

## First Aid Education for High School Students - Focusing on CPR, AED installation and application -

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### ABSTRACT

*This research, by analyzing the current first aid education status in K district, Seoul and comparing first aid education systems in other developed countries, introduces the need of first aid/Cardio Pulmonary Resuscitation(CPR) education with Automated External Defibrillator(AED) usage to high school students, who are on the verge of becoming adults. The thorough research shows that schools should be appointed as mandatory facilities for AEDs by laws and execute first aid education to their students. Only through organized and consistent first aid education would the students develop into true volunteers who not only have altruistic minds, but the ability to fluently adapt to medical emergency and properly use AED. In addition, the research also outlines various laws that could be legislated such as having to master the basic degrees of first aid education before getting driver's license and graduating high school so that more people become aware of first aid.*

**Keywords:** first aid education, emergency medical service, cardiopulmonary resuscitation(CPR), automated external defibrillator(AED), volunteering

### 1. INTRODUCTION

According to National Statistical Office, diseases related with brain and heart blood vessel ranked second, third on causes of death in 2009 Korea and the number of such deaths is 48185, constituting 19.54% of total dead population 246,942 [1]. The data reflects a rapid increase in the number of patients (especially elderly people, people suffering from cardiovascular patients and those afflicted with drowning accidents and asphyxia) having cardiac standstill before arriving at the hospital [2]. In emergency situation, the Act of Cardio Pulmonary resuscitation(CPR) becomes significant in saving the patients' lives from the edge of death. Because it is impossible to predict the time of cardiac standstill and a fatal brain damage occurs 4~6 minutes after such cardiac standstill,

It has been found out that most of cardiac attacks happen at homes and as a result, in majority cases, it happens out that the family members or friends become

the observers of the accident [3]. In cases of severe patients as well, 70% of them undergo cardiac arrests at homes and thus, it becomes absolutely important to educate the general public of cardiopulmonary resuscitation so that they acknowledge and handle emergency situations with fluency[4]. Therefore, for rudimentary cardiopulmonary resuscitation to be well executed in the scene of accident, basic education and promotion on first aid including CPR should be given to the public.

American Heart Association in 2000[5] also stated that as early cardiopulmonary resuscitation plays a critical role in increasing the survival rate of a patient, CPR education should be required in mandatory courses from high school to general public. Immediate CPR is especially necessary in South Korea where the survival rate for cardiac arrest patients before arriving at hospital is 2~17%, a rate lower than that of other developed countries [6].

In response to 2007, 12 Emergency Medical Service Act, Republic of Korea obliged provision of AED

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(Automated External Defibrillator) and AED usage guide booklets in public institutions and other multiplex facilities designated by Presidential Decree. In 2010, 300 million dollars were sent as government funds to provide AED facilities and currently, approximately 1160 AED are installed nationwide [7]. In addition, there is an ongoing research to improve the user interface characteristic of AED machines to the extent that even the novice may use it well [8]. However, in standards to June 2010, only 2,647 places (public institution-2,414, multiplex facility-197, others -36) have AEDs prepared out of all 12,623 required facilities. In a state which AEDs have been set in 19.4% of the places that should have been set already, there is a need of additional installation of AEDS.

While the awareness of necessity of CPR education to the general public is increasing, in reality it is perceived to be difficult to attempt an organized and consistent CPR education to ordinary adults[9]. Considering this dire situation, the most effective and efficient way of maximizing the number of people who are capable of performing first aid would be teaching first aid/CPR education to high school students, the adolescents on the verge of becoming adults. Taking into account of the fact that Korean high school students must fulfill 20 hours of volunteering annually and a significant numbers are volunteering in welfare centers for the aged or disabled, CPR education to high school students is actually a necessary education provided at the most appropriate period. To make an additional remark, an organized and consistent education towards high school students would directly contribute to increasing social awareness of general first aid and carrying out CPR in real life.

## 2. LITERATURE REVIEW

### 2.1. Definition of Words

Here are some of the definition of the words used frequently in this paper.

#### 2.1.1 Emergency Medical Services

Emergency medical services are a type of emergency service dedicated to providing out-of-hospital acute medical care and/or transport to definitive care, to patients with illnesses and injuries which the patient, or the medical practitioner, believes constitutes a medical emergency.

#### 2.1.2 First Aid

First aid is the provision of initial care for an illness or injury. It is usually performed by non-expert, but trained personnel to a sick or injured person until definitive medical treatment can be accessed. It generally consists of a series of simple and in some cases, potentially life-saving techniques that an individual can be trained to perform with minimal equipment.

#### 2.1.3 Automated External Defibrillator (AED)

An automated external defibrillator(AED) is a portable electronic device that automatically diagnoses the potentially life threatening cardiac arrhythmias of ventricular fibrillation and ventricular tachycardia in a patient, and is able to treat them through defibrillation, the application of electrical therapy which stops the arrhythmia, allowing the heart to reestablish an effective rhythm (Cited from Wikipedia).

### 2.2 Developed Countries' Status of CPR Education and Application

Even though it is hard to collect data regarding first aid in Europe, according to IFRC and European Reference Centre for First Aid Education, in countries, such as Norway(95%), Austria (80%), Germany (80%), Iceland (75%) and Sweden(50%), most people have received CPR education. In addition, these countries have enacted laws to require people to obtain CPR education certificate when employing at school, work or acquiring driver's license [11]. That is to say that 55% of European Countries call for all potential drivers and 70% of employees in workplaces to be acknowledged of first aid and CPR. Since IFRC believes that all people are capable of saving human lives, in developed countries, CPR is not regarded as a simple tool but a humane activity and a great responsibility as a global citizen.

Table 1. First Aid Education in Developed Countries

Country	Current Situation
United States [9]	· CPR education through American Heart Association and American Red Cross · American Heart Association in 2000 stated that because early cardio-pulmonary resuscitation plays a critical role in increasing the survival rate, CPR education should be required in mandatory courses from high school to general public..
Japan [9]	· Require CPR education in getting driver's license
Europe [11]	· Northern European countries require CPR education in workplaces and when getting driver's license

**2.3 Current Status of CPR Education and Application in Korea**

We will review the CPR related laws in Korea and in other countries. And then review the current status of the CPR education and application in Korea.

**2.3.1 Emergency Medical Service Act in Korea**

The following Emergency Medical Service Act including Good Samaritan law has been implemented in Korea since December 14, 2008. Federal and local governments' responsibility to provide financial funds for emergency medical service, first aid equipment and protect Good Samaritan laws are described as below. In law, currently schools are not marked as compulsorily first aid equipped facilities.

**Article 13(Provision of Emergency Medical Service)**

The State and local governments shall adopt and implement policies on the provision of emergency medical services, such as the protection of individuals having an emergency medical condition, assistance in and the establishment and operation of medical institutions, etc., the training of manpower for emergency medical service and the securing of the means of transportation for the emergency transfer of individuals, etc.

**Article 16(Financial Assistance)**

② The State or a local government may provide necessary financial support to institutions which should have emergency equipment for cardiopulmonary resuscitation, such as automated external defibrillators or such under Article 47-2.

<Newly inserted by Act No. 8692, Dec. 14, 2007>

**Article 47-2(Duty of Possession of Emergency Equipment for Cardiopulmonary Resuscitation)**

① Institutions, etc. falling under any of the following subparagraphs shall have emergency equipment which can perform cardiopulmonary resuscitation, such as an automated external defibrillator or such:

1. Public health and medical services institutions under Article 2 of the Public Health and Medical Services Act;
2. Ambulances being operated by first-aid teams under Article 35 of the Framework Act on Fire Services;
3. Passenger airplanes being used for the purpose of air transportation business from among the airplanes under subparagraph 1 of Article 2 of the Aviation Act and airports under subparagraph 5 of Article 2 of the same Act;
4. Passenger trains from among the rolling stock under subparagraph 4 of Article 3 of the Framework Act on the Development of Railroad Industry;
5. Ships, gross tonnage of which is not less than 20 tons from among ships under Article 1-2 of the Ship Act;
6. Other public institutions prescribed by Presidential Decree

② Matters necessary for management, etc. of emergency equipment which should be possessed pursuant to paragraph

① shall prescribed by Ordinance of the Ministry for Health, Welfare and Family Affairs.

[This Article Newly Inserted by Act No. 8692, Dec 14, 2007]

**Article 5-2(Exemption from Responsibility for Well-Intentioned Emergency Medical Service)**

In cases where no intention or gross negligence is committed on the property damage and death or injury caused by giving any emergency medical service or first-aid treatment falling under any of the following subparagraphs to an emergency patient whose life is in jeopardy, the relevant actor shall not take the civil liability and penal responsibility for injury, and the penal responsibility for death shall be reduced or exempted:

1. First-aid treatment provided by a person other than a person falling under any of the following items

- (a) Persons engaged in emergency medical service
- (b) Persons in charge of first-aid treatment under Article 78-2 of the Seafarers Act, persons liable to provide first-aid treatment pursuant to other Acts and subordinate statutes, such as first-aid teams under Article 35 of the Framework Act on Fire Services;

2. Emergency medical service provided by a person engaged in emergency medical service within the extent of his/her license or qualification when he/she is not on duty;

3. First-aid treatment provided by a person liable to provide first-aid treatment under subparagraph 1 (b) when he/she is not on duty.

[This Article Newly Inserted by Act No. 9124, Jun. 13, 2008]

**2.3.2 Current Status of CPR Education and Application in Korea**

As table 2 shows, most other countries adapt the Good Samaritan laws and the laws clarify that “the people who try to help in good will should not be punished” and “people are obliged to take action to help others in danger (and even punished from 3 months up to several years)”.

Table 2. Good Samaritan Laws in Other Countries[9]

Country	Current Situation
United States	- Most states adopt Good Samaritan Laws. - In case of Florida, Flor. Stat. Ann. 768.13 -"Any person who, in good faith, renders emergency medical care or assistance to an injured person at the scene of an accident or other emergency shall not be liable in civil damages for any act or omission, not constituting gross negligence, in the course of such care or assistance."
France	-Criminal Code Article 63-25 -may be punished by from 3months up to 5 years of imprisonment or a fine up to 75.000 Euro”.
Germany	-Criminal Code Article 330-C -"Who fails to provide help in cases of disaster or imminent danger or distress, will be penalized with imprisonment up to one year or

	fined.”
Poland	-Polish Article 164 of the Criminal Code of 1969 - imposes a penalty of imprisonment no longer than 3 years
Japan	-The criminal law -1 year imprisonment for one who abandoned the duty to save (abandonment).

### 2.3.3 Current Usage of AED in Korea

As can be seen in the Table 3, nationally, there are AEDs installed in 2,647 places which are mostly concentrated in public health institutions, hospitals and fire stations. The three provinces in the following: Kyeong-Nam (410), Jeon-Nam(347) and Gyeonggi(329) have the maximum number of AEDs. Seoul with total 190 AEDs has been discovered to have a small number of AEDs installed compared to the size of the city and thus Seoul needs to exert more efforts to prepare a fitting number of AEDS.

Table 3. AED installation in cities/provinces (June 2010)  
(Unit: Places)

	Total	Facilities		
		Sub total	Public Health Institution	Fire Station
Total	2,647	2,611	1,178	1,205
Seoul	190	190	46	114
Busan	86	86	32	32
Daegu	35	35	18	7
Incheon	109	109	52	46
Gwangju	75	49	11	32
Daejeon	54	51	9	31
Ulsan	45	41	7	27
Gyeonggi	329	328	86	228
Kangwon	233	232	117	99
Chungbuk	135	134	44	74
Chungnam	170	170	83	71
Jeonbuk	85	85	5	73
Jeonnam	347	347	247	87
Kyeongbuk	301	301	152	131
Kyeongnam	410	410	265	123
Jeju	43	43	4	30

	Facilities				Others
	Airport	Passenger train	Vessel	Multi-plex facility	
	24	6	1	197	36
Seoul	2	2	-	26	-
Busan	8	1	-	13	-
Daegu	1	1	-	8	-
Incheon	1	-	-	10	-
Gwangju	1	-	-	5	26
Daejeon	-	1	-	10	3
Ulsan	2	-	1	4	4

Gyeonggi	-	-	-	14	1
Kangwon	2	-	-	14	1
Chungbuk	1	-	-	15	1
Chungnam	2	-	-	14	-
Jeonbuk	-	1	-	6	-
Jeonnam	2	-	-	11	-
Kyeongbuk	-	-	-	18	-
Kyeongnam	1	-	-	21	-
Jeju	1	-	-	8	-

Ministry of Health and Welfare (2010. 8)[7]

### 2.3.4 Current Status of K District[10], Seoul in AED provision and education

K district, located in Seoul, has a total of 111 AEDs supplied and of them, 33 have been additionally bought in the year 2010. In regards to the fact that Seoul city itself has total 190 AEDs, it is easy to infer that K district has more AEDS installed compared to other districts. On the other hand, in case of schools, out of all 74 K district schools – 30 elementary schools, 23 middle schools and 21 high schools (General 17/ Specialized 4), only three of them had AEDs equipped. And it was found out that these three schools had set up the AEDS independently from their own motive and their private funds.

In 2009, the K district distinctively enacted its own Emergency Medical Service Act by classifying AED required facilities and supporting the funding and education of CPR in the Article 6(Provision of Emergency Medical Service). Therefore, K district can be said to have enough government funds to install EDs at schools and the basic foundation to mandate emergency medical education at school for the sake of students' health and safety. At the same time, K district has organized CPR intensively trained team constituted of four people which its role is to educate first aid to local residents, school students and teachers. In standards to 2010 statistics, total 64,573 people have received this emergency medical education and the range is diverse from future soldiers to ordinary local residents. The team in collaboration with local Education Office is especially concerned with providing constant education to students and promoting AED usage to the local public.

Therefore, it is important to actively fund AEDs to the K district, which is relatively equipped well with first aid tools and rudimentary infrastructure including a specialized CPR team dealing with education. Promotion of an organized first aid education would not only enhance application of already installed AEDs in some areas but also bring a national effect of imbuing altruistic mind and the ability to flexibly adapt to emergency cases to student volunteers.

## 3. METHODS

### 3.1 Sample and Data Collection

Structured questionnaire were administered to all the people

who received the CPR education right before and after the education at K district Community Health Center from May to December, 2010. 819 out of 1,659 of the education participants were students. We use these 819 students as our sample in the form of a secondary data analysis to investigate the effectiveness of the CPR education, since our main research target was students.

Table 4. General characteristics of the subjects

Variable		N	%
Gender	Male	504	62.1
	Female	307	37.9
		811	100.0

**3.2 Research Questions**

The research questions of this study are 1) Are there any significant change occurred in terms of the motivation to perform CPR when they come across the patients who experience the cardiac arrest? 2) What are the factors to influence them to perform AED?

**3.3 Statistical Analysis**

SPSS 18.0 was used to examine the changes of the motivation to perform CPR and factors to influence the motivation to perform AED among students. Matched pair t-test was used to examine differences between the pre scores and post scores with the significance level of  $p < 0.05$ . And multiple regression was used to figure out the factors to influence the motivation to perform AED among students.

**4. RESULTS**

**4.1 The Changes over Motivation to perform CPR**

The test showed that there actually had a statistically significant change occurred.

Table 5. Pre-Post Comparisons of the motivation to perform CPR among students

	Pre	Post
Mean	2.9530	3.1001
Standard Deviation	.85032	.77307
N	809	809
t	-6.849	
sig	.000	

The t-score was -6.849 and the significant score was .000 at the level of .05 and therefore there was significant change between the pre and post score among the students who participate the CPR education.

**4.2 Multiple Regression**

As shown in table 6, the dependent variable was the degree of the “Motivation to perform AED” and the independent variables were gender, CPR education frequency within last 2 years, the level of felt difficulty of education and pre-score of the motivation to perform CPR.

The model explains as much as 21% of the variance in dependent variable, with a small number of input variables. The results show that more male students than female counterparts, and the higher the pre-score of the motivation to perform CPR, the intent to perform AED tend to increase.

Interestingly, the CPR education frequency doesn’t affect the motivation to perform AED which might imply the frequency itself doesn’t necessary affect the motivation to perform AED and the quality of and practice-focused education might be more important for them to increase the motivation to perform.

Table 6. The factors affecting the post Motivation to perform AED among students

Independent Variable	B	$\beta$	t	F(p)	Adj-R <sup>2</sup>
constant	1.867	-	12.615***	-53.702***	.21
Gender (1=male)	.116	.065	2.015*		
CPR education frequency	-.070	-.048	-1.527		
CPR education Difficulty	-.079	-.061	-1.886		
Pre-Motivation to perform CPR	.429	.422	12.983***		
gender was dummy variable.					
* $p < .05$ , ** $p < .01$ , *** $p < .001$					

The limitation of the study is due to the fact that we are using the secondary data, there should be included various variable to determine the factors affecting the motivation to perform AED among students. Further study needs to explore other variables.

**5. CONCLUSION**

As the research showed, CPR education has a significant effects on the motivation of perform AED among students.

Today, since the majority of schools do not provide first aid education, there is an increasing number of unfortunate cases in which poor lives are sacrificed due to lack of immediate first aid that could have been provided if well taught.

To prevent these unfortunate accidents, it is essential to take actions.

Firstly, in prevention of occasional accidents that occur in schools, the law needs to correct schools from recommended to AED required facilities to be equipped with AEDs. When it is hard to educate the entire general public due to financial concerns, it is most sensible to primarily teach high school students who are at the one last stage behind becoming adults

Also, in a school that already prepared AED must perform a parallel first aid education as well.

Secondly, it is important to add first aid education as compulsory subjects for high school students. The organized and consistent first aid education would improve the emergency medical service of students, endow awareness of safety and develop students into truly substantive volunteers. Above all, active application of AED in diverse places is anticipated.

Finally, if it is difficult to promote voluntary first aid education for adults, it is necessary to amend law like other developed countries did to force people to receive such when getting driver's license or graduating high school. One another method to promote first aid education would be providing financial or other incentives to schools that have AEDs equipped. Such education, by expanding the significance and the method of conducting first aid such as cardiopulmonary resuscitation to the general public, would be an effective way to grow all citizens the potential to save other people's lives

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