenue from traffic violation fines added | |
| 2003 | Fund expansion | 20% of traffic violation fines |
| | Ministry of Health and Welfare to directly manage the fund, but substitution and reimbursement programs for emergency care commissioned to the Health Insurance Review and Assessment Service | |
| | Evaluation of emergency medical facility implemented | |
| 2005 | 2005~2010 Basic Emergency Medical Service Plan established | |
| 2010 | Fund expansion | 20% of traffic violation fines |
| | 2010~2012 Advancement of Emergency Medicine Proposal established | |

Source: Reorganized from Emergency Medical Service Act.

## Table 4-19 | Purpose of Emergency Healthcare Fund

1. Used for substitution and reimbursement program
2. Loans or grants for establishing emergency medical facilities
3. Support programs for effective administration of emergency medical services
4. Finance medical services in case of presidentially declared disasters
5. Provide education and campaign rescue and first aid skills
6. Finance AEDs and other emergency equipment for effective administration of emergency medical services
7. Research and development in emergency healthcare
8. Finance execution of the basic plan and regional emergency healthcare system planning

Source: Reorganized from Emergency Medical Service Act.

In April 2000, the emergency healthcare administrative fee was implemented as part of the national health insurance benefit. This fee supplemented the opportunity cost and administrative cost of medical facilities of providing 24-hour emergency medical care. Not only did profitability improve, but overcrowding of emergency rooms was alleviated, and the system encouraged prioritization of emergency patients with severe conditions by covering the emergency healthcare administrative fee only when the patient met the emergency medical conditions.

Korea is a rare example of implementation of such a system carried out by the national government as a way to expand the emergency healthcare delivery system.[20] As of 2012, the emergency healthcare administrative fee at the emergency department level was KRW 35,740, and KRW 17,870 at the local facility level. In 2011, the National Health Insurance Corporation secured KRW 125,200 million from collecting the emergency healthcare administrative fee.[21]

### 3.1.3. Administrative System of Emergency Healthcare

Emergency medical legislation and budgeting in Korea fall under the jurisdiction of the Ministry of Health and Welfare. The pre-hospital stage emergency medical service policy falls under the National Emergency Management Agency, and actual budgeting and administration fall under the state government agencies. Therefore, it is important for all agencies to collaborate on policy making and adjustments in order to achieve efficiency and effectiveness in emergency medical service delivery.

The central administrative system of emergency healthcare is composed of the Central Emergency Healthcare Committee (CEHC), which serves as the monitoring body. The National Emergency Medical Center (NEMC) serves as the execution body that oversees the monitoring of the Department of Emergency Healthcare of the Ministry of Health and Welfare, the Bureau of Rescue and EMS of the National Emergency Management Agency (NEMA), and the emergency medical facilities, as well as development of a disaster relief response system and emergency healthcare information network. The state emergency healthcare administrative system is operated by the provinces public health policy and management agencies and provincial fire departments.

20. Dong Woo Suh. Change of Emergency Department Visits between Before and After Implementation of Emergency Medical Care Management Program. 2003 (Korean).

21. The Ministry of Health and Welfare. 2013~2017 Emergency Healthcare Plan. 2013. Seoul (Korean).

### a. Central Emergency Healthcare Committee

The Central Emergency Healthcare Committee was established under the revised Emergency Medical Service Act in 2002. The main purpose of the committee is to monitor and review national policy regarding emergency healthcare. The committee reviews the "Basic Emergency Healthcare Plan," which the Minister of Health and Welfare institutes every five years. The committee also monitors the expenditures of the Emergency Healthcare Fund, which is the main resource for emergency healthcare system development. In 2011, in order to strengthen its function, the committee was promoted to the cabinet ministerial level and convenes at least twice a year.

Table 4-20 | Organization of Central Emergency Healthcare Committee

| |
|---|
| 1. Chairman (Minister of Health and Welfare) |
| 2. Vice Chairman (appointed by the Chairman) |
| 3. Member (official members and appointed members) |
| ① Official member |
| 1. Vice Minister of Strategy and Finance |
| 2. Vice Minister of Education |
| 3. Vice Minister of Land, Infrastructure and Transport |
| 4. Administrator of the National Emergency Management Agency |
| 5. Director of the National Emergency Medical Center (according to Article 25) |
| ② Appointed member (appointed by the Chairman) |
| 1.3 Representatives from NPOs/NGOs according to the "Assistance for Non-Profit, Non-Governmental Organization Act" Article 2 |
| 2.3 Experts with extensive knowledge and experience in emergency medicine |
| 3.1 Representative to represent emergency medical facility (according to Article 2 No. 5) |
| 4.1 Local public health service employee to represent provinces |
| 5.1 Local public health service employee to represent provinces (including Metropolitan city) |

Source: Reorganized from Emergency Medical Service Act.

### b. Department of Emergency Healthcare of the Ministry of Health and Welfare

The Department of Emergency Healthcare within the Ministry of Health and Welfare was newly established in 2010. The department is responsible for overall emergency healthcare programs including management of the Emergency Healthcare Fund, compilation of the budget and execution, pre-hospital stage programs regarding emergency healthcare, and the evaluation of emergency medical facilities.

Table 4-21 | Role of the Department of Emergency Healthcare, Ministry of Health and Welfare

| |
|---|
| 1. Responsible for programs related to the Basic Emergency Healthcare Plan and execution plan |
| 2. "Emergency Medical Service Act" and related policy enactments and revisions |
| 3. Operate and manage the Emergency Healthcare Fund and emergency medical charge standards |
| 4. Emergency medical facilities, ambulances, and other transportation systems |
| 5. Emergency medical information center administration |
| 6. Foster and manage emergency medical technicians and emergency healthcare workers |
| 7. Emergency healthcare education and promotion |
| 8. Relieve emergency room overcrowding and programs related to advanced emergency medical services system |
| 9. Disaster medical service and emergency medical service support |
| 10. Establish and manage specialized trauma treatment centers |
| 11. Establish and manage poisoning information centers |
| 12. Establish after-hour care service systems and other emergency care systems |

Source: Reorganized from Emergency Medical Service Act.

### c. National Emergency Medical Center

After the revisions to the Emergency Medical Service Act were enacted in 2000, the Minister of Health and Welfare established the National Emergency Medical Center in 2001 in order to execute emergency healthcare policies and efficiently manage emergency medical resources. After the establishment of the Department of Emergency Healthcare in 2010, the Center is being managed as part of the Division of Public Healthcare under the National Medical Center.

The main purpose of the National Emergency Medical Center is to evaluate emergency medical facilities and establish a disaster relief response system, execute an emergency healthcare information network program, and publish the chronological summary of emergency healthcare statistics every year to manage statistics regarding emergency healthcare.

Table 4-22 | Role of National Emergency Medical Center

| |
|---|
| - Promotion of services and benefits to everyone in the community |
| - Developing educational materials and training medical service staff |
| - Strengthening the treatment network by establishing an information communication network |
| - Building monitoring systems to control the quality of EMS |
| - Evaluating and supporting emergency medical facilities |
| - Researching related matters and developing policies |
| - Striving for advanced EMS by strengthening the system |
| - Supporting medical care in case of accidents and disasters |
| - Other emergency medical service related matters |

Source: Reorganized from Emergency Medical Service Act.

**d. Bureau of 119 Rescue and EMS of the National Emergency Management Agency**

As of July 23, 2012, the "Bureau of 119 Rescue and EMS" was newly established under the National Emergency Management Agency to manage rescue and emergency medical service policies. As of now, the "Bureau of 119 Rescue and EMS" is organized into the following departments: 1) the rescue team is responsible for rescue policy, 2) EMS team is responsible for providing emergency medical services and emergency healthcare education, and 3) life safety team is responsible for public safety and aerial ambulance service such as Helicopter-EMS.

**e. Regional Emergency Healthcare Committee**

One of the unique characteristics of emergency healthcare is regionalism. Given the nature of emergency healthcare, the survival of the emergency patient increases only when proper treatment is administered as promptly as possible, which can be achieved by utilizing local medical resources. Therefore, the regionalization of emergency healthcare is a significant factor in policy making. In order to regionalize emergency healthcare, it is extremely important to establish a stable policy-making body and an administration system.

In order to establish such a system, public and private institutions and emergency medical facilities including public health organizations, fire departments, police departments, and other first-order responders must collaborate. Therefore, there must be a decision-making body or agency as well as an administrative support system for optimal interdepartmental collaboration.

With the revisions made in 2002 to the Emergency Medical Service Act, the regional emergency healthcare committee is given the function of legally acting as the evaluating body to review regional or local emergency healthcare plans and how the budget is utilized. The regional committee is also held at least twice a year as the Central Emergency Healthcare Committee.

Table 4-23 | Regional Emergency Healthcare Committee

〈Organization〉

- Chairman/Vice Chairman (appointed from members by the mayor/governor)
- Member (appointed from the representing agencies by the mayor/governor)

1. Representative from the emergency medical facility
2. Representative from the emergency medical information center
3. Rescue worker from the state/local fire department
4. EMS worker from the state/local fire department
5. Representative from non-profit/non-governmental organization
6. Expert with extensive knowledge and experience in emergency medicine

Source: Reorganized from Emergency Medical Service Act.

**f. Provincial Public Health Policy and Management Agencies**

The regional or local public health agency is to assign departments and/or officers within the departments of public health, public health policy, public health hygiene, public health medicine policy and the emergency healthcare administration team. Additionally, the agency acts to deliver and distribute nationally assigned responsibilities to regional medical clinics while autonomously executing its own emergency healthcare projects.

**g. Department of Rescue and EMS under Provincial Fire Departments**

In the nation, there are 17 regional provincial fire departments – Seoul, Incheon, Daegu, Kwangju, Daejeon, Busan, Ulsan, Gyeonggi, Gyeonggi (secondary), Kangwon, Chungbook, Chungnam, Jeonbook, Jeonnam, Kyeongbook, Kyeongnam, and Jejui. Each department is responsible for ambulance and EMS service in the respective area.

The organization within the regional fire department varies among provinces and cities. The rescue and EMS division, the core system in the pre-hospital stage, generally operates on a team-level basis in most states and cities.

## 3.2. Emergency Healthcare System Governance and System Development Process

The following table summarizes emergency healthcare system governance and system development processes.

Table 4-24 | Summary of Governance and System Development

| Stage | Year | Policy Enactment or Revision | Description |
|---|---|---|---|
| Program Implementation | 1990 | "Basic Plan to Establish Emergency Healthcare System" signed | |
| | 1991 | "Emergency Healthcare System Administration and Operation Regulation" enacted and announced | |
| | 1994 | "Emergency Medical Service Act" signed | |
| Foundation of Basic Infrastructure | 1995 | "Emergency Medical Service Act" enacted | Emergency Healthcare Fund |
| | | | 50% of medical facility penalty fines |
| | | | Substitution and reimbursement program begins |
| | 2000 | "Emergency Medical Service Act" revised | Emergency Medical Service fee enforced |
| Quantitative Growth | 2001 | | National Emergency Medical Center established |
| | 2002 | "Emergency Medical Service Act" partially revised | Central Emergency Healthcare Committee established |
| | | | Basic Plan for Emergency Medicine evaluated |
| | | | Local Emergency Healthcare Committee established |
| | | | Local emergency medical service execution plan evaluated |
| | | | National Emergency Medical Center begins operations |
| | 2003 | | Emergency Healthcare Fund expanded |
| | | | 20% of traffic violation fines added |
| | 2004 | | Separation of the National Emergency Management Agency |
| Qualitative Improvement | 2008 | "Emergency Medical Service Act" partially revised | Good Samaritan Law signed |

| Stage | Year | Policy Enactment or Revision | Description |
|---|---|---|---|
| Advanced System | 2010 | | Emergency Healthcare Fund expanded |
| | | | 20% of traffic violation fines added |
| | | | Department of Emergency Healthcare established under the Ministry of Health and Welfare |
| | 2011 | "119 Rescue and EMS Act" enacted | Central Emergency Healthcare Committee promoted |
| | | "Emergency Medical Service Act" partially revised | Vice Minister to Minister level promotion |
| | | | Local Emergency Healthcare Committee strengthened |
| | 2012 | | Bureau of 119 Rescue and EMS established |

Source: Homepage of National Emergency Medical Center (http://www.nemc.or.kr/).

### 3.2.1. Program Implementation (1990~1994)

**a. Emergency Healthcare Administration Based on General Legislation**

Upon hosting the 1986 Asian Games and the 1988 Olympics and Paralympics, the shortcomings of the poorly established emergency healthcare system became more apparent. To address the problems, the government actively discussed ways to resolve the situation through an "Emergency Healthcare System Development Council" in 1990. The "Emergency Healthcare System Administration and Operation Regulation" was then signed and enacted in April 1994. The legislation, which the current Emergency Medical Service Act is based on, includes the establishment of 129 emergency patient information centers, installation of an emergency healthcare communication network, and designation of emergency medical facilities.

### 3.2.2. Basic Infrastructure (1995~1999)

**a. Enactment of the Emergency Medical Services Act, 1995**

After multiple catastrophic disasters and casualties occurring from not being able to receive proper treatment due to the lack of medical bill payment capability since 1991, existing shortcomings of the emergency healthcare system were exploited, raising the call for a revamped system.

Despite efforts to implement various strategies in 1992, including a drastic increase in medical insurance cost, emergency room, ambulance, and fire department operations did not reach optimal efficiency as the legal basis for regulations surrounding improvements in these areas was very dispersed.[22] To resolve this issue, the Emergency Medical Service Act was signed in 1994 to reinforce the legal basis and enacted in 1995. According to the enactment of this Act, the emergency medical specialist and emergency medical technician program were implemented, resulting in a successful growth in the number of emergency medical professionals.

**b. Implementation of the Emergency Healthcare Fund (1995)**

In 1995, the fund was initially financed by the following: 1) 50% fines collected from medical facilities for violating the National Health Insurance Act, 2) contributions and/or donations from emergency healthcare facilities and organizations, and 3) revenues accruing from fund operations. The fines collected from nursing homes constituted the largest source of the fund, which eventually reached KRW 1,700 million.[23,24] The Emergency Healthcare Fund was consigned to be operated and managed by the National Health Insurance Review and Assessment Service from 1995 to 2002, and the primary function of the fund was to finance the substitution and reimbursement program for emergency care.

**c. Implementation of the Substitution and Reimbursement Program for Emergency Care (1995)**

The substitution and reimbursement program for emergency care began in 1995 and is still in effect today (2013). The program particularly holds great significance among other programs developed in relation to the emergency healthcare system. The substitution and reimbursement program refers to the government subsidy given to hospitals or emergency medical facilities that have accumulated uncollected emergency medical bills from emergency patients who were unable to settle the out-of-pocket payment at the time of treatment. The hospitals or emergency medical facilities can apply to be reimbursed for the uncollected amount, which is reviewed and paid for if approved by the National Health Insurance and Review Assessment Service. The amount is later billed to the emergency patient or whoever is legally obligated to provide care. This program is one of the key budget elements in the Emergency Healthcare Fund.

22. The Ministry of Health and Welfare. 2010 Report of Health and Welfare. 2011. Seoul (Korean).

23. The Office of Legislation. The Emergency Medical Services Act. Available at http://www.law.go.kr/%EB%B2%95%EB%A0%B9/%EC%9D%91%EA%B8%89%EC%9D%98%EB%A3%8C%EC%97%90%20%EA%B4%80%ED%95%9C%20%EB%B2%95%EB%A5%A0. Accessed on December 20, 2013 (Korean).

24. Available at https://www.digitalbrain.go.kr/kor/view/index.jsp. Accessed on December 20, 2013 (Korean).

The program allowed patients unable to afford payments in the emergency room to benefit from medical services and provided a foundation for hospitals and medical facilities to administer treatment regardless of the patient's ability to pay, effectively guaranteeing the minimum level of the right of a person to emergency medical services.

At the beginning of the program's implementation, the number of substitution and reimbursement applications was not as extensive due to limited understanding of the subrogation payment system and the hospital administration's perception that it was more beneficial to collect the unsettled amount from the patients directly if possible. This led to more active efforts to increase awareness of the program among hospitals and patients, which resulted in a higher number of substitution and reimbursement applications. Within the first half of 2012, the program received KRW 4,127 substitution and reimbursement requests and paid out KRW 1,300 million.

Currently, despite the program's fundamental intention to increase and reinforce medical coverage, there have been concerns of moral hazard and unjust claims from hospitals and patients misusing the system. Thus, a re-evaluation of the program as well as an improvement plan are thought to be in order.[25]

**Table 4-25 |** PPP Currency Converted Substitution and Reimbursement Payment Amount and Percentage of Total Fund, 1995~2012

(Unit: $1,000,000, %)

| Year | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|
| No | 6 | 36 | 86 | 235 | 358 | 510 |
| Amount | 3 | 50 | 166 | 415 | 582 | 605 |
| Proportion (%) | 0.1 | 1.1 | 3.1 | 13.5 | 22.2 | 12.9 |
| **Year** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** |
| No | 803 | 541 | 1,027 | 1,300 | 3,219 | 4,198 |
| Amount | 935 | 734 | 1,206 | 976 | 1,792 | 1,863 |
| Proportion (%) | 23.2 | 83.5 | 2.0 | 1.0 | 2.4 | 2.4 |
| **Year** | **2007** | **2008** | **2009** | **2010** | **2011** | |
| No | 3,878 | 2,868 | 4,708 | 6,437 | 5,170 | |
| Amount | 1,788 | 1,274 | 3,111 | 2,930 | 2,735 | |
| Proportion (%) | 2.3 | 2.4 | 6.0 | 0.9 | 0.9 | |

Source: Reorganized from the Account Summary of 2002~2011 and settlement of revenue and expenditure account Summary of 1996~2001 from the Budget and Account Information System.

25. The Korea Human Resource Development Institute for Health and Welfare. Substitution and reimbursement Program Analysis for Emergency Patients. 2009. Seoul (Korean).

### 3.2.3. Quantitative Growth (2000~2004)

**a. Revisions to the Emergency Medical Service Act**

The revisions made to the Emergency Medical Service Act in 2000 aimed to modify the emergency healthcare delivery system through amendments that addressed the following points: to be prepared to respond to natural disasters and accidents with prompt and fair emergency medical services, to reinforce the rights of the people as consumers and obligations of the providers, to rank and evaluate emergency medical facilities, and to establish and operate an Emergency Medical Information Center (EMIC).

The partial amendments in 2002 aimed to improve the quality of emergency medical services as it is considered to be a part of medical services with the highest interest of the public. Hence, the following reforms were made: 1) the Minister of Health and Welfare was to require that every mayor and governor propose an emergency healthcare plan every 5 years, 2) the national government was to propose an emergency healthcare plan to be evaluated by the Central Emergency Healthcare Committee every 5 years, according to the Emergency Medical Service Act revision, and 3) local and state governments were to establish their own Emergency Healthcare Committees responsible for evaluating local and regional emergency medical service matters.

In addition, the partial amendments in 2002 added a new source of revenue to the Emergency Healthcare Fund by collecting 20% of the revenue generated from traffic violation fines starting in 2003. This move secured the necessary budget to develop an advanced emergency healthcare system.

**b. Establishment of the National Emergency Medical Center**

With the revisions made to the Emergency Medical Service Act in 2000, the Minister of Health and Welfare designated the National Emergency Medical Center among qualifying general hospitals to execute emergency healthcare policies and efficiently manage and operate emergency medical resources. The National Medical Center was appointed as the National Emergency Medical Center and has been in effect since 2002.

**c. Implementation of the Central Emergency Healthcare Committee**

With the revisions made to the Emergency Medical Service Act in 2002, the Central Emergency Healthcare Committee was established under the Ministry of Health and Welfare to function as the evaluating body to review emergency healthcare related policies. The Committee's primary role was to evaluate the Basic Emergency Healthcare Plan and how the Emergency Healthcare Fund is budgeted and used.

### d. Expansion of Emergency Healthcare Fund (2003)

According to the Road Traffic Act of 2003, 20% of the revenue collected from traffic violation fines was added to finance the Emergency Healthcare Fund, which greatly contributed to the fund's expansion. As of 2009, the fund raised approximately KRW 40~60 billion.[26] The fund has increased ten-fold since 2003, and the Ministry of Health and Welfare directly manages the budget and its usage with the exception of the substitution and reimbursement program.

After 2003, the main function of the Emergency Healthcare Fund was to strengthen the infrastructure of the emergency healthcare system and reduce preventable trauma deaths from 40.5%-50.4% to 20% by 2007 by implementing the emergency medical facility evaluation system.[27,28,29] In order to achieve this goal, full-scale investment was made in pre-hospital and hospital stage facilities and equipment.

**Table 4-26 |** Yearly Summary of Items Financed by the Emergency Healthcare Fund and PPP Currency Converted Fund Expenditure, 2003~2004

(Unit: $1,000,000)

| Year | Stage | Item Description | Amount | % |
|---|---|---|---|---|
| 2003 | Hospital | Supporting emergency medical facility development programs | 9.8 | 18.2 |
| | | Loans to expand emergency medical facilities | 10.1 | 18.7 |
| | | Administration of the National Emergency Medical Center | 0.6 | 1.1 |
| | | Implementation of portable emergency medical sets | 0.5 | 1 |
| | | Supporting the establishment of the public university emergency department (Ministry of Education) | 5.7 | 10.5 |

26. Available at https://www.digitalbrain.go.kr/kor/view/index.jsp. Accessed on December 20, 2013 (Korean).
27. Yun Kim, Koo Young Jung, Jun Sik Kim. Problem and preventable death rate in trauma care. The Journal of Korea Society of Emergency Medicine. 2001;12(1):45~56. (Korean).
28. Korea Health Industry Development Institute. Basic Plan of Emergency Healthcare and Evaluation of Emergency Medical Services System. 2005. Seoul (Korean).
29. Available at http://nafs.assembly.go.kr:83/) Available at http://nafs.assembly.go.kr:83/ Accessed on December 20, 2013 (Korean).

| Year | Stage | Item Description | Amount | % |
|---|---|---|---|---|
| 2003 | Pre-hospital | Supporting the Emergency Medical Information Center | 3.4 | 6.4 |
| | | Primary establishment of the emergency patient treatment information network | 0.4 | 0.8 |
| | | Supporting 119 Rescue and EMS (Ministry of Security and Public Administration) | 20 | 37.2 |
| | Emergency Healthcare | Emergency healthcare familiarization | 0.3 | 0.5 |
| | Others | Emergency patient medical cost, substitution and reimbursement program | 1.2 | 2.2 |
| | | Emergency medical service research | 0.3 | 0.5 |
| | | Emergency medicine resident training assistant salaries | 1.6 | 3 |
| | Total / % | | 53.8 | 100 |
| 2004 | Hospital | Supporting emergency medical facility development programs | 13.7 | 23.2 |
| | | Loans to expand emergency medical facilities | 12.5 | 21.1 |
| | | Administration of the National Emergency Medical Center | 0.6 | 1.1 |
| | | Supporting the establishment of public university emergency departments (Ministry of Education) | 4.5 | 7.6 |
| | Pre-hospital | Supporting the Emergency Medical Information Center | 3.5 | 5.9 |
| | | Secondary establishment of the emergency patient treatment information network | 0.5 | 0.8 |
| | | Supporting 119 Rescue and EMS (Ministry of Security and Public Administration) | 19.8 | 33.6 |
| | Emergency Healthcare | Emergency healthcare familiarization | 0.4 | 0.6 |
| | Others | Emergency patient medical cost, substitution and reimbursement program | 1 | 1.7 |
| | | Emergency medical service research | 0.3 | 0.5 |
| | | Emergency medicine resident training assistant salaries | 2 | 3.4 |
| | | Supporting medical service in case of domestic and foreign disasters | 0.3 | 0.4 |
| | Total / % | | 59.1 | 100 |

Source: Reorganized from the Account Summary of 2002~2008 from the Budget and Account Information System.

**e. Establishment of the National Emergency Management Agency (NEMA)**

Since the 1990s, national catastrophes have occurred almost every year, calling for the establishment and reform of the disaster preparedness and response system. To unify all operational processes related to disaster response and manage such processes under one body, the National Emergency Management Agency (NEMA) was established in June 2004 to act as the executive administrative agency to oversee all activities related to fire services and national disaster preparedness and response.

The National Emergency Management Agency is assigned under the Ministry of Public Administration and Security and is the first central government agency to oversee all activities in disaster relief including typhoons, rainstorms, earthquakes, snowstorms, fires and building and/or facility collapse, and wildfires. NEMA also oversees the safety of lives and property, disaster prevention, response, control and recovery, while executing disaster-related policy and operation.

At the time of its establishment, there were several considerations, including: 1) an increase in the number of disasters, 2) worsening conditions for performing fire-fighting activities, 3) increasing needs of Fire Administration Divisions, and 4) increasing demand for quality improvement in Fire Administration Divisions.[30] To address such considerations, an organization to executively take charge of providing pre-hospital stage emergency medical services was established.

### 3.2.4. Qualitative Growth (2005~2009)

**a. Revisions to the Emergency Medical Service Act (2008)**

The Good Samaritan Law was established in 2008 (Exemptions to well-intentioned emergency medical service, Article 5, No. 2), which provided exemption regulations to first aid provided by the general public. The Law served as the institutional foundation to early first aid by the public.[31] Additionally, the Minister of Health and Welfare, governors, and mayors enacted an obligatory provision for first aid education and awareness in the general public, commencing a national campaign to familiarize the public with emergency healthcare.

30. Seung Hwan Myung, Ju Sang Chun, Ki We. Vision and Strategy of New National Emergency Management Agency: Government Organization Reform of Disaster Area. The Journal of Korea Administrative Affair. 2004.

31. The Office of Legislation. The Emergency Medical Services Act. Available at http://www.law.go.kr/%EB%B2%95%EB%A0%B9/%EC%9D%91%EA%B8%89%EC%9D%98%EB%A3%8C%EC%97%90%20%EA%B4%80%ED%95%9C%20%EB%B2%95%EB%A5%A0. Accessed on December 20, 2013 (Korean).

**Table 4-27 |** Yearly Summary of Items Financed by the Emergency Healthcare Fund and PPP Currency Converted Fund Expenditure, 2005~2009

(Unit: $1,000,000)

| Year | Stage | Item Description | Amount | % |
|---|---|---|---|---|
| 2005 | Pre-hospital | Supporting the emergency medical facility development program | 13.6 | 24 |
| | | Loans to expand emergency medical facilities | 8.7 | 15.3 |
| | | Administration of the National Emergency Medical Center | 4.8 | 8.4 |
| | | Replacement of portable emergency medical sets | 0.5 | 0.9 |
| | Hospital | Supporting Emergency Medical Information Centers | 3.5 | 6.1 |
| | | 3rd establishment of an emergency patient treatment information network | 0.5 | 0.9 |
| | | Supporting 119 Rescue and EMS (Ministry of Security and Public Administration) | 20.1 | 35.5 |
| | Emergency Healthcare | Emergency healthcare familiarization | 0.4 | 0.7 |
| | Others | Emergency patient medical cost substitution and reimbursement program | 1.9 | 3.3 |
| | | Emergency medical service research | 0.3 | 0.5 |
| | | Emergency medicine resident training assistant salaries | 2.3 | 4 |
| | | Supporting medical services in the case of domestic and foreign disasters | 0.4 | 0.6 |
| | Total / % | | 56.7 | 100 |
| 2006 | Pre-hospital | Supporting the emergency medical facility development program | 18.1 | 30.5 |
| | | Loans to expand emergency medical facilities | 8.7 | 14.6 |
| | | Administration of the National Emergency Medical Center | 0.9 | 1.6 |
| | | Replacement of portable emergency medical sets | 0.8 | 1.3 |
| | Hospital | Supporting the Emergency Medical Information Center | 4 | 6.7 |
| | | 4th establishment of the emergency patient treatment information network | 1.3 | 2.1 |

| Year | Stage | Item Description | Amount | % |
|---|---|---|---|---|
| 2006 | Hospital | Supporting 119 Rescue and EMS (Ministry of Security and Public Administration) | 19.8 | 33.3 |
| | Emergency Healthcare | Emergency healthcare familiarization | 0.5 | 0.8 |
| | Others | Emergency patient medical cost substitution and reimbursement program | 1.9 | 3.1 |
| | | Emergency medical service research | 0.3 | 0.5 |
| | | Emergency medicine resident training assistant salaries | 2.8 | 4.7 |
| | | Supporting medical services in case of domestic and foreign disasters | 0.4 | 0.6 |
| | Total / % | | 59.4 | 100 |
| 2007 | Pre-hospital | Supporting the emergency medical facility development program | 18.2 | 32.4 |
| | | Loans to expand emergency medical facilities | 8.7 | 15.5 |
| | | Administration of the National Emergency Medical Center | 0.9 | 1.6 |
| | | Implementation of portable emergency medical sets | 1 | 1.8 |
| | Hospital | Supporting the Emergency Medical Information Center | 4.6 | 8.2 |
| | | 5th establishment of the emergency patient treatment information network | 0.7 | 1.2 |
| | | Helicopter purchase | 7.7 | 13.7 |
| | | Ambulatory vehicle purchase | 7.9 | 14.1 |
| | | Establishment of a transfer system | 0.5 | 1 |
| | Emergency Healthcare | Emergency healthcare familiarization | 0.5 | 0.9 |
| | Others | Emergency patient medical cost substitution and reimbursement program | 1.8 | 3.2 |
| | | Emergency medicine resident training assistant salaries | 3.2 | 5.7 |
| | | Supporting medical service in the case of domestic and foreign disasters | 0.5 | 1 |
| | Total / % | | 56.3 | 100 |
| 2008 | Pre-hospital | Supporting an emergency medical facility development program | 15.4 | 26 |
| | | Loans to expand emergency medical facilities | 8.6 | 14.5 |

| Year | Stage | Item Description | Amount | % |
|---|---|---|---|---|
| 2008 | Pre-hospital | Administration of the National Emergency Medical Center | 1 | 1.6 |
| | | Implementation of portable emergency medical sets | 0.2 | 0.3 |
| | Hospital | Supporting the Emergency Medical Information Center | 4.8 | 8.1 |
| | | 6th establishment of the emergency patient treatment information network | 0.3 | 0.5 |
| | | Helicopter purchase | 7.4 | 12.6 |
| | | Ambulatory vehicle purchase | 14.2 | 24 |
| | | Establishment of a transfer system | 1 | 1.6 |
| | Emergency Healthcare | Emergency healthcare familiarization | 0.4 | 0.6 |
| | | Specialized education and training to emergency medical service workers | 1.1 | 1.8 |
| | Others | Emergency patient medical cost substitution and reimbursement program | 1.3 | 2.1 |
| | | Emergency medicine resident training assistant salaries | 3.4 | 5.7 |
| | | Supporting medical service in the case of domestic and foreign disasters | 0.3 | 0.4 |
| | Total / % | | 59.3 | 100 |
| 2009 | Pre-hospital | Supporting an emergency medical facility development program | 13.7 | 26.9 |
| | | Loans to expand emergency medical facilities | 7.5 | 14.7 |
| | Hospital | Supporting 119 Rescue and EMS | 12.2 | 24 |
| | Emergency Healthcare | - | | |
| | Others | Emergency patient medical cost substitution and reimbursement program | 3.1 | 6.1 |
| | | Emergency healthcare system development | 11.2 | 22.1 |
| | | Emergency healthcare informatization | 3.1 | 6.2 |
| | Total / % | | 50.9 | 100 |

Source: Reorganized from the Performance Summary of 2009~2011 and Account Summary of 2002~2008 from the Budget and Account Information System.

### 3.2.5. Operation of the Advanced System (2010~ )

**a. Establishment of the Department of Emergency Healthcare under the Ministry of Health and Welfare (2010)**

In 2010, the Ministry of Health and Welfare established the Department of Emergency Healthcare under the Office for Healthcare Policy, which took over the emergency healthcare-related responsibilities of the Department of Public Healthcare and the function of the National Emergency Medical Center from the National Medical Center.

**b. Expansion of the Emergency Healthcare Fund (2010)**

From 2009 to 2010, the 20% of revenue collected from traffic violation fines was added to finance the Emergency Healthcare Fund according to the Road Traffic Act, which greatly increased the size of the fund to KRW 200,000 million annually (see below table).[32] This amount recorded the largest fund exclusively allocated for emergency healthcare in the world. To establish a world-class emergency healthcare system, the 2010-2012 Advancement of Emergency Healthcare Proposal was announced, which aimed to achieve the following: to relieve and strengthen areas with weak emergency healthcare, to establish regional specialized centers, and to reinforce and perform quality control of 119 ambulance vehicles.[33]

Table 4-28 | Yearly Summary of Total Expenditure (PPP Currency Converted) of the Emergency Healthcare Fund

(Unit: $1,000,000)

| Year | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|
| Total Expenditure | 2.7 | 4.5 | 5.3 | 3.1 | 2.6 | 4.7 |
| Expenditure per 100,000 | 0.06 | 0.10 | 0.12 | 0.07 | 0.06 | 0.10 |
| **Year** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** |
| Total Expenditure | 4.0 | 0.9 | 60.1 | 98.5 | 74.5 | 76.7 |
| Expenditure per 100,000 | 0.09 | 0.02 | 1.26 | 2.05 | 1.55 | 1.59 |
| **Year** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** |
| Total Expenditure | 79.3 | 53.1 | 51.7 | 308.8 | 302.1 | 392.1 |
| Expenditure per 100,000 | 1.63 | 1.08 | 1.05 | 6.25 | 6.07 | 7.84 |

Source: Emergency Medical Services Act/Homepage of National Emergency Management Agency (http://www.nema.go.kr/)
Reorganized from the Account Summary of 2002~2011 and settlement of revenue and expenditure account Summary of 1996~2001 from the Budget and Account Information System.

32. Available at https://www.digitalbrain.go.kr/kor/view/index.jsp. Accessed on December 20, 2013.

33. Available at http://nafs.assembly.go.kr:83/ Accessed on December 20, 2013.

Table 4-29 | Yearly Summary of Items Financed by the Emergency Healthcare Fund and PPP Currency Converted Fund Expenditure, 2010~2011

(Unit: $1,000,000)

| Year | Stage | Item Description | Amount | % |
|---|---|---|---|---|
| 2010 | Hospital | Supporting the emergency medical facility development program | 28.5 | 10.6 |
| | | Loans to expand emergency medical facilities | 12 | 4.5 |
| | | Fostering emergency medical facilities in areas with limited access | 21.1 | 7.9 |
| | | Establishment of specialized treatment systems in major trauma | 14.2 | 5.3 |
| | | Supporting local cardio- and neurovascular centers | 6 | 2.2 |
| | | Establishment of specialized emergency medical service systems | 6.5 | 2.4 |
| | | Supporting regional cardio- and neurovascular centers | 29.5 | 11 |
| | | Expansion of isolated bed availability in the case of new infectious diseases | 8 | 3 |
| | | Establishment of national isolation facilities in the case of new infectious diseases | 1.6 | 0.6 |
| | Pre-hospital | Supporting the Emergency Medical Information Center | 57.6 | 21.5 |
| | | Expansion of 119 rescue equipment | 12.2 | 4.6 |
| | | Expansion of the Central 119 Rescue Team facilities and equipment | 0.8 | 0.3 |
| | | Helicopter operation of the Central 119 Rescue Team | 6.5 | 2.4 |
| | | Establishment of the transfer information system | 22.5 | 8.4 |
| | | Supporting the remote ocean emergency transfer system | 3.2 | 1.2 |
| | | Enhancement of pre-hospital stage emergency medical services | 0.2 | 0.1 |
| | | Establishment of pre-hospital stage treatment training systems | 0.4 | 0.1 |
| | Emergency Healthcare | Emergency healthcare information network and familiarization | 30.6 | 11.4 |

| Year | Stage | Item Description | Amount | % |
|---|---|---|---|---|
| 2010 | Emergency Healthcare | Specialized education and training to emergency medical service workers | 0.6 | 0.2 |
| | Others | Emergency patient medical cost for the substitution and reimbursement program | 2.9 | 1.1 |
| | | Emergency medicine resident training assistant salaries | 3.4 | 1.3 |
| | Total / % | | 268.4 | 100 |
| 2011 | Hospital | Supporting the emergency medical facility development program | 31 | 17.8 |
| | | Loans to expand emergency medical facilities | 12 | 6.9 |
| | | Fostering emergency medical facilities in areas with limited access | 24.5 | 14.1 |
| | | Establishment of specialized treatment systems in major trauma | 15 | 8.6 |
| | | Supporting local cardio- and neurovascular centers | 5.8 | 3.3 |
| | | Establishment of specialized emergency medical service systems | 11.5 | 6.6 |
| | | Supporting regional cardio- and neurovascular centers | 13.1 | 7.5 |
| | | Expansion of isolated bed availability in the case of new infectious diseases | 1 | 0.6 |
| | | Establishment of national isolation facilities in the case of new infectious diseases | 7.4 | 4.3 |
| | | Operation of national isolation facilities in the case of new infectious diseases | 0.4 | 0.2 |
| | Pre-hospital | Supporting the Emergency Medical Information Center | 5 | 2.9 |
| | | Expansion of 119 rescue equipment | 12.1 | 7 |
| | | Expansion of the Central 119 Rescue Team facility and equipment | 3.5 | 2 |
| | | Helicopter operation of the Central 119 Rescue Team | 3.4 | 1.9 |
| | | Establishment of a transfer information system | 0.1 | 0.1 |
| | | Supporting a remote ocean emergency transfer system | 5.5 | 3.2 |
| | | Establishment of a pre-hospital stage treatment training system | 0.4 | 0.2 |

| Year | Stage | Item Description | Amount | % |
|---|---|---|---|---|
| 2011 | Pre-hospital | Establishment of an emergency safety system for elderly citizens living alone | 3 | 1.7 |
| | Emergency Healthcare | Emergency healthcare information network and familiarization | 12 | 6.9 |
| | | Specialized education and training to emergency medical service workers | 0.4 | 0.2 |
| | Others | Emergency patient medical cost substitution and reimbursement program | 2.7 | 1.6 |
| | | Emergency medicine resident training assistant salaries | 3.2 | 1.9 |
| | | Integrated Emergency Healthcare Information Network (informatization) | 12 | 6.9 |
| | Total / % | | 174.2 | 100 |

Source: Reorganized from the Performance Summary of 2009~2011 from the Budget and Account Information System.

From 2010 to 2012, KRW 564,200 million was invested to address the following indicator areas, all resulting in positive improvements: to strengthen areas with weak emergency medical services, to advance emergency medical facilities, to establish specialized treatment centers for critical emergency conditions, to transport emergency patients promptly and properly, and to increase basic first aid skills among the general public.

In 2009, there were 43 counties without an emergency medical facility. Through the program to strengthen and reinforce areas with weak emergency medical services, this number fell to 18 in 2012. Other improvements in emergency medical facilities could be observed, such as fewer areas with no emergency medical services, as well as the percentage of emergency medical facilities meeting legal qualification standards increased from 40% in 2009 to 58.4% in 2011.

**c. Enactment of the 119 Rescue and EMS Act (2011)**

In the past, the organization and management of rescue and emergency services were regulated under the Framework Act on Fire Services. Not only were there limited national efforts and resources in establishing a systemized and professional advancement plan for rescue and emergency services, but the complex, diverse, and unpredictable nature of special disasters called for a preparedness countermeasure for effective rescue and emergency services.

The national government had the duty of addressing these limitations and thereby provided the legal basis to strengthen the quality and expertise of rescue and emergency services, which resulted in the enactment of the "119 Rescue and EMS Act" of 2011. The "119 Rescue and EMS Act" contained six chapters and 35 clauses and aimed to strengthen the rescue and emergency services to protect the lives, health, and property of the people and contribute to improving quality of life.

The Central Rescue and EMS Policy Committee was established under the National Emergency Management Agency to discuss the details of rescue and EMS technology research and development as well as basic strategy proposals and execution plans with the central administrative agency. Additionally, state and local rescue and EMS policy conferences were also convened to discuss regional plans and their execution.

The world has witnessed frequent catastrophic disasters resulting from climate change. In occurrences of such foreign disasters, an international rescue team was formed to provide humanitarian assistance to rescue and protect the Korean nationals residing abroad. Additionally, an aerospace rescue and emergency service team was formed to be able to rescue people from skyscrapers as well as to transport emergency patients from remote areas.

Also, it was enforced that any unreasonable or unjustifiable interference with rescue and emergency services was subject to a maximum of 5 years in prison or a penalty of up to KRW 10,000,000. Requests for assistance during non-emergencies could be denied, and measures to protect the safety of emergency service technicians were established and executed for accident and infection prevention and overall health and safety.

In addition, by performing comprehensive evaluations of rescue and emergency services of the state and local fire departments, the 119 Rescue and EMS Act provided the foundation to provide administrative and financial support depending on the evaluation results.

In order to provide prompt and efficient nationwide emergency medical service, the "119 EMS Incident Management Center" was established and administered in 2012. The Center provided information about first aid performance and hospital transfers to state and local fire departments.

**d. Reinforcement of the National and Regional Emergency Healthcare Committee**

The revisions made to the Emergency Medical Service Act in 2002 also set the foundation for establishing the central, state and local emergency Healthcare Committee. The definitive role of the committee was not clearly illustrated at the time but was stipulated in the amendments made to the Emergency Medical Service Act in 2011.

Through this, the Central Emergency Healthcare Committee was promoted to the cabinet ministerial level from the vice-ministerial level and was regulated to evaluate the following:

Table 4-30 | Role of the Central Emergency Healthcare Committee

1. Establish a safe living environment for the people through the following services:
   a. Educating and promoting first aid and emergency healthcare
   b. Expanding emergency medical infrastructure in the living environment
   c. Providing fair emergency medical services that benefit all the people
2. Provide effective emergency healthcare through the following services:
   a. Fostering private transportation resources and improving the transfer system
   b. Evaluating emergency medical facilities and providing support
   c. Supplying emergency medical service workers
   d. Establishing and operating an emergency medical information network system
   e. Improving the quality of emergency medical services
   f. Planning prevention and response to disasters
3. Effectively achieve the basic plan through the following:
   a. Achievement aims and direction of the basic plan
   b. Evaluating the emergency medicine system and its administrative system and improvement direction
   c. Raising funds for emergency medical service resources
   d. Collaborating with the central executive facility to execute the basic plan

Source: Emergency Medical Service Act Article 13 No. 2.

Additionally, to revitalize the state and local emergency healthcare committee, its functions were legally stipulated, which are listed below:

Table 4-31 | City/Provincial Emergency Healthcare Committee

- The basic local emergency healthcare plan and execution plan by year
- Adjustments in the basic local emergency healthcare plan
- Execution results and application of the basic local emergency healthcare plan
- Evaluation of the emergency medical facility and application of the results

Source: Emergency Medical Service Act, Article 13, No 6. Revised.

**e. Establishment of the Bureau of 119 Rescue and EMS**

In the past, the Department of Rescue and EMS under the National Emergency Management Agency was in charge of policy planning with regard to responsibilities of the 119 emergency service during the pre-hospital stage. With the enactment of the "119 Rescue and EMS Act" in 2011, the Department became the primary responsible office to operate and manage the "119 rescue team," "119 EMS team," and "Helicopter rescue and EMS team."

With the drastic increase in rescue and EMS activities in the past 10 years (EMS 51.2%, rescue 220%), it was necessary to evaluate the heavy demands and expand the organization to provide quality rescue and emergency services, especially with the integration of the Ministry of Health and Welfare's 1339 program to 119 according to the "119 Rescue and EMS Act."

Hence, there were new tasks involving the transfer of human resources and responsibilities of the "119 Life Safety Team" with the existing Department of Rescue and EMS as the center, operation and management of the state and local 119 situation rooms and the emergency situation administration center, and performance evaluation of emergency rescue supporting organizations. The Department of Rescue and EMS was established in 2012 and was assigned to carry out the aforementioned responsibilities.

In addition, by establishing the 119 Emergency Services branch under the Bureau of 119 Rescue and EMS, further advancements are expected in establishing a specialized pre-hospital stage emergency healthcare system that meets the expectations of the people, providing prompt and efficient nationwide rescue and emergency services, and providing emergency medical services appropriate to the respective local community.

## 3.3. Problems in Establishing the Emergency Healthcare Governance and System

### 3.3.1. Re-establishment of the Functions of the Ministry of Health and Welfare and the National Emergency Management Agency (NEMA)

The current structure of Korea's emergency healthcare is as follows: the Ministry of Health and Welfare manages the legislation and the budget, the National Emergency Management Agency manages the pre-hospital stage emergency service policy, and state and local governments manage the actual budget and administration. However, there are very few areas directly related to pre-hospital emergency healthcare that are managed by the Ministry's Department of Emergency Healthcare. In other words, the Ministry predominantly manages the hospital stage, and the pre-hospital stage tasks need to be negotiated with the National Emergency Management Agency directly and indirectly.

However, collaboration between the two agencies has been difficult, and their respective roles ambiguous. The National Ambulance Information System is an example of poor communication between agencies despite billions of won invested annually. The system has not made much progress due to policy disagreements between the National Emergency Management Agency and the fire department.

There is a need for a collaborative system as well as clear and definitive roles for various departments where the Ministry of Health and Welfare executively oversees all emergency healthcare related policies, and the National Emergency Management Agency oversees pre-hospital patient transfers and first aid. Through this, the quality of emergency healthcare can advance further.

### 3.3.2. Regional Emergency Healthcare Management

The emergency medical facility appointment power belonged to the Minister of Health and Welfare in the early stage of the Emergency Medical Service Act. With the revisions in 2002, state governors and city mayors were granted the power to appoint local emergency departments. In 2008, with the "Evaluation Statement" on regional emergency departments submitted by the governors and mayors, they had the practical power to appoint regional emergency departments.

However, the state and local government has a limited role and limited power in controlling the supply and demand of local emergency medical resources, which makes it difficult for the local governments to autonomously establish and manage policies regarding emergency medical services. To encourage autonomous policymaking and administration in local governments, strengthening their power and right to regulate the budget is in order. Additionally, with the revisions to the Emergency Medical Service Act in 2002, local governments are to hold state/local emergency healthcare committees to review and evaluate regional emergency healthcare operations. However, considering the relative impracticality of this regulation, synchronization of local emergency healthcare system development is critical.

### 3.3.3. Emergency Healthcare Fund (Expansion vs. Repeal)

Existing investment of the Emergency Healthcare Fund is rather focused on the hardware aspect among the components of the emergency healthcare system. This translates into less capacity to finance the software aspects such as increasing the first aid skills of the general public, increasing emergency service technician qualifications, and increasing the number of emergency healthcare specialists and medical professionals specializing in major emergency diseases. However, in order to achieve a qualitative reform of the emergency healthcare system, such software components of emergency healthcare must be accompanied with consistent investment.

However, the temporary nature of the current financing structure will be a significant barrier to the future advancement of the emergency healthcare system and needs to be reconsidered for more stable fundraising. In other words, there is a need for political considerations in structuring the operational budget for emergency healthcare systems in

response to increasing demand for emergency medical services. In addition to the traffic violation and citation fines, other sources of revenue such as automobile registration fees, license tax, excise tax, or liquor tax should be considered to securely maintain the Emergency Healthcare Fund.

Additionally, encouraging voluntary investment from emergency medical facilities must be considered instead of relying solely on the fund. The production cost conservation rate in emergency medical facilities is a mere 68.8% compared to 88% in other industries. The rate should be increased to strongly encourage medical facilities to invest in their emergency rooms.[34]

According to research, the annual social benefit expected to be gained from reducing preventable mortality from trauma to 20% by 2017 is approximately KRW 1 trillion (about KRW 6 trillion in 2005~2010). Therefore, investing in emergency healthcare is logical given its cost-effectiveness.[35]

34. Korea Health Industry Development Institute. Study on Improvement of Fee for Services of Emergency Medical Services. 2003. Seoul (Korean).

35. Korea Health Industry Development Institute. Cost-Benefit analysis of Development of Emergency Medical Services. 2008. Seoul (Korean).

2013 Modularization of Korea's Development Experience
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# Chapter 5

## Analysis of Success and Failure Factors of Establishing the Emergency Medical Services System

1. Success Factors of the Emergency Healthcare System
2. Improvements Needed in the Emergency Healthcare System
3. International Comparison Analysis of EMS Development

# Analysis of Success and Failure Factors of Establishing the Emergency Medical Services System

## 1. Success Factors of the Emergency Healthcare System

### 1.1. Pre-hospital Stage Success Factors

#### 1.1.1. Fire-based Emergency Medical Services

The pre-hospital stage emergency healthcare system utilizes the existing organization of a dispatch system and response program of the fire departments. The utilization of the existing system allows nationwide jurisdiction with timeliness and minimum resources. In 2000, five years after the proposed "Expansion of Rescue and EMS System," most of the 119 centers in the nation were equipped with an ambulance. In this process, the advantageous speed of the fire departments gave them the dominant position in the competition against private transfer institutions. Because the fire department is a public organization, it was obligated to provide fair service nationwide. And by providing the service free of charge, there were minimal regional or economical barriers for the people to benefit from pre-hospital stage emergency medical service.

#### 1.1.2. Systemized Evaluation and Medical Direction

Along with the Korean Society of Emergency Medicine, professional medical organizations have continuously pointed out problems regarding the quality of specialty pre-hospital stage emergency healthcare through academic publications and media interviews. The criticism did not stop at just denouncing the fire service agency but led to the founding of the Korean Council of EMS Physicians to improve the quality of EMS by providing EMS protocols and education. This move was to pressure the fire departments to pursue emergency services beyond prompt patient transfer. In response, the fire departments began

the "EMS Quality Control and Management" program in 2008, which came to fruition in 2011 through the enactment of the Rescue and EMS Act that included quality control and a medical control system.

## 1.2. Hospital Stage Success Factors

### 1.2.1. Evaluation of Emergency Medical Facilities

In the process of expanding the Emergency Healthcare Fund and the general advancing of the emergency healthcare system, the evaluation of hospital stage emergency departments measured the quality of rescue, processes, and public service in the emergency departments and contributed to strengthening the observed weak points.

Especially in the early stage of establishing the basic infrastructure of facilities, human resources, and equipment for emergency departments, monitoring the infrastructure development statuses and the percentage of facilities satisfying the legal qualifications contributed to building the basic nationwide infrastructure of the emergency departments in a short period of time.

After the preliminary evaluation of the basic infrastructure of hospital stage emergency medical services, an evaluation of the organization, processes, and public service was performed. This was considered to be the appropriate entry into a more advanced stage of emergency medical services. The evaluation would also contribute to a qualitative indicator assessment and the ability to expand the role of the public sector in clinical prognosis improvement, emergency medical facility education, and disaster relief.

Through the centralized implementation of the evaluation of emergency medical facilities, it was possible to efficiently manage and perform standardized assessments nationwide. Some future directions for systematic improvements include more focus on administrative evaluations based on legal qualifications, encouraging voluntary improvement within the hospitals through evaluation feedback, and connecting first aid and post-emergency room treatments.

### 1.2.2. Emergency Healthcare Fund

The Emergency Healthcare Fund played a pivotal role in financing the advancement of the domestic emergency healthcare system. Invigorating investments through the fund's expansion resulted in positive impacts for the emergency healthcare system.

### 1.2.3. National Emergency Medical Center

The National Emergency Medical Center was established under the Ministry of Health and Welfare to executively be in charge of emergency medical facility evaluations. Under the Ministry's supervision, the Center conducted the overall evaluation and put together specific assessment plans. Upon the Ministry's policy on establishing an evaluation system, the National Emergency Medical Center reported to the Ministry on the following agendas: announcement of the evaluation implementation, presentation to describe the plan, patient feedback, presentation of interim findings, and reporting of the end results and feedback. Based on what was presented by the Center, the Ministry reviewed and finalized the budget and execution criteria.

Some future directions for the system's improvement include more focus on administrative evaluations based on legal qualifications, encouraging voluntary improvements within the hospitals by providing evaluation feedback, and connecting first aid and post-emergency room treatments.

## 1.3. Governance and System Success Factors

### 1.3.1. Emergency Medical Service Act

Upon the enactment and amendments of the Emergency Medical Service Act in 1995, the Korean emergency healthcare system is considered to be on par with that of other developed nations in the following capacities: 1) recognizing emergency medical services as a part of the public healthcare system, 2) advancing the core areas of the emergency healthcare system through policy revisions, and 3) establishing the Emergency Healthcare Fund to be used as the primary financial resource.

### 1.3.2. 119 Rescue and EMS Act

Upon enactment of the "119 Rescue and EMS Act," both federal and local governments were obligated to improve the quality of 119 rescue and emergency services through systematic advancements and more balanced support. Various measures were put forth to this effect. The Director of the NEMA was to plan the basic framework for rescue and EMS services and submit the plan to the National Assembly Standing Committee, which was responsible for medium- and long-term progressive plans. Also, the director of the fire department was to submit an execution plan for rescue and EMS services annually to the agency director. The 119 EMS team, which was previously housed under the 119 Safety Center, was integrated to further enhance the specialization of rescue and emergency services. Finally, a comprehensive evaluation was performed on the rescue and emergency services of the state and local fire departments. The evaluation determined administrative

and financial support based on the results of the evaluation, which encouraged voluntary quality control and improvement.

#### 1.3.3. Establishment and Expansion of the Emergency Healthcare Fund

Through the utilization of the Emergency Healthcare Fund, Korea was able to join the ranks of developed countries in addition to setting the foundation for the advancement of the emergency healthcare system. In particular, Korea as citizens, society, and government not recognize the necessity to develop the emergency healthcare system. Through the enactment of and amendments to the Emergency Medical Service Act, the Emergency Healthcare Fund was established and expanded. Deficiencies in the system were identified through the evaluation and were supplemented using the fund for the most optimal system performance.

## 2. Improvements Needed in the Emergency Healthcare System

### 2.1. Improvements Needed in the Pre-hospital Stage

#### 2.1.1. Specialization of the Report & Dispatch System

The specialization of the 119 report and dispatch system was partially upgraded when the emergency situation administrative center was established under the central situation room. However, the system still needs to differentiate further based on severity of illness and in emergency situations needing immediate dispatch such as cases of cardiac arrest. In 2012, a quality control improvement was made regarding performing CPR on cardiac arrest patients before hospital arrival; however, there is still no quality control system. Also, the Rescue and EMS Act includes regulations on emergency service quality control and the fire department's ability to appoint a chief doctor, but such regulations are not available in the central situation room and needs to be revised.

#### 2.1.2. Medical Oversight and Control

The National Emergency Management Agency published standardized field guidelines for first aid, which formalized the steps of an emergency service technician's assistance protocol during the pre-hospital stage. However, the guidelines do not take into account geographical considerations and technology levels in the field, the scarcity of emergency and medical resources, or the location of the nearest emergency facility. Therefore, the

guidelines should be revised to accommodate community-specific emergency services. Also, there is a large discrepancy between the number of indirect medical training activities provided by the appointed chief doctor per fire department. Each fire department is to have one chief doctor appointed to provide indirect medical training, but the workload differs from 1 to 80 per month given the statistics collected from January to September of 2013. The direct medical training process is integrated and managed by several local governments with few exceptions, but the process also suffers from difficulties of poor communication with the emergency service technician and the appointed doctor's lack of knowledge and experience in the specific community. With the revisions to the Rescue and EMS Act in 2011, the medical training system was developed, but further revisions need to be made to regionalize and refine the system.

## 2.2. Improvements Needed in the Hospital Stage

### 2.2.1. Overcrowding in the Emergency Department

The situation of overcrowding in leading emergency departments has been worsening due to several reasons, including the limited functional difference between various stages of emergency departments, problems in the hospital selection process during patient transfer, and the clustering of patients with mild conditions in large hospitals.

Large hospitals with a heavy flow of patients have been suffering from overcrowding, noise, and delays in the admission process. Large hospitals also tend to have a large volume of cancer patients who average 21 hours in an emergency room. This also contributes to overcrowding as this number is more than double the average stay time of 9 hours. Additionally, the emergency room stay time is proportional to the size of the emergency department, where the stay time in regional centers is 7.9 hours vs. 4.2 hours in local centers.

To address the overcrowding issue, the Ministry of Health and Welfare has attempted several policy implementations. For example, the Ministry launched a pilot program to develop the next generation emergency medical facility model that addresses overcrowding due to a high volume of non-emergency patients. The program permitted only critical patients to the emergency room, and patients with mild conditions were examined in the outpatient ward. This program is expected to reduce crowding and increase profits from outpatient treatment after hours, as well as provide information on medical clinics open after hours, which would relieve patients with mild conditions from the lack of available clinics open on holidays and during non-business hours.

### 2.2.2. Regionalization of Emergency Healthcare

Because all hospitals within the regional community are not equipped with sufficient resources (personnel, facility, equipment) to provide the highest quality emergency medical services, certain emergency conditions (major trauma, poisoning, cardio- and neurovascular diseases) should be directed to specialized medical centers – instead of to the nearest hospital – so as to access the most optimal treatment to the specific condition. This is the rationale behind pursuing regionalization of emergency healthcare.

Considering the time dependency and region-specific conditions affecting emergency medical service, regionalization of the emergency healthcare system is not an unusual concept. The current emergency healthcare delivery system is organized so that the patient's severity of illness determines the level of the emergency medical facility that the patient is transferred to (critical – regional emergency department, intermediate – local emergency department, mild – local emergency medical facility). This system is imperfect, however, since patients cannot be relied upon to determine their own severity status, and the opinions of pre-hospital stage emergency medical technicians are often unpredictable.

The existing three stages of the emergency healthcare delivery system aimed to complete the organizational components of the emergency healthcare system with limited human and financial resources; however, the end result has not been satisfactory. To address the issue, a specialized emergency healthcare system was established in 2010 including a major trauma emergency center and a cardio- and neurovascular emergency center. This is an example of how specialized emergency healthcare is assigned to the emergency medical facility to provide the final-level of treatment for critical emergency conditions by disease and region.

In 2010, the Emergency Healthcare Fund was drastically increased by approximately 5 times to KRW 2,000,000 million from KRW 400,000 million, which provided sufficient resources to establish regional specialized emergency healthcare systems, including a trauma center and cardio-and neurovascular center. Also, the fund financed the establishment of emergency medical facilities in regions with weak emergency medical services as well as newborn centers that specialize in premature infant care.

## 2.3. Improvements Needed in Governance and Systems

### 2.3.1. Regional Emergency Medical Services System

According to the Emergency Medical Service Act, the Ministry of Health and Welfare is to establish the basic framework for emergency healthcare, and the state and local governments are to follow the basic framework to establish local emergency medical service execution plans. In other words, the state and the city are to refine the framework built at

the national level by region and establish an execution plan that is appropriate to its region. The state and city also hold the power to autonomously analyze the local community, put together suitable plans, and prioritize accordingly. The Emergency Medical Service Act also rules that the state and local governments are to form regional emergency healthcare committees whose roles are to provide recommendations on the annual execution plan and evaluate the progress and end results.

However, the level of utilization of the regional emergency healthcare committee is not very satisfactory, and there are many difficulties associated with the local public health center in establishing the regional emergency medical service execution plan. Therefore, active application of the regional emergency healthcare committee should be encouraged, and the local public health center should collaborate with the Fire Service Agency to establish a systemized regional emergency medical service execution plan.

The Ministry of Health and Welfare should discuss the specific details of the basic framework of emergency healthcare with the National Emergency Management Agency and provide detailed guidelines for establishing an execution plan. The state and local public health centers are then more easily able to set up regional emergency medical service execution plans that are in line with the larger vision.

Additionally, the state and local governments are expected to actively partake in setting up the regional emergency healthcare committee and discuss the regional complications of emergency medical services. For instance, as of May 2009, only 10 out of 16 states/cities had formed a regional emergency healthcare committee, and only 4 states/cities had hosted a conference one-three times within the last four years The remaining six states/cities have no record at all of holding a meeting.

### 2.3.2. Reinforcement of Legislation and Policy

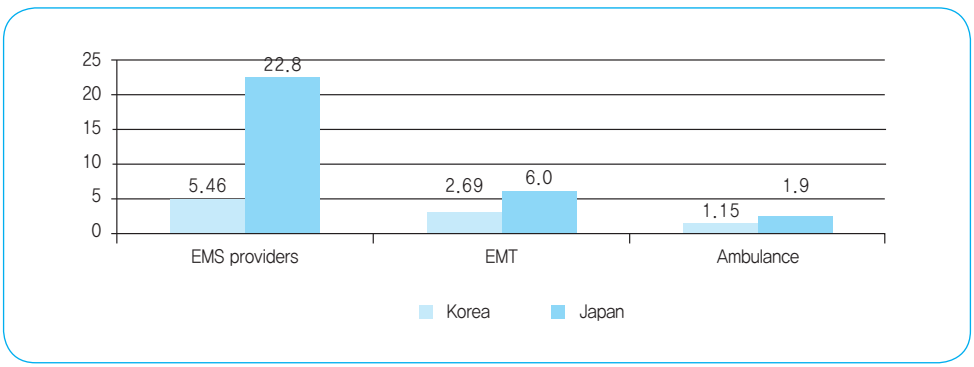
Currently, there are areas in the development of the emergency healthcare system with high demand for improvement, including public awareness of emergency medical services, the quality of first aid service, setting up regionalized emergency healthcare models – particularly with regard to trauma and cardiac arrest – disaster relief and preparedness, and accessibility to emergency medical services. Additionally, there is still a significant need for policy reforms to address the following issues: increasing cases of overcrowding in emergency rooms and consequent reduction in emergency medical facility functions and efficiency, transfer system between hospitals, linkage with the national health insurance system and securing a stable source of revenue to finance programs and reforms in emergency medical service.

# 3. International Comparison Analysis of EMS Development

## 3.1. Pre-hospital EMS Development and Outcome

Given the difference in the structures of emergency healthcare systems in other nations, there are limitations to making direct comparisons. The following table contains data for Japan in 2005, which has the most similar system as the Korean system (annual data from Japan was not obtainable). The number of ambulance vehicles per 50,000 was 1.2 vs. 1.9, and the difference was not significant. However, Japan has 2.5 times more EMTs and 3.5 times more EMS providers in general. In 2005, there were 1861.1 ambulatory transfers per 50,000 in Japan and 1551.2 ambulatory transfers per 50,000 in Korea.

**Figure 5-1 |** Number of EMTs and Ambulances in Korea and Japan

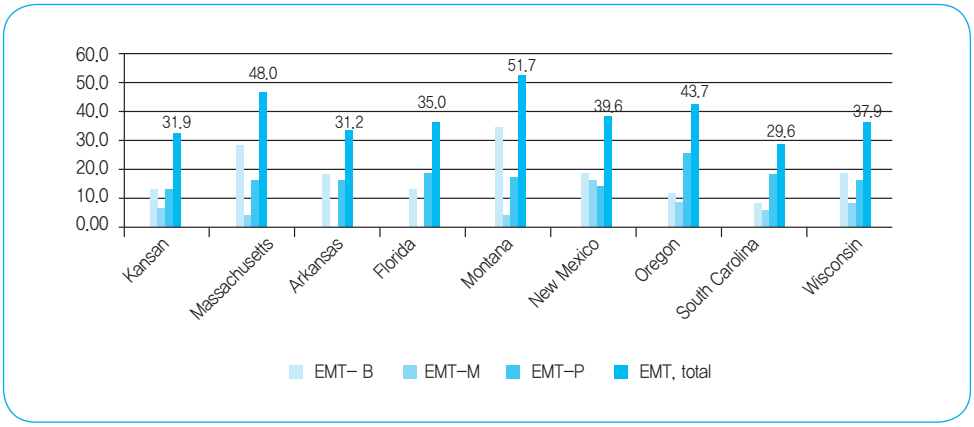



Source: 1. National Emergency Management Agency, 2. Tanigawa K, Tanaka K. Emergency medical service systems in Japan: past, present, and future. Resuscitation. 2006; 69: 365-70.

The data collected from the U.S. was reorganized to include nine states in 2008. While data on the total number of emergency service workers was not available, the size of emergency service technicians was approximated by level. The data on the number of hospital transfers categorized as emergency transfers was also not available. The available variables pertaining to hospital transfers were excluded as they included non-fire reports.

The total number of emergency service technicians per 50,000 varied by state and ranged from 29.6 to 51.7, which was very different from that of Korea or Japan.

Figure 5-2 | Comparison of EMTs per 100,000 in the U.S.




Source: Survey of EMS Practices for Heart Disease and Stroke: Summary of Results.

Table 5-1 | Ambulance Run Time per 100,000 in Europe

| | Bonn | Cantabria | Coventry | Richmond |
|---|---|---|---|---|
| Service Area [km²] | 141 | 5321 | 99 | 101 |
| Served Population | 341,303 | 537,506 | 305,000 | 197,790 |
| Population Density [1/km²] | 2421 | 101 | 3081 | 1958 |
| ALS Unit Hours [1/100,000 inhabitants/year] | 5,064 | 6,420 | 19,896 | 38,736 |
| BLS Unit Hours [1/100,000 inhabitants/year] | 16,452 | Not applicable | 42,132 | Not applicable |
| ELS Unit Hours [1/100,000 inhabitants/year] | Not applicable | 21,636 | Not applicable | Not applicable |
| SUM of Unit Hours [1/100,000 inhabitants/year] | 21,516 | 28,056 | 62,028 | 38,736 |

Source: Fischer M, Kamp J, Garcia-Castrillo Riesgo L, Robertson-Steel I, Overton J, et al.; EED Group. Comparing emergency medical service systems--a project of the European Emergency Data (EED) Project. Resuscitation. 2011; 82: 285-93.

## 3.2. Comparison of Hospital Achievements

### 3.2.1. Comparison of the Number of Emergency Healthcare Specialists

Since the very first certification of emergency healthcare specialists in 1996, the number of available emergency healthcare specialists per emergency department has been consistently increasing. As of 2012, there were 2.09 emergency healthcare specialists per 100,000 people, which increased from 1.66 per 100,000 in 2010. In comparison to other nations, the U.S. has 8.7 emergency healthcare specialists per 100,000 (2009), and Japan has 2 per 100,000 (2009), whereas Korea reported 1.9 per 100,000 in the same year (2009).

Table 5-2 | Regional Variation of Emergency Medicine Certified Board Physicians by Province per 100,000 (2012)

| Region | Total Population | Total Number of Emergency Medicine Specialists | Number of Emergency Medicine Specialists per 100,000 |
|---|---|---|---|
| Total | 50,835,155 | 1,064 | 2.09 |
| Seoul | 10,195,318 | 381 | 3.74 |
| Busan | 3,538,484 | 41 | 1.16 |
| Daegu | 2,505,644 | 52 | 2.06 |
| Incheon | 2,843,981 | 57 | 2.00 |
| Kwangju | 1,469,216 | 46 | 3.13 |
| Daejeon | 1,524,583 | 40 | 2.62 |
| Ulsan | 1,147,256 | 9 | 0.78 |
| Gyeonggi | 12,093,299 | 186 | 1.54 |
| Kangwon | 1,538,630 | 57 | 3.70 |
| Chungbook | 1,565,628 | 10 | 0.64 |
| Chungnam | 2,028,777 | 36 | 1.77 |
| Jeonbook | 1,873,341 | 46 | 2.46 |
| Jeonnam | 1,909,618 | 28 | 1.47 |
| Kyungbook | 2,698,353 | 32 | 1.10 |
| Kyungnam | 3,319,314 | 34 | 1.02 |
| Jeju | 583,713 | 9 | 1.54 |

### 3.2.2. Comparison of the Number of Emergency Departments

The reported statistics on the number of emergency rooms per population are limited in scope. In the U.S., there were 97,000,000 patients who visited the emergency room in 1995, which increased by 34% to 130,000,000 in 2010 according to the National Center for Health Statistics; on the other hand, the number of emergency rooms decreased 11% to 3,700 in 2010. Considering the population of 309,183,463 in 2010, it can be estimated that there were 1.19 emergency rooms per 100,000 people.

In Korea, there were 461 designated emergency medical facilities as of 2011, and a total of 103,200,000 patients visited the emergency room. Considering that the total population was reported at 5,0699,478 in 2011, there were 0.91 emergency rooms per 100,000 people.

In Australia, there were 129 emergency rooms operated by the public medical clinic in 2006 according to the statistics reported by the Australian Health Workforce Advisory Committee. Since 1988, there have also been private medical clinics that operate emergency rooms, and the total number added up to 23 in 2003. In total, there were 152 operating emergency rooms. Considering the population size in 2003, there were 0.76 emergency rooms per 100,000.

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# Chapter 6

## Implications for Developing Countries

1. International Norms on Emergency Medical Service (EMS) Systems
2. Experience of Establishing Emergency Medical Services (EMS) in Korea: Implications and Applicability
3. Establishing EMS Governance and System

# Implications for Developing Countries

## 1. International Norms on Emergency Medical Service (EMS) Systems

The existing norms commonly suggested by international organizations are actually difficult to implement in real-life situations because of the lack of infrastructure and resources, limited information on local populations and undeveloped transport systems in most developing countries. Yet, it is important to promote public health through the provision of emergency medical services (EMS), and therefore although it may lack evidence, it has to focus on improving overall patient health through the most effective means.

### 1.1. Guidelines for Establishing an Emergency Medical Service System for Injuries[36]

According to the survey conducted by the WHO, 83.7 deaths in 100,000 individuals are injury-related, with the total number of deaths reaching of five million – or 12% of the World's burden of disease in 2000s.

According to the report on the Global Burden of Disease in 2010, non-communicable diseases such as injuries have taken the place of infectious diseases such as HIV/AIDS, malaria and tuberculosis as the major causes of premature deaths. The report foretells of a rapid increase in the number of cases related to injuries (particularly car accidents, violence, war, self-harm, etc.) by 2020.

36. Guidelines for essential trauma care: World Health Organization; 2004.

### 1.1.1. Backgrounds

Guidelines for establishing an emergency medical service system for injuries aims to provide standard norms for health services injury-related cases, that are universally-applicable and could effectively improve injury treatment services for the large number of injuries throughout the world. In order to provide effective injury treatment services, the guidelines would determine the resources needed such as personnel (e.g. staffing and training) and other tangible resources (e.g. infrastructure, equipment and supplies). Morever, the guidelines promote setting up organizations and proper planning, at the same time improving the results of injury treatment at lower costs.

The tables presented in the guidelines determine and explain the required resources (human and physical) for the EMS, as well as what health professionals – both primary care physicians and those of a tertiary hospital – should look for in order to provide optimal treatment to injured patients. In particular, the guidelines take into careful consideration of the limited resources availability in developing countries and their EMS systems. It also includes recommendations regarding standards to promote training programs for health professionals, service quality maintenance, injury treatment teams and hospital facility monitoring systems.

The guidelines handle 14 different EMS related arease, and provide a brief summary.

### 1.1.2. Contents

The guidelines incorporate the most important requirements of EMS such as ensuring a patient's airway, treating breathing difficulties and ensuring circulation, and also propose treatment principles for head injuries, neck injuries, chest injuries, abdominal injuries, spinal cord injuries, and burns. Also, the guidelines provide useful information on pain management, medication, diagnostics and monitoring, special attention to young children, and safety management for public health professionals. In particular, these propose requirements for medical knowledge, techniques and hospital facilities depending on the level of the health institution (non-health professional outclinics, primary care clinics, secondary hospitals and tertiary referral hospitals) <Table 6-1> .

## Table 6-1 | Examples of Airway Management

| Airways: Knowledge and Devices | Level of Health Institutions[1] | | | |
|---|---|---|---|---|
| | Basic | GP | Specialist | Tertiary |
| Airway Assessment | E[2] | E | E | E |
| Manual Maneuvers | E | E | E | E |
| Airway Insertion | D | E | E | E |
| Use of Suction | D | E | E | E |
| Use of Bag-valve-mask | D | E | E | E |
| Endotracheal Intubation | D | D | E | E |
| Cricothyroidotomy | D | D | E | E |
| **Airway: Equipment and Supplies** | | | | |
| Airway | D | E | E | E |
| Suction: Manual | D | E | E | E |
| Suction: Electric | D | D | D | D |
| Suction Tubing | D | E | E | E |
| Stiff Suction Tip | D | E | E | E |
| Laryngoscope | D | D | E | E |
| Endotracheal Tube | D | D | E | E |
| Oesophageal Detector Device | D | D | E | E |
| Bag-valve-mask | D | E | E | E |
| Basic Trauma Pack | D | E | E | E |
| Magill Forceps | D | D | E | E |
| Capnography | I | D | D | D |

1. In this and subsequent resource matrices, the following key is used to indicate different levels of facilities: Basic: outpatient clinics, often staffed by non-doctors, GP: hospitals staffed by general practitioners, Specialist: hospitals staffed by specialists, usually including a general surgeon; Tertiary: tertiary care hospitals, often university hospitals, with a wide range of specialists.
2. Items in the resource matrices are designated as follows:
   E: essential; D: desirable; PR: possibly required; I: irrelevant (not usually to be considered at the level in question, even with full resource availability).

Source: Guidelines for essential trauma care: World Health Organization; 2004.

## 1.2. Predicting the Needs and Cost-effectiveness of an EMS system[37]

### 1.2.1. Cost-effectiveness Analysis

Countries willing to establish an EMS system must first consider diverse approaches and measures such as training the general public as a first responder and using medical assistants in EMS. Also, the need for ambulances and human resources must be predicted after careful consideration, and cost and cost-effectiveness should be priorities.

The following contains estimates of costs related to training the general public as a first responder.

- Expected demands
  - Every 1 million population requires 7,500 trainees.
  - It takes half a day to train the general public as a first responder.
  - The program must be repeated 3 times per year to maintain effectiveness.
  - 2,500 individuals can be trained every year.
- Expected costs
  - Since the training program takes half a day, 1,250 days of time and wages for the trainees should be set aside.
  - 1 instructor who would work 62.5 days training can educate 20 trainees.
  - A venue of 100m$^2$ in size for training must be rented for 62.5 days.
  - 1 USD will pay for 2,500 training booklets.

The following is an estimate of the expected demands and costs for training emergency medical technicians (EMTs).

- Expected demands
  - It takes 25 days to train an EMT.
  - Every 1 million population requires 7,500 trainees.
  - The program must be repeated 3 times per year to maintain effectiveness.
  - 50 EMTs can be trained every year.

37. Disease control priorities in developing countries: Washington, DC: World Bank and Oxford University Press; 2006.

■ Expected costs

- 1,250 days (25 days per trainee × 50 trainees) of training time is necessary.
- If 10 trainees are assigned to 1 instructor, 125 days of the instructor's training time is necessary.
- A venue of 100m² in size for the training is necessary.
- It costs 1 USD for one training booklet. A total of 50 booklets are needed.
- All trainees must prepare a stethoscope, gloves, dressings and splinting material.

The following is an estimated cost for a training program if provided at the national level.

Table 6-2 | Cost of Using General First Responders with Trained Paramedics

(Unit: USD)

| Regions | Low Costs | Moderate Costs | High Costs |
|---|---|---|---|
| East Asia and Pacific | 27,539 | 48,050 | 75,232 |
| Europe and Central Asia | 30,209 | 52,339 | 79,605 |
| Latin America and Caribbean | 32,777 | 74,589 | 110,453 |
| Middle East and North America | 33,050 | 104,585 | 261,935 |
| South Asia | 27,183 | 45,637 | 116,456 |
| Sub-Saharan Africa | 20,765 | 52,339 | 115,171 |
| Average | 30,254 | 62,923 | 126,475 |

Note: Cost of treating a community of 1 million.

Source: Disease control priorities in developing countries: Washington, DC: World Bank and Oxford University Press; 2006.

According to the WHO, the number of injury cases in the world is estimated at 410 cases per 4,100~100,000 individuals. Husum (2003) says the availability of first responders and trained medical assistants could reduce the mortality rate by 9%. Therefore, based on the estimate of 410 deaths per 4,100 cases, the estimated cost would be equivalent to the cost corresponding to 370 deaths (91%). Moreover, if the regional life expectancy of a non-injured individual at the age of 20 could be assumed, the cost could be calculated by dividing the number of years. In general, the life expectancy at the age of 20 is 50 years, except for those who reside in Western Sub-Saharan region <Table 1-2>.

Table 6-3 | Cost-effectiveness of Combining Paramedics with Lay Responders

(Unit: USD)

| Regions | Low Costs | Moderate Costs | High Costs |
|---|---|---|---|
| Cost per death averted with trained first responder together with volunteer paramedics | | | |
| East Asia and Pacific | 74 | 130 | 203 |
| Europe and Central Asia | 82 | 141 | 215 |
| Latin America and Caribbean | 89 | 202 | 299 |
| Middle East and North America | 89 | 283 | 708 |
| South Asia | 73 | 123 | 315 |
| Sub-Saharan Africa | 83 | 141 | 311 |
| Average | 82 | 170 | 342 |
| Cost per life year saved with trained first responder together with volunteer paramedics | | | |
| East Asia and Pacific | 3 | 5 | 8 |
| Europe and Central Asia | 3 | 5 | 8 |
| Latin America and Caribbean | 3 | 8 | 11 |
| Middle East and North America | 3 | 11 | 27 |
| South Asia | 3 | 5 | 12 |
| Sub-Saharan Africa | 4 | 6 | 14 |
| Average | 3 | 7 | 13 |

Note: Cost of treating a community of 1 million.

Source: Disease control priorities in developing countries: Washington, DC: World Bank and Oxford University Press; 2006.

The concepts proposed in the above also could be applied to ambulances (emergency medical transportation) in urban and rural areas <Table 1-3>.

■ Expected demands

- In an urban area, 1 ambulance covers 30,000 individuals; therefore, 33 ambulances in total are necessary for a population of 1 million.
- Each ambulance must be accompanied by six medical assistants and 1 on standby.
- 1 administrator (ambulance operation manager) is necessary to manage 3 ambulances.
- An ambulance can be used for 9 years, and its remodeling and maintenance cost would be around USD5,000.

- A mileage of 20,000km/year is expected for an ambulance, and therefore such costs must be considered as well.

■ Expected costs

- It is necessary to provide wages for 231 rescue workers (33 ambulances × 7 staffs/ambulance) and 10 administrators.

Table 6-4 | Cost and Effectiveness of Ambulances

(Unit: USD)

| Regions | Low Cost | Moderate Cost | High Cost |
|---|---|---|---|
| Cost of treating a community of 1 million with urban ambulances | | | |
| East Asia and Pacific | 691,603 | 871,208 | 1,090,032 |
| Europe and Central Asia | 839,468 | 1,204,235 | 1,220,888 |
| Latin America and Caribbean | 849,556 | 1,550,521 | 1,747,630 |
| Middle East and North America | 894,379 | 2,435,000 | 4,960,705 |
| South Asia | 676,111 | 803,361 | 1,973,093 |
| Sub-Saharan Africa | 781,568 | 951,906 | 1,905,417 |
| Average | 788,781 | 1,272,705 | 2,149,628 |
| Cost per death averted in treating a community of 1 million with urban ambulances | | | |
| East Asia and Pacific | 988 | 1,245 | 1,557 |
| Europe and Central Asia | 1,199 | 1,463 | 1,744 |
| Latin America and Caribbean | 1,214 | 2,215 | 2,497 |
| Middle East and North America | 1,278 | 3,479 | 7,087 |
| South Asia | 966 | 1,148 | 2,819 |
| Sub-Saharan Africa | 1,117 | 1,360 | 2,711 |
| Average | 1,127 | 1,818 | 3,071 |
| Cost per life year saved in treating a community of 1 million with urban ambulances | | | |
| East Asia and Pacific | 50 | 63 | 79 |
| Europe and Central Asia | 62 | 75 | 90 |
| Latin America and Caribbean | 61 | 111 | 126 |
| Middle East and North America | 65 | 176 | 359 |

| Regions | Low Cost | Moderate Cost | High Cost |
|---|---|---|---|
| South Asia | 50 | 60 | 147 |
| Sub-Saharan Africa | 67 | 81 | 163 |
| Average | 59 | 95 | 161 |
| | | | |
| Cost of operating ambulances in a rural area, per 1 million | | | |
| East Asia and Pacific | 2,978 | 3,748 | 4,686 |
| Europe and Central Asia | 3,613 | 4,405 | 5,248 |
| Latin America and Caribbean | 3,652 | 6,656 | 7,500 |
| Middle East and North America | 3,847 | 10,449 | 21,274 |
| South Asia | 2,911 | 3,457 | 8,470 |
| Sub-Saharan Africa | 3,361 | 4,092 | 8,178 |
| Average | 3,394 | 5,468 | 9,226 |

Source: Disease control priorities in developing countries: Washington, DC: World Bank and Oxford University Press; 2006.

### Table 6-5 | Summary of Cost and Effectiveness

(Unit: USD)

| Regions | Training First Responder and Medical Assistants | Ambulances in Urban Area | Ambulances in Rural Area |
|---|---|---|---|
| Cost for a population of 1 million | | | |
| East Asia and Pacific | 48,050 | 871,208 | 2,623,392 |
| Europe and Central Asia | 52,339 | 1,204,235 | 3,083,637 |
| Latin America and Caribbean | 74,589 | 1,550,521 | 4,659,017 |
| Middle East and North America | 104,585 | 2,435,000 | 7,314,544 |
| South Asia | 45,637 | 803,361 | 2,419,607 |
| Sub-Saharan Africa | 52,339 | 951,906 | 2,864,062 |
| Average | 62,923 | 1,272,705 | 3,827,376 |
| | | | |
| Cost per death averted for a population of 1 million | | | |
| East Asia and Pacific | 130 | 1,245 | 3,748 |
| Europe and Central Asia | 141 | 1,463 | 4,405 |

| Regions | Training First Responder and Medical Assistants | Ambulances in Urban Area | Ambulances in Rural Area |
|---|---|---|---|
| Latin America and Caribbean | 202 | 2,215 | 6,656 |
| Middle East and North America | 283 | 3,479 | 10,449 |
| South Asia | 123 | 1,148 | 3,457 |
| Sub-Saharan Africa | 141 | 1,360 | 4,092 |
| Average | 170 | 1,818 | 5,468 |
| Cost per life year gained for a population of 1 million[a] | | | |
| East Asia and Pacific | 5 | 63 | 190 |
| Europe and Central Asia | 5 | 75 | 227 |
| Latin America and Caribbean | 8 | 111 | 335 |
| Middle East and North America | 11 | 176 | 530 |
| South Asia | 5 | 60 | 180 |
| Sub-Saharan Africa | 6 | 81 | 245 |
| Average | 7 | 94 | 284 |

a. Personnel consists of lay first responders together with paramedics.

Source: Disease control priorities in developing countries: Washington, DC: World Bank and Oxford University Press; 2006.

# 2. Experience of Establishing Emergency Medical Services (EMS) in Korea: Implications and Applicability

## 2.1. Pre-hospital Management of the EMS System

### 2.1.1. Emergency Medical Technician (EMT) Training Program

**a. Implications**

In Korea, EMTs are primary providers of pre-hospital care and provide care quickly, at the scene, and while satisfying emergency treatment services. These are important criteria for pre-hospital trauma care. Depending on their roles, EMTs are classified as Class 1 or Class 2. The former has to go through training at the university level, while the latter requires complete training sessions in a relatively short period of time. The training programs for both Class 1 and Class 2 mandate training periods in an emergency medical (EM) center. Also, by developing and applying an evidence-based assessment system, Korea realized

improvements in on-scene emergency medical response rates, along with other advancements in the EMS system. Yet, the overall quality of the on-scene emergency medical response is inadequate despite training programs for high-quality human resources. This might imply a lack of medical direction system once the EMTs first respond at the scene.

**b. Applications**

When developing a pre-hospital EMS system, it is very important to consider long-term planning and a practical approach for training human resources. In the beginning of establishing an EMS system, priority should be placed on training first responders and educating the general public. The first responder in urban areas could be, for example, a bus driver within the public transport system while a village councilman could take on this role in less populated areas. If an ambulance is required, then medical assistants must also be trained. Although EMTs are the primary service providers, they should undergo driving instructions and lessons. If EMTs are eventually trained to drive as paramedics, a long-term plan is necessary to facilitate this process and roles.

Medical doctors should participate and take the leading role in selecting EMTs, determining their training requirements, and drafting related guidelines since they are the ones actually responsible for the patients once transferred to hospitals. If an EMT implemented pre-hospital care just as the doctor directed, the doctor would indirectly be responsible for on-scene medical treatment administered by the EMT.

### 2.1.2. On-scene Care and Transport Service

**a. Implications**

Korea uses a national fire fighting system, intended for both fire fighting and rescue, during dispatches to accident scenes in order to provide advanced life support and then transport them to a hospital by ambulance or helicopter as a free of charge service. This system is based on health professionals who are trained to perform emergency medical services, as well as the supplying of ambulances, helicopters and emergency medical equipment for emergencies. Moreover, Korea has enabled high-quality well-trained EMS teams by developing an evaluation program for emergency treatment and transport.

However, it seems organizing an independent team for emergency services by drawing from existing fire fighting and rescue personnel within the fire fighting system could be convenient for reducing costs for human resrouces. Also, not having a clear medical direction has resulted in several side effects. For example, patients were able to choose their own hospitals during transport, resulting in a populous convergence on certain hospitals. Also, many non-critical cases were transported to hospitals, compromising the system's ability to respond to genuine emergencies.

In the case of air transport, the Korean system assured service efficiency by operating a helicopter. However, Korea did not have a professional EMS team dedicated to high-risk patients and has yet to develop such a capacity.

**b. Applications**

When establishing an on-scene care and transport service system, one must take into account a cost-effective operation. Particularly in those countries with a high rate of car accidents and injuries in their society overall, they could first consider an EMS focusing on injury and maternal and child health.

If the fire fighting system is utilized for pre-hospital trauma care, the government needs to provide the manpower for fire fighting and rescue rather than exclusively for emergency treatment personnel.

However, if it is difficult to introduce an ambulance to the scene, using other transport methods such as a police car and public transport should be considered. While the quality of on-scene care is important, the arrival time to the hospital is of a higher priority. If the fire or police departments plan to purchase a helicopter, this should also be considered in the transport of patients in emergencies.

### 2.1.3. Projects for Promoting Emergency Services, Setting Up Communication Systems, and Facilitating Effective Disaster Response

**a. Implications**

Korea applies a national emergency telephone number, 119, to fire and rescue services. By using this existing system, Korea was able to build a situation room at the metropolitan level for an effective EMS communications network. The system unified operational processes prior to setting up pre-hospital care management for free of charge with a single phone call anywhere within the country. This process is followed by report by a phone call, emergency medicine consultation and support, dispatch, on-scene care, and hospital transport.

Despite the convenience and efficiency of this available EMS system, if mobile phones are used, the regional code of the scene has to precede the 119 situation room, and video calls from smart phones are practically not utilized. Also, the available manpower in the situation room sometimes can be problemetic with less-experienced consultatns being used, resulting in delays in diagnosing the severity of the emergency or providing pre-treatment emergency care or support on the line before the ambulance arrives.

**b. Applications**

Ensuring an efficient communication system and rapid dispatch system is much more important than on-scene care. Since many countries have a reduced distribution rate of wired telephones, and wireless systems such as mobile phones are being increasingly utilized even in developing countries as a major means of communication, the EMS communication network should take this trend into consideration. For example, it is necessary for major health facilities such as maternal and child health centers and emergency care centers to consider a way to communicate by radio with the situation room.

### 2.1.4. Projects for EMS Assessment and Medical Direction Systems

**a. Implications**

Korea implemented an evidence-based assessment system for pre-hospital EMS, which enabled its continuous development. Also, certain independent functional characteristics of the National Emergency Medical Center allowed for continuous and fair scientific assessments.

Through the EMS assessment system, it was found that adequate handling of major emergency cases such as cardiac arrest and polytrauma had been questioned despite the availability of well trained personnel being dispatched immediately to the scene, which suggested a lack of medical direction.

**b. Applications**

Governments must establish an independent organization that can continuously address EMS assessments. In particular, it is important to have an assessment for the pre-hospital EMS system, which will eventually serve as the main driving force of the system's development. Also, a reporting system to assess the form of documentation, for example patient transport reports, is needed. When establishing the assessment system, the government must provide the key indicators to be used for long-term development and applied for future use – this could also be used to assess newly-proposed resolutions to current problems.

If emergency medical technicians and paramedics are the primary service providers in pre-hospital EMS, the government must implement a medical direction system in the very early stages, and an assessment has to be conducted for this as well.

## 2.2. Hospital-based Emergency Care System

### 2.2.1. Human Resources for Emergency Care

**a. Implications**

Korea has effectively developed the EMS by implementing an emergency medicine specialist system. The most important criterion for designating a trauma centre is the availability of EM staff including EM specialists. This has allowed for Korea to satisfy public demands.

However, it has been difficult to develop the EMS system because of the way medical specialists are classified in Korea. Also, the limited training exchange programs among specialists has impeded the development of emergency medicine. Moreover, the training programs of EM nurses and special coordinators (data admistrators) were not well accompanied. EM nurses and special coordinators (data administrators) not being accompanied.

**b. Applications**

Development of emergency medicine eventually requires training EM specialists. But in the early stage of an EMS, EM specialists can be provided by educating non-medical staff through basic training programs to handle patients with diarrheal or other infectious diseases.

### 2.2.2. Emergency Medical Facilities

**a. Implications**

Korea has 3 major levels for designating EM special centers (district trauma center, regional trauma center, and regional trauma institute), in addition to a center for burn victims, establishing an efficient emergency patient transport and treatment system. And by determining the criteria for the EM medical staff employed based on the center levels, it provides efficient and better treatment for patients.

This system, however, has not been successful in preventing patient convergence to EM departments at specific or popular university hospitals due to the limited emergency patient transport system.

**b. Applications**

It is necessary to establish a patient transport system that can handle every transport stage with assigned EM centers to provide support. In the case of using current medical institutes, the roles of the EM center have to be clarified in advance, and the system's capacity strengthened to reflect the needs of EMS and address inequalities among the regions.

### 2.2.3. Assessing and Monitoring EM Centers

**a. Implications**

Korea has adopted a legal basis through the Emergency Medical Service Act, which includes the practice of EM center assessments and specifies the roles of the National Emergency Medical Center (NEMC) as the executive body for such tasks. Based on the Act, the NEMC could therefore assess whether or not the EM center satisfies the mandatory requirements on structure, process and public service. Also, The Ministry of Health and Welfare, the NEMC, and the Emergency Medical Center Evaluation Committee conduct private and public assessments of the system. The emergency medical information network enabled documentation of objective reference data that could be used for common national indicators.

The evaluation system of emergency medical institutions connects its results to EMS fund incentives, therefore supporting the development of the institutions depending on their status and performance.

Yet, the uniform application of the evaluation system throughout the nation resulted in difficulties such as inequalities among EMS services since the existing situation of unequal resources among the regions has not yet been reconciled.

**b. Applications**

It is necessary to ensure a legal basis such as Korea's Emergency Medical Service Act for the establishment of an EMS evaluation committee while providing an institutional strategy. The law must include an adequate evaluation depending on the development stages of the EM center, and must be accompanied by an incentive system based on its evaluation results. By conducting different evaluation programs that must have different requirements depending on the population (e.g. urban areas and less populated regions), legal precedence could foster the roles of EM centers in the regions.

### 2.2.4. Patient Transfer between Hospitals

**a. Implications**

In Korea, a fee is charged for the use of an ambulance in the case of a patient transfer from hospital to hospital or from the hospital to the patient's residence. An EM center must be entrusted with ambulance operation with equipment and medical staff to transport critical patients. Also, the patient transfer system with a helicopter is operated for dispatch and between hospitals.

Yet, the quality of the system in Korea has not been maintained unlike that of pre-hospital trauma care, due to the small size of private transport companies which are mostly responsible for the ground transport. Although airway transport is an essential service to provide rapid patient transfer, it requires special facilities for taking off and landing, as well as specially trained staff to maintain the service, requiring more resources to be invested in the future.

**b. Applications**

Operation of ambulances for patient transfer between hospitals and also for critical patients is necessary. And in order to maintain the system, there must be fees for the service, and expenses have to be calculated appropriately. For private transport companies, a management system is necessary to prevent potential misuse and abuse of ambulances. For the airway transport system, helicopters from fire fighting and police departments could be considered for use during these early stages.

## 3. Establishing EMS Governance and System

### 3.1. Emergency Medical Service Act

**a. Implications**

Korea established a legal basis, thus the foundation and requisites, for the Emergency Medical Information Center, EM institutions, Emergency Medical Service Fund and human resources for EMS by enacting the "Emergency Medical Service Act" and "Act on 119 Rescue and Emergency Medical Services." However, the laws for pre-hospital care and hospital care are separately written, limiting the EMS system to operation as one single system.

**b. Applications**

Laws and policy to organize the EMS system and arrange for its funding constitute the beginning steps to developing the EMS. Thus, one single law is necessary to effectively

manage pre-hospital and hospital care. Yet, prior to establishing the law and policy, strategic plans for EMS development must be addressed first, by taking into account the country's EMS and public health system characteristics.

## 3.2. EMS Funds

**a. Implications**

Korea collects EMS funds for development through paying accounts and has been expanding the size of its budget gradually by assigning car accident fines to part of the EMS fund budget. Also, Korea applies medical insurance costs for emergency patient care and treatment. At the same time, it also limits the use of EM centers by non-emergency patients,which helps to control the overpopulation problem in certain centers.

However, it is difficult to arrange for funding and solve the challenges at the regional level of EMS because the EMS funds are primarily used at the central government level for implementing EM policy and supporting EM centers. Moreover, the system to encourage the participation of the public and local government for fund raising is not fully developed, limiting the EMS fund to evolve as social property.

**b. Applications**

It is difficult to expect private investment for EMS because it is less likely to return profits in the course of providing 24 hours of maintenance for medical staff, equipment and facilities to better respond to any emergency situation. Therefore, it is necessary to establish the EMS fund on a social basis, and develop the medical insurance costs for EMS as a budget for operating the EM institution.

It is more secure to obtain EMS funding through a government budget. Other options, however, include incorporating the support of industries most involved in the use of emergency services – e.g., car insurance companies – through some type of a social agreement. In this vein, the medical community could provide reports and documents that demonstrate and support the actions to reduce EM related incidents and the social burden. In addition, the most common uses of emergency services (e.g. car accidents, and maternal and child health) could receive priority in terms of identifying funding for cost-effectiveness.

## 3.3. Administration of the EMS System

**a. Implications**

In Korea, emergency medicine is handled by several governmental bodies. The Ministry of Health and Welfare is responsible for enacting laws, budget planning and establishing policy for EMS hospital care, while the National Emergency Management Agency

addresses pre-hospital care. Actual operation and budget handling is conducted by the local government. And in order to promote policy coordination between the bodies, an operating committee at the local level is established as well. The Ministry of Health and Welfare, the Ministry of Strategy and Finance, the Ministry of Education, the Ministry of Land, Infrastructure and Transport, and the National Emergency Management Agency participate in the Central Emergency Medical Service Committee which handles the evaluation of the Emergency Medical Service Basic Plan and the use of the EMS funds.

Organize and operating a central emergency medical center as an collaborating body of the Ministry of Health and Welfare and the National Emergency Management Agency would be ideal to execute the evaluation results. Yet, this set-up seems inconvenient because the National Emergency Medical Center already exists under the Ministry of Health and Welfare as a part of the National Medical Center.

One of the current challenges is developing the EMS through the local government. In the local government, where the EMS is practically achieved, the Department of Public Health Policy and Fire Service are responsible for hospital and pre-hospital care, respectively. Therefore, the organizations must collaborate. And to handle this task, the Regional Emergency Medical Service Committee is created. For practical purposes, the local committee must be operated at all times. But since it is operated as a non-sdeady one, it is difficult to expand the scope beyond mere delivery of the policies from the central government.

In order to implement EMS policies appropriately to patients at the scene, and be applied as practical emergency treatments, it is necessary to localize emergency medicine and its management.

**b. Applications**

Operating emergency medicine management systems requires decisions from the central government, collaboration between departments, and processes for mediating their respective interests. Yet this effort should be accompanied by the collaboration and operational system of the local government. The central government has to provide solutions to current challenges and long-term plans at the national level, as well as undergo review processes and revisions based on the outcome of these efforts. If the governmental body handling pre-hospital emergency care is different from that handling hospital emergency care, a committee has to be established to control the process.

The operational system of the local government has to be conducted at a civic unit, and as a constant organization, it must be able to perform tasks such as providing medical direction to EMS staff, supporting EM centers, and resolving the current challenges.

1) The Dong-A Ilbo. “Emergency patient rejected by three hospitals died.” June 30, 1989 *(Korean)*

2) The Korea Institute for Health and Social Affairs. Evaluation of Emergency Medical Services System. 1993. Seoul *(Korean)*

3) The Korea Society of Emergency Medicine. Proposal for Establishment of New Specialty Medicine. The Journal of Korea Society of Emergency Medicine. 1992;3(2):5~9 *(Korean)*

4) The National Emergency Medical Center. “History of Korean Emergency Medical Services System”. Available at www.nemc.or.kr/emergency/emergency_history.jsp. Accessed on November 30, 2013 *(Korean)*

5) The Hangyorye Shinmun. “ Increse in number of EMS use.” August 5, 1990

6) The Dong-A Ilbo. “Urban disasters increase but very old EMS equipments.” November 17, 1997 *(Korean)*

7) Jong Gil Lee. What is the problem for preparing hospital emergency care? The Journal of Korea Society of Emergency Medicine. 1993;4(1);8~14 *(Korean)*

8) The Korea Institute for Health and Social Affairs. Evaluation of Emergency Medical Services System. 1993. Seoul *(Korean)*

9) The Kyounghyang Shinmun. “Designating 54 hospitals for emergency medical facility.” March 28, 1990 *(Korean)*

10) The Dong-A Ilbo. “Designating 79 hospitals for emergency medical facility.” July 25, 1990 *(Korean)*

11) The Kyounghyang Shinmun. “Emergency medical services system will be operated for 24 hours 7 days” July 1, 1991 *(Korean)*

12) The Kyounghyang Shinmun. “The Top 10 news of medical society in 1991” December 20, 1991 *(Korean)*

13) The Korea Institute for Health and Social Affairs. Evaluation of Emergency Medical Services System. 1993. Seoul *(Korean)*

14) Hori S. Keio. Emergency medicine in Japan. J Med. 2010; 59 (4): 131-9.

15) The Ministry of Health and Welfare. 2010~2012 Advancement of Emergency Healthcare Proposal. 2009. Seoul. *(Korean)*

16) Korea Foundation for International Health. ODA model development of emergency medical services system in developing country. 2013. Seoul *(Korean)*

17) Judith Tintinalli et al. Tintinalli's Emergency Medicine: A Comprehensive Study Guide, 7e

18) The Office of Legislation. The Emergency Medical Services Act. Available at

http://www.law.go.kr/%EB%B2%95%EB%A0%B9/%EC%9D%91%EA%B8%89%EC%9D%98%EB%A3%8C%EC%97%90%20%EA%B4%80%ED%95%9C%20%EB%B2%95%EB%A5%A0. Accessed on December 20, 2013.

19) Dong Woo Suh. Change of Emergency Department Visits between Before and After Implementation of Emergency Medical Care Management Program. 2003 *(Korean)*

20) The Ministry of Health and Welfare. 2013~2017 Emergency Healthcare Plan. 2013. Seoul *(Korean)*

21) The Ministry of Health and Welfare. 2010 Report of Health and Welfare. 2011. Seoul *(Korean)*

22) The Office of Legislation. The Emergency Medical Services Act. Available at

http://www.law.go.kr/%EB%B2%95%EB%A0%B9/%EC%9D%91%EA%B8%89%EC%9D%98%EB%A3%8C%EC%97%90%20%EA%B4%80%ED%95%9C%20%EB%B2%95%EB%A5%A0. Accessed on December 20, 2013 *(Korean)*

23) Available at https://www.digitalbrain.go.kr/kor/view/index.jsp. Accessed on December 20, 2013 *(Korean)*

24) The Korea Human Resource Development Institute for Health and Welfare. Substitution and reimbursement Program Analysis for Emergency Patients. 2009. Seoul *(Korean)*

25) Yun Kim, Koo Young Jung, Jun Sik Kim. Problem and preventable death rate in trauma care. The Journal of Korea Society of Emergency Medicine. 2001;12(1):45~56 *(Korean)*

26) Korea Health Industry Development Institute. Basic Plan of Emergency Healthcare and Evaluation of Emergency Medical Services System. 2005. Seoul *(Korean)*

27) Available at http://nafs.assembly.go.kr:83/) Available at http://nafs.assembly.go.kr:83/ Accessed on December 20, 2013 *(Korean)*

28) Seung Hwan Myung, Ju Sang Chun, Ki We. Vision and Strategy of New National Emergency Management Agency: Government Organization Reform of Disaster Area. The Journal of Korea Administrative Affair. 2004

29) The Office of Legislation. The Emergency Medical Services Act. Available at http://www.law.go.kr/%EB%B2%95%EB%A0%B9/%EC%9D%91%EA%B8%89%EC%9D%98%EB%A3%8C%EC%97%90%20%EA%B4%80%ED%95%9C%20%EB%B2%95%EB%A5%A0. Accessed on December 20, 2013 *(Korean)*

30) Available at https://www.digitalbrain.go.kr/kor/view/index.jsp. Accessed on December 20, 2013

31) Available at http://nafs.assembly.go.kr:83/ Accessed on December 20, 2013

32) Korea Health Industry Development Institute. Study on Improvement of Fee for Services of Emergency Medical Services. 2003. Seoul *(Korean)*

33) Korea Health Industry Development Institute. Cost-Benefit analysis of Development of Emergency Medical Services. 2008. Seoul *(Korean)*

34) Board of Audit and Inspection of Korea, Disposition of Audit Result ? Operational Status of Emergency Medical Service System, 2011

35) Ex-post Evaluation Report 2013 Emergency Medical Service Reinforcement Project for Local Hospitals in Avissawella, Sri Lanka - Hanyang University, KOFIH

36) Assessment Plan Report 2011 Emergency Medical Service Reinforcement Project in Tangalle, Sri Lanka - - Korean society of Emergency Medicine, KOFIH

37) 2012 Democratic Republic of the Congo Mission Trip Report: 1st EMS Training, KOFIH

38) 2012 Democratic Republic of the Congo Mission Trip Report: 2nd EMS Training, KOFIH

39) 2012 Democratic Republic of the Congo Mission Trip Report: 3rd EMS Training, KOFIH

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