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Access to EMS Services and Training, Knowledge, and Perceptions Related to First Aid and Cardiopulmonary Resuscitation (CPR) Skills Among College Students

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This thesis has been examined and approved by the following members of the thesis committee.

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Abstract

This study included two purposes. The first purpose of this study was to compare undergraduate students' knowledge and perceptions related to first aid and cardiopulmonary resuscitation (CPR) according to their level of first aid and CPR training. The second purpose of this study was to compare the students' perceptions of access to emergency medical services (EMS) by the geographic location of their hometown. A quantitative survey was distributed to students enrolled in three HLTH 101: Health and Environment classes in Spring, 2013. The survey included questions related to the participants' demographic characteristics, perceptions of the time needed for EMS services to arrive in their hometown, first aid and CPR knowledge, and perceptions related to first aid and CPR. Descriptive statistics, Cronbach's alpha reliability, one way analysis of variance (ANOVA), and Chi-square were used to analyze the data. Participants who were currently certified in first aid agreed significantly more that CPR and first aid training are worth of their time than participants who have been trained and participants who have never been trained. Participants who were currently certified in first aid reported significantly less concerns than those who have never been trained in first aid with respect to their perceptions of access to first aid and CPR training classes. Participants who are currently certified in CPR agreed significantly more that training in first aid and CPR is worth their time than participants who have been certified and have never been trained. Participants who were currently trained in CPR showed significantly more willingness to perform first aid and CPR to family member, someone they know, and even strangers, compared to those who have been certified and never been trained in CPR. Also, those currently certified in CPR reported

significantly less concerns than those who have never been trained in CPR with respect to their perceptions of access to first aid and CPR training classes. Participants who lived in the urban area reported significantly shorter time for EMS services to arrive than those who lived in a rural area. Further research related to individuals' knowledge and perceptions related to first aid and CPR is recommended. Additionally, it is recommended that all persons, especially those who live in rural areas, receive and retain certification related to first aid and CPR.

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Chapter One: Introduction

This study included two purposes. The first purpose of this study was to compare undergraduate students' knowledge and perceptions related to first aid and cardiopulmonary resuscitation (CPR) according to their level of first aid and CPR training. The second purpose of this study was to compare the students' perceptions of access to emergency medical services (EMS) by the geographic location of their hometown. The background of the problem, a statement of the problem and its significance, and research questions are provided. Additionally, the limitations, delimitations, assumptions of the study, and the definitions that apply to this study are identified in this chapter.

Background of the Problem

Health emergencies happen every moment around the world. They vary from minor injuries to death. It is important for a rapid response when an emergency happens, to prevent the situation from becoming worse. The earlier initial care is provided; the risk of the injury or death is minimized. The Emergency Medical Services (EMS) system, described as a "comprehensive system which provides the arrangements of personnel, facilities and equipment for the effective, coordinated and timely delivery of health and safety services to victims of sudden illness or injury" (Moore, 1999, p. 325). Both medical personnel and the lay public are involved in managing this system effectively. Many developing countries in Asia, however, have unsophisticated EMS systems that lack the capacity to provide prompt care to patients. To fill the gap between the initial care until the arrival of advanced medical support, training in first aid and CPR skills is

needed among the citizens of these developing countries. These skills allow the trained first responder the opportunity to sustain the patients' lives while waiting for the advanced medical personnel to arrive.

Statement of the Problem

When an emergency happens in the public, every minute from the initial care to advanced care can mean the difference between life and death. A person who provides initial care, like first aid and CPR, plays an important role in sustaining life and communicating with the emergency facilities. In the United States, more than 12 million people are trained in CPR annually (American Heart Association, 2011). In contrast, Asian such as China, less than one percent of their population has received first aid and CPR training (China Daily, USA, 2012). This study had two purposes. The first purpose of this study was to compare undergraduate students' knowledge and perceptions related to first aid and CPR according to their level of first aid and CPR training. The second purpose of this study was to compare the students' perceptions of access to EMS by the geographic location of their hometown.

Significance of the Study

The World Health Organization (WHO, 2006) states the importance of a fast response, coordinated resources to provide initial care, and transportation to receiving facilities for out-of-hospital emergency medical services and hospital emergency departments. The WHO (2006) points out that the lack of well-structured emergency services, the lack of specific training for health professionals, and the lack of education of the population all contribute to the decreased access to advanced emergency health care in many countries.

Time is golden in emergency care. Within four to six minutes, a cardiac arrest victim's brain cells will start to die from the lack of adequate oxygen, and for each minute that passes, the likelihood of survival decreases 7% to 10% (American Heart Association, 2012). American students as young as nine years old are able to successfully and effectively learn basic life support skills including AED deployment, correct recovery position, and emergency calling procedures (Fleischhackl et al., 2009). If more countries and their citizens can recognize the benefits of first aid and CPR skills and more training courses can be provided to the general public and more lives can be saved.

Research Questions

This study is designed to answer four research questions:

1. What are the knowledge, perceptions, and training levels of university students related to first aid and CPR?

2. How do students' knowledge and perceptions related to first aid and CPR vary according to their training in first aid and CPR?

3. What are the perceptions of students regarding access to the EMS system in their respective hometowns?

4. How do the perceptions of students regarding access to EMS system in their respective hometowns vary according to the geographic location of their hometowns?

Limitations

The study has three limitations.

1. The diversity and size of the international students studying at Minnesota State University, Mankato.

2. The accuracy of self-report data regarding perceptions and levels of training related

to first aid and CPR, and perceptions of the access to the EMS system in their

country of origin.

3. The readability, validity, and reliability of the measures used to assess the students'

knowledge of first aid and CPR, perceptions related to first aid and CPR and levels

of first aid and CPR training, and perceptions of access to EMS systems.

Delimitation

The following delimitation applied to this study:

1. This study was limited to international students from selected countries attending

Minnesota State University, Mankato, in the spring semester of 2013.

Assumptions

There were these assumptions related to this study.

1. All participants answered the survey truthfully and to the best of their ability.

2. All participants understood the items of the survey.

Definition of Terms

A number of operational definitions apply to this study.

Cardiopulmonary resuscitation (CPR). Emergency method of restoring heart beat

and respiration when these have been interrupted briefly (Last, 2012, p. 51).

Emergency medical services system. EMS personnel respond to a medical

emergency in an official capacity as part of an organized medical response team. By this

definition, physicians, nurses, or paramedics who witness a cardiac arrest and initiate

CPR but are not part of the organized rescue team are characterized as bystanders and are

not part of the EMS system (National EMS Management Association, 2012, p. 12).

First aid. A set of mostly simple measures to provide immediate emergency

treatment of painful injury or life-threatening cardiac or respiratory crises (Last, 2012, p. 125).

Summary

The purpose of this study, the background of the problem, the statement of the problem over the significance of the study, the research questions, the limitations and delimitations, the assumptions and the definitions of terms related to this study were presented in this chapter. Chapter Two will include a review of the literature related to the study.

Chapter Two: Review of the Literature

Introduction

In this chapter, literature related to global EMS systems, EMS training and individuals' knowledge and perceptions of first aid and CPR skills are presented. This study had two purposes. The first purpose was to examine undergraduate students' knowledge, and perceptions related to first aid and CPR according to their level of first aid and CPR training. The second purpose was to compare the students' perceptions of access to EMS by the geographic location of their hometown.

Global EMS Systems

EMS can be defined as a "comprehensive system which provides the arrangements of personnel, facilities and equipment for the effective, coordinated and timely delivery of health and safety services to victims of sudden illness or injury" (Moore, 1999, p. 325). Not only does EMS provide timely care to victims of sudden and life-threatening injuries, but also prevents needless mortality or long-term morbidity (AlShaqsi, 2010). Four main components comprise the function of EMS system: accessing emergency care, care in the community, care en route, and care upon arrival to receiving care at the health care facility (Razzak & Kellermann, 2002).

As an integral part of any effective and functional health care system, EMS is the first point of contact to the injured citizens during emergencies and life-threatening injuries and acts as a gate-keeping step for accessing additional medical services (Sasser, Varghese, Kellermann, & Lormand, 2005). During the medical and trauma emergencies, Emergency medical providers around the world have developed an extended role to deal

with these situations by utilizing advanced clinical technology. This clinical technology also reformed the multifunctional EMS system that manages and monitors patients' needs in an uncontrolled environment of pre-hospital settings (Al-Shaqsi, 2010).

Worldwide, the delivery of EMS can be categorized into Franco-German or Anglo-American models according to the philosophy of pre-hospital care delivery (AlShaqsi, 2010). Another method of EMS classification is also used to divide the EMS system into Basic Life Support and Advanced Life Support according to the level of care provided (Moore, 1999).

The Franco-German model of EMS is based on the "stay and stabilize" philosophy by bringing the hospital to patients (Tian, 2007). Physicians who have an extensive scope of practice with very advanced technology usually run this model (Asian Disaster Preparedness Center, 2003). In Europe, this model is a young field but is widely implemented in emergency medicine (Fleischmann & Fulde, 2007). Not only the attending emergency doctors in the field have the authority to make clinical judgment but also can treat patientsin their homes or at the scene. This causes more patients being treated on the scene and less being transported to hospital (Al-Shaqsi, 2010). Germany, France, Greece, Malta and Austria, for example, have very well-developed FrancoGerman EMS systems (Adnet & Lapostolle, 2004).

In contrast to the Franco-German model, the Anglo-American model is based on "scoop and run" philosophy which brings patients to the hospital with less pre-hospital interventions (Asian Disaster Preparedness Center, 2003). Instead of public health services and hospitals, this model is usually allied with public safety services rather than public health services and hospitals (Pozner, Zane, Nelson, & Levine, 2004). Trained 8

paramedics and Emergency Medical Technicians (EMTs) who run the system usually have the oversight of an incident. Countries include the United States, Canada, New Zealand, Sultanate of Oman and Australia are using this model of EMS delivery (Pozner et al., 2004). Following by this model, emergency medicine in these countries is welldeveloped. Majority of the patients are transported by EMS personnel to developed emergency departments, rather than hospital wards comparing to the Franco-German model (Al-Shaqsi, 2010).

Emergency Medical Services System and Training in the United States

The first advanced life support ambulance in the United States was launched in 1960s (Robbins, 2005). In 1969, the first non-physician advanced medical unit was initiated in Miami, Florid and the emergency telephone number 9-1-1 was launched in Haleyville, Alabama (National Emergency Number Association, 2013). By the close of the 1970s, EMS was firmly established in the medical infrastructure of the United States as its own discipline with its own science (Robbins, 2005). In 1988, the "cardiac chain of survival" (early access, early CPR, early defibrillation, and early advanced care) was introduced in the United States by Mary Newman (American Heart Association, 2013). This concept was later been adopted by American Heart Association and elaborated on it in its 1992 guidelines for cardiopulmonary resuscitation and emergency cardiac care (Cummins, Ornato, Thies, & Pepe, 1992). Today, almost all United States citizens (99%) and majority of the geographic United States (96%) have access to at least basic 9-1-1 services (E911 Institute, 2003).

In the United States, city departments are responsible for the pre-hospital care and transportation. The United States EMS system has divided into four levels of trainings.

The first level of training is the First Responder, who is identified as an individual that "uses a limited amount of equipment to perform initial assessment and intervention and is trained to assist other EMS providers" (Occupational Safety and Health Administration, 2006). Emergency Medical Technician for basic life support (EMT-B) involves a minimum of 110 hours of training. EMT-B'stake over care from the first responders and work on stabilizing and preparing the patient for transportation (Fulmer el al., 2008). Every two years, nationally registered EMT-B's must complete a 24-hour refresher course, have evidence of current CPR training, and complete 48 hours of additional continuing education that must be approved by the Continuing Education Coordinating Board for Emergency Medical Services (Health Resources and Services Administration [HRSA], n.d.). The third level of training is advanced emergency medical technician or EMT intermediate, this training allows them to insert IVs, administer medications, and perform advanced airway procedures (American Red Cross, 2011). The fourth level, paramedics have a more depth training than other levels. In addition to performing basic life support skills, they are trained to administer more complex medication, and run an electrocardiogram. The National Registry of Emergency Medical Technicians policy allows EMTs and paramedics to use distributed learning resources to fulfill a portion of their total continuing education requirements (HRSA, n.d.). Out of the 24-hour refresher course, ten hours of the can be taken via distributed learning. These professional preparation and development requirements have been used to train medical professionals who provide pre-hospital care with the EMS system (National Highway Traffic Safety Administration, 2007).

Emergency Medical Services Systems in South Korea

In South Korea, approximately 150 local fire stations nationally consist of the rescue services and they are fully responsible for all aspects of emergency rescue activities(Choi, Hong, Lee, Jung, & Kim, 2007). Nationally, an average of 2585 calls were dispatched daily (Choi et al., 2007). In the capital city of Seoul, for example, there are 21 fire stations, and 110 emergency rescue teams that consist of nurses, EMT-1, EMT-2, and accredited specialists (Cho, Cho, & Kim, 2000).

Emergency Medical Services Systems in Japan

Japan emergency medical services are provided by the local governmental fire headquarters, and followed by the Local Autonomy law and Firefighting Acts (Tanigawaa & Tanaka, 2006). The universal emergency access number 119 is directly connected with the dispatch center. Three levels of pre-hospital emergency care personnel compose Japan's EMS system: a basic-level ambulance crew, an intermediate level of expertise, and an advanced level (Tanigawaa & Tanaka, 2006). All ambulance crews are required to be trained in firefighting techniques and ambulance vehicle operations (emergency driving responses, tactics, techniques and maintenance) (Tanigawaa & Tanaka, 2006). Emergency medical services are dispatched once every 6.3 seconds in Japan, and an average of transportation time is 6.4 minutes (Tanigawaa & Tanaka, 2006).

The EMS training system in Japan has three levels. After receiving 135 hours of the basic standard training course, the basic level ambulance crew is qualified to perform basic life support, administer oxygen and establish an oral airway. The intermediate level of expertise must complete 250 hours of the National Standard training course to perform

11 an electrocardiogram, oxygen saturation, blood pressure monitor, use of nasal airway, use of laryngoscope to remove foreign body, and care for patients with special needs. In addition to the above, the advanced level is trained in all aspects of basic life support and some advanced life support procedures relevant to pre-hospital emergency care. They are allowed to use invasive airways devices, placement of an IV line and administration of fluid to treat cardiac arrest patients (Tanigawaa & Tanaka, 2006).

For the general public, the citizens of Japan are trained through the fire department, Red Cross, and other volunteer groups. Licensed drivers are required to be trained in CPR as well (Tanigawaa & Tanaka, 2006).

Emergency Medical Services Systems in Hong Kong

Hong Kong is a special administrative region of China. However, under long-term British governing, the emergency medical services system is different from mainland China. In Hong Kong, the ambulance command of the fire services department is the main provider of the emergency ambulance service. It is a type of Anglo-American model, which has become a "gold standard" for many regions of the world (Vanrooyen, Tamara, & Chem, 1999).

There are approximately 2200 uniformed staff in the Ambulance Command. The ambulance command has 240 ambulances and 23 ambulance motorcycles, which are located in 29 depots and 27 outstations. There are two levels of emergency medical assistants: Level I and Level II. Level I equals basic emergency medical technician in the United States. Level II is permitted to administer drugs, initiate intravenous therapy and apply a splint to treat lower-limb fractures. Ambulance staffs receive 24 weeks of training and ambulance motorcycle crew receives an additional 2-week training course because

they need to manage patients single-handedly (Lo, Lai & Mak, 2000). The public can dial 999 police center when they want to access the emergency ambulance service. If the call only requests ambulance service, it will be transferred to the Fire Services Communication Centre. According to the information provided by the call, the Fire Services Communication Centre will dispatch an ambulance to the scene. Whether the emergency medical assistant level II staff will be sent to the scene or not depends on the patient's situation. The crew can directly inform the emergency department to prepare using the radio sets when they are transporting severely ill patients to the hospital (Hong Kong Fire Services Department, 2011).

Emergency Medical Services Systems in China

China, compared to the services in the United States, has a history of only 25 years. The EMS system has become a major component of daily life with the rising incidence such as cardiovascular diseases and trauma, and subsequent need for emergency stabilization, rapid transport, and timely treatment (Hung, Cheung, Rainer, & Graham, 2009). The prehospital emergency service which is provided by physicians on the scene, the emergency department, and the intensive care unit compose the EMS system in China (Guo, 2003). Access to the prehospital emergency service is achieved by dialing '120'. Crews on the ambulance including medical doctors and registered nurses are either new graduates from medical/nursing schools or transferred from hospitals (Lin, Wei, & Chen, 2003). Therefore, no staff member other than the Emergency Physician is formally authorized to give medications, establish intravenous access, defibrillate, or perform tracheal intubation during the prehospital care. Although Chinese emergency physicians receive specialty training through a number of pathways, national standards in

training and certification have not yet been developed (Pei & Xiao, 2011). In other words, other than the physicians and professional health workers, there is no medical training for first responders, and these personnel are also hospital staff members.

Each year, 40 to 66 hours' training of prehospital care is provided to about 300 personnel (Hung et al., 2009). China does not have an equivalent level of training to Emergency Medical Technician (EMT) and the responding crew on the ambulance usually include a driver, a transporter who functions as a basic care provider but with no formal training, a nurse, and a physician respectively (Pei & Xiao, 2011).

The unique phone number '120' has been proposed by the Ministry of Health and the Ministry of Posts and Telecommunications to be used for all emergency calls to prehospital emergency service institutions in China (Dai, Xu & Zhu, 2003). Only about 80 cities, however, have the access to 120 (Clem, Thomas, Wang, & Bradley, 1998). From the emergency call to the time of the ambulance departure, a Beijing Emergency Department showed that response times for ambulance dispatch have significantly reduced; but times for the arrival of ambulance, however, from 16.79 to 14.61 minutes was not significant (Ding, 1990) comparing to a gold standard of eight-minute arriving time in the capital of United States (Sa'adah, 2004).

Less than one percent of Chinese have received CPR and First Aid training and this number is far below the world average of 30 percent (China Daily, USA, 2012). Not only that, Ali (2001) suggests that even though there are first aid and CPR training provided to the general public, it is still a challenge to keep the courses practical and efficient due to the lack of official curriculum and renewing system to the citizens.

To improve the future performance of the EMS system in China, Hung and others

(2009) suggests four components. First, to improve the government's support of prehospital emergency service development by recognizing the trained responders; second, to improve the development of prehospital care in the rural areas in order to limit the responding time and reduce mortality rate; third, to educate the public about ambulance use and the EMS system to reduce the misuse and waste of resources and help the emergency department work more efficiently; fourth, to develop a multi-disciplinary response plan for major disasters that incorporates lessons learned from Sichuan earthquake.

Importance of First Aid and CPR Training

When a sudden and unexpected emergency happens, immediate reaction is needed. Without a doctor's order, a trained first aid and CPR responder can attempt to reestablish heart function and supply oxygen to the lungs at the scene (Handley et al., 2005). According to Rawlins, Woollard, Williams, and Hallam (2009), one life is saved for every 24–36 persons who receive CPR training, and being an important component of the cardiac chain of survival, CPR will also improve the out-of-hospital survival rate. One of the goals of CPR training is to increase the number of citizens capable of performing CPR, and thus increase the rate of bystander CPR.

Summary

Articles related to the importance of the EMS systems internationally were reviewed in this chapter. The two models of EMS systems, Anglo-American Model and Franco-German Model, both have advantages based on the country's characteristic. A well-developed EMS system will provide sophisticated training in all levels in order to achieve the ultimate goal of the EMS system.

The research methods that were used to conduct the study are provided in Chapter Three. This includes the research design, procedures, participant selection, instrumentation, and data analysis.

Chapter Three: Methodology

Introduction

The first purpose of this study was to compare undergraduate students'

knowledge and perceptions related to first aid and CPR according to their level of first

aid and CPR training. The second purpose of this study was to compare the students'

perceptions of access to EMS by the geographic location of their hometown. The research

technique used in this study included an online survey distributed to undergraduate

students who are studying at Minnesota State University, Mankato.

This study is designed to answer four research questions.

1. What are the knowledge, perceptions, and training levels of university students

   related to first aid and CPR?

2. How do students' knowledge and perceptions related to first aid and CPR vary

   according to their training in first aid and CPR?

3. What are the perceptions of students regarding access to the EMS system in their

   respective hometowns?

4. How do the perceptions of students regarding access to EMS system in their

   respective hometowns vary according to the geographic location of their hometowns?

   Topics in this chapter include research design, procedures, participant selection,

instrumentation, and statistical analyses.

Research Design

The design of this research was a descriptive study. A quantitative survey method was chosen to examine research questions. Therefore, a written survey was distributed to undergraduate students at Minnesota State University, Mankato.

Procedures

This study was approved by, conducted in compliance with, and guidelines for the protection of human participants established by, and with approval of, the Institutional Review Board (IRB) at Minnesota State University, Mankato. Informed consent was obtained from the participants before the distribution of the survey. Participants were able to decline to participate or discontinue taking the survey at any time. The time needed by the participants to respond to the written questionnaire was less than ten minutes.

Participant Selection

The participants who were selected for this study were 250 undergraduate students enrolled at Minnesota State University, Mankato. The students were 18 years of age and older and enrolled in HLTH 101: Health and the Environment at Minnesota State University, Mankato, during the spring 2013 semester.

Instrumentation

The survey (see Appendix A) was designed to assess undergraduate students' demographic characteristics, geographic location of their hometown, perception of access to EMS services, knowledge about first aid and CPR, perceptions related to first aid and CPR, and level of training related to first aid and CPR. Due to the limited amount of published research on this topic, the majority of the survey questions were designed by the research team.

Section I: *Demographic characteristics*. The survey included items related to the participants' age, gender, classification, and geographic location of the students' hometown. This section also included an item related to the time needed for the emergency medical services to arrive in the participants' hometown as well as the students' level of first aid and CPR training.

Section II: Knowledge. The 11 knowledge questions were drawn from the test bank for the Emergency Medical Response tests from Health 210: First Aid and CPR course offered by Minnesota State University, Mankato.

Section III: *Perceptions about first aid and CPR*. Nine five-point Likert-type (strongly disagree, disagree, don't know, agree, and strongly agree) items were included in this section. Students were asked to circle the response that most accurately reflected their level of agreement with the statement.

Data Collection

The survey was distributed to undergraduate students in five HLTH 101 classes at Minnesota State University, Mankato. In order to participate in the survey, participants were required to be at least 18 years old. The purpose of the study, potential risks to the participants, and the rights of the participants were stated immediately following a statement about the age requirement. Information about confidentiality of the study, the right of the participants to quit taking the survey at any time, and the informed consent (see Appendix B) was provided to all participants.

Data Analysis

The data were analyzed by using descriptive statistics to analyze the means, standard deviations, frequency counts, and percentages related to the the demographic

characteristics, the students' knowledge related to first aid and CPR, and the students' perceptions related to first aid and CPR. Cronbach's alpha reliability analyses were used to determine the internal consistency of the scales designed to assess the students' perceptions related to first aid and CPR. One-way analysis of variance (ANOVA) was used to compare the students' knowledge and perceptions related to first aid and CPR skills and training according to their level of first aid and CPR training. One-way ANOVA was also used to analyze students' perceptions related to access to EMS system according to the geographic location of their hometown.

Summary

Chapter Three described the research methods that were used to conduct the study. Students' geographic background, perceptions of first aid and CPR, knowledge of first aid and CPR, and training in first aid and CPR were collected and analyzed. Chapter Four will provide the results of the study.

Chapter Four: Findings and Discussion

Introduction

The first purpose of this study was to compare undergraduate students' knowledge and perceptions related to first aid and CPR according to their level of first aid and CPR training. The second purpose of this study was to compare the students' perceptions of access to EMS by the geographic location of their hometown. A 27-item survey was developed and administered to students in HLTH 101: Health and Environment classrooms in Minnesota State University, Mankato. This chapter includes the results of descriptive statistics, Cronbach's alpha reliability analyses, and one-way ANOVA. The findings from the quantitative analysis for each research question are presented in this chapter.

Upon IRB approval, a total number of 203 surveys were collected and analyzed. Two surveys were disregarded from analysis because respondents were over the age of 26 or under the age of 18. The responses were coded and entered into a database using SPSS.

Demographic Characteristics of the Participants

The demographic characteristics of persons participating in this study are presented in Table 1. Demographic data included age, gender, classification, geographic location of their hometown, the amount of time for local EMS services to arrive in their hometown, and their level of training related to CPR and first aid. The participants ranged in aged from 18 to 26 years (m = 19.54; standard deviation [SD] = 1.58). Most of the participants were female (129 female, 63.5%; 74 male, 36.5%). Some students (21, 10.3%) were from an urban area (e.g., Minneapolis), others (54, 28.6%) were from a

Table 1

Demographic Characteristics of the Sample

Characteristic	*n*	%	*M (SD)*
Age	203		19.54 (1.58)
18	48	23.6	
19	81	39.9	
20	38	18.7	
21	17	8.4	
22	5	2.5	
23	5	2.5	
24	5	2.5	
25	3	1.5	
26	1	.5	
Gender			
Male	74	36.5	
Female	129	63.5	
Class			
Freshman	112	55.2	
Sophomore	53	26.1	
Junior	31	15.3	
Senior	7	3.4	
Location			
Urban	21	10.3	
Suburban	54	28.6	
Non-Suburban City	38	18.4	
Rural	90	44.3	

Suburban area (e.g., Bloomington), and some (38, 18.4%) were from a non-suburban city (e.g., Mankato), and many (90, 44.3%) were from rural area (e.g. farm or small town). The levels of training to perform CPR and first aid were divided into three categories: never been trained to perform; have been certified to perform; and currently certified to perform.

Results Related to the Research Questions

The following sections are related to the results of the research questions.

Research Question 1: What are the knowledge, perceptions, and training levels of university students related to first aid and CPR? The frequency counts and percentages related to the participants' training level in CPR and first aid are provided in Table 3. The level of training to perform CPR was divided into three categories: never been trained to perform CPR (n = 70, 34.5%); have been certified to perform CPR (n = 90, 44.3%); and currently certified to perform CPR (n = 42, 20.7%). The level of training to perform first aid was also divided into three categories: never been trained to perform first aid (n = 84, 41.9%); have been certified to perform first aid (n = 76, 37.4%); and currently certified to perform first (n = 42, 20.7%).

The mean score and standard deviation for the participants' first aid and CPR knowledge and the mean scores, standard deviations and Cronbach's alpha for the standardized scale comprised of items related to participants' perceptions related to first aid and CPR are presented in Table 2. The values for the participants' perceptions related to first aid and CPR are based on nine items that were divided into four scales: time, cost, risk, and access. The Cronbach alpha reliability coeffecients for these scales range from good (risk, .85; access, .87) to poor (time, .24; cost, .48). The participants' mean score for

Table 2

Level of First Aid and CPR Training, Knowledge Mean and Standard Deviation, and Means, Standard Deviations, and Cronbach's Index of Internal Consistency (a) for the Scales Related to the Students' Perceptions regarding First Aid and CPR

Characteristic	*n*	*%*	*M (SD)*	*a*
CPR				
Never been trained	70	34.5		
Been Trained	90	44.3		
Currently trained	42	20.7		
First Aid				
Never been trained	84	41.9		
Been trained	76	37.4		
Currently trained	42	20.7		
Knowledge	194		7.76 (1.82)	
Perceptions				
Time	2		4.01 (.67)	.24
Cost	2		4.25 (.73)	.48
Risk	3		4.20 (.78)	.85
Access	2		3.44 (.88)	.87

the two items related to the amount of time required to complete CPR and first aid training was 4.01 (SD = .67). The participants' mean score for the two questions related to the cost of CPR and first aid training was 4.25 (SD = .73). The participants' mean score for the three items associated with risk to perform CPR and first aid to strangers, to someone they know, and to their family members was 4.20 (SD = .78). The participants mean score for the two items related to the access to CPR and first aid training classes was 3.44 (SD = .88).

Research Question 2: How do students' knowledge and perceptions related to first aid and CPR vary according to their training in first aid and CPR? One by three ANOVAs were used to analyze the differences of students' knowledge and perceptions related to first aid and CPR based on their level of first aid and CPR training. As previously stated, the training levels related to first aid were divided into three categories: "Never been trained to perform first aid; have been certified to perform first aid; and currently certified to perform first aid." The students' training levels related to CPR were also divided into three categories: "Never been trained to perform CPR; have been certified to perform CPR; and currently certified to perform CPR." Eleven questions were used to exam students' knowledge related to first aid and CPR. Those who have never been trained in first aid (n = 81) had a mean knowledge score of 6.15 (SD = 1.62); those who have been certified to perform first aid (n = 74) had a mean knowledge score of 7.03 (SD = 1.87); and those who are currently certified in first aid (n = 39) had a mean knowledge score of 7.54 (SD = 1.71) (see Table 3). Those who have never being trained in CPR (n = 65) had a mean knowledge score of 5.83 (SD = 1.62); those who have been certified in CPR (n = 89) had a mean knowledge score of 7.02 (SD = 1.75); and those

who are currently certified in CPR (n = 39) had a mean knowledge score of 7.69 (SD = 1.64) (see Table 4). The students' mean knowledge scores related to first aid and CPR were significantly different according to both their levels of first aid training (F = 9.79) and CPR training (F = 16.94) (see Table 3 and Table 4). For both analyses, the students' level of first aid and CPR knowledge were significantly less among students never trained than students who had received training and those currently certified.

Students' perceptions related to first aid and CPR training were evaluated through the use of nine questions. Students' perceptions about the amount time required to complete CPR and first aid training, students' perceptions about the cost of CPR and first aid training, students' perceptions about the health risk of providing CPR and first aid to family members, someone they know and strangers, and the ease of finding CPR and first aid classes were the four variables related to the participants' perceptions related to first aid and CPR. Based on the level of training on first aid and CPR, the mean values and standard deviations for the variables are presented in Table 3 and Table 4.

Participants who were currently certified in first aid significantly agreed more that CPR and first aid training are worth of their time than participants who have been trained and participants who have never been trained (F = 7.24) (see Table 3). There is no reported difference in terms of the participants' perception related to the cost of the training even though their level of training varied (F = .31) (see Table 3). No significant difference was found between participants who have never been trained, have been certified, and are currently certified (F = 2.69) (see Table 3) with respect to their perceptions related to the risks of performing first aid. Participants who are currently certified in first aid reported significantly greater access to first aid and CPR classes than

Table 3

One by Three Analysis of Variance of Knowledge and Perceptions by Level of First Aid Training

First Aid Training

Scale	*None* *M (SD)*	*Past* *M (SD)*	*Current* *M (SD)*	*F*
Knowledge	6.15 (1.62)[a]	7.03 (1.87)[a]	7.54 (1.71)[a]	9.79*
Time	3.91 (.66)[b]	3.93 (.70)[b]	4.34 (.50)[b]	7.24*
Cost	4.27 (.76)	4.26 (.72)	4.17 (.70)	.31
Risk	4.11 (.79)	4.16 (.82)	4.44 (.65)	2.69
Access	3.28 (.85)[c]	3.48 (.88)	3.71 (.88)[c]	3.68*

Note. *p* < .01. a =None < Past < Current; b = None and Past < Current; c = None < Current

Table 4

One by Three Analysis of Variance of Knowledge and Perceptions by Level of CPR Training

CPR Training

Scale	*None* *M (SD)*	*Past* *M (SD)*	*Current* *M (SD)*	*F*
Knowledge	5.83 (1.62)[a]	7.02 (1.75)[a]	7.69 (1.64)[a]	16.94*
Time	3.90 (.71)[b]	3.94 (.62)[b]	4.31 (.56)[b]	5.89*
Cost	4.22 (.75)	4.29 (.71)	4.18 (.76)	.37
Risk	4.12 (.84)[b]	4.13 (.77)[b]	4.52 (.62)[b]	4.34*
Access	3.25 (.89)[c]	3.51 (.82)	3.64 (.95)[c]	3.04*

Note. *p* < .01. a = None < Past < Current; b = None and Past < Current; c = None < Current.

those who have never been trained in first aid (F = 3.68) (see Table 3).

Similarly, participants who are currently certified in CPR agreed significantly more that training in first aid and CPR is worth their time than participants who have been certified and have never been trained in CPR (F = 5.89) (see Table 4). There was no reported difference in the participants' perceptions related to the cost of the training by their level of training in CPR (F = .37) (see Table 4). Participants who are currently trained in CPR showed significantly more willingness to perform first aid and CPR to family member, someone they know, and even strangers, compared to those who have been certified and never been trained in CPR (F = 4.34) (see Table 4). Participants who are currently certified in CPR reported greater access to first aid and CPR classes than those who have never been trained in CPR (F = 3.04) (see Table 4).

Research Question 3: What are the perceptions of students regarding access to the EMS system in their respective hometowns? The descriptive analysis was used to examine the participants' perception about the access to the EMS system in their respective hometowns based on the amount of time they expected to wait after calling 911. It should be noted that arriving within eight minutes is the gold standard for determining the quality of an EMS system (Sa'adah, 2004). The size of the participants' respective hometowns were divided into four categories: urban, suburban, non-suburban and rural. The wait time reported by the students varied from one minute to thirty-five minutes. The mean wait time for EMS services to arrive was 9.34 minutes (SD = 5.76) (see Table 5). Nearly half of the participants (45.9%) believed that it would take five or six minutes for local EMS Services to arrive at their homes.

Table 5

Access in Minutes to EMS Services

EMS Access (Minutes)	*Minutes*	%	*M (SD)*
	156		9.84 (5.76)
1	1	.5	
2	3	1.5	
3	4	2.0	
4	4	2.0	
5	47	23.2	
6	3	1.5	
7	4	2.0	
8	2	1.0	
10	46	22.7	
13	1	.5	
15	24	11.8	
20	14	6.9	
25	1	.5	
30	1	0.5	
35	1	0.5	

Research Question 4: How do the perceptions of students regarding access to EMS system in their respective hometowns vary according to the geographic location of their hometowns? A one by three ANOVA was used to analyze the differences of students' perceptions regarding the access to EMS system in their respective hometown. Participants who lived in the urban area expected to wait 6.93 (SD

= 4.53) minutes for EMS services to arrive in comparison to 8.42 (SD = 5.06) minutes for

those who lived in a suburban area, 10.40 (SD = 6.67) minutes for students who lived in a

non-suburban city, 11.13 (SD = 5.66) minutes in a rural area. The mean values and

standard deviations of the students' reports of the estimated arrival time by EMS services

according to the location of students' home town are presented in Table 6. There was a

significant difference in the students' reports regarding the EMS response times between

students who lived in urban and rural locations (F = 3.55) (see Table 6).

Table 6

One by Three Analysis of Variance of EMS Response Time by Location of the Participants' Home Town

Location	*n*	%	*Minutes* *M (SD)*	*F*
Urban	15	10.3	6.93 (4.53)[a]	3.55*
Suburban	43	28.6	8.42 (5.06)	
Non-Suburban City	30	18.4	10.40 (6.67)	
Rural	68	44.3	11.13 (5.66)[a]	

Note. *p* < .01. a = Urban < Rural

Summary

The results of the study revealed that the selected participants' perceptions and

knowledge related to first aid and CPR and EMS system varied based on their level of

training. Significant differences in the students' perceptions about first aid and CPR were

related to their perceptions to the amount of time required to complete CPR and first aid

training, as well as the ease of finding of CPR and first aid classes. Participants who are

currently trained in first aid and CPR showed more accuracy in knowledge and more

willingness to perform first aid and CPR skills. The conclusions and recommendations of

this study will be discussed in Chapter Five.

Chapter Five: Conclusion and Recommendations

The first purpose of this study was to compare undergraduate students' knowledge and perceptions related to first aid and CPR according to their level of first aid and CPR training. The second purpose of this study was to compare the students' perceptions of access to EMS by the geographic location of their hometown.

Conclusions

The survey was distributed to three HLTH 101: Environment and Health classes and 203 surveys were collected back and analyzed. Data were analyzed based on four research questions:

1. What are the knowledge, perceptions, and training levels of university students related to first aid and CPR?

2. How do students' knowledge and perceptions related to first aid and CPR vary according to their training in first aid and CPR?

3. What are the perceptions of students regarding access to the EMS system in their respective hometowns?

4. How do the perceptions of students regarding access to EMS system in their respective hometowns vary according to the geographic location of their hometowns?

According to the results, there is a strong need of CPR and first aid training to the general public, even though majority of the participants have been trained at least once. The level of training is an essential factor that affects the knowledge of first aid and CPR. Those who have been trained and are currently certified have a higher level of first aid

and CPR knowledge than those who have never been trained. Students' perceptions about first aid and CPR training also varied based on their level of training. Students who were currently certified in first aid were willing to spend significantly more time on first aid and CPR training than students who were not currently certified in first aid or had no training in first aid. Students who were currently certified in CPR were also willing to spend more time on first aid and CPR training and more willing to perform first aid and CPR on others than those who had been trained and never been trained to perform CPR. Perceptions related to the access to the EMS system were compared based on the geographic locations. Participants from the urban area believed the waiting time for the EMS system to arrive was significantly shorter than participants from the rural areas.

There is not much research to which to compare the results of this study. The results of this study do show consistency between the need for first aid and CPR training for the general public and effectiveness of delivery of the pre-hospital care. In addition, these findings of the study may also be important for local communities and organizations to consider the variables and factors that affect their participation in the first aid and CPR classes.

Recommendations for Future Research

The following recommendations are offered for individuals interested in conducting future research related to this topic.

1. Future research should include a more diverse sample. The current sample was selected from health related courses. Therefore, differences between non-health major students and students majoring in Health Science could not be evaluated.

2. Future research should incorporate more questions related to students'
   perceptions about first aid and CPR. Even though there was a very limited
   amount studies related to this topic, it would be important to determine the
   participants' perceptions related to the EMS system other than the only
   question which evaluated the time required for the EMS services to arrive in
   their home town.

3. Future research should include studies related to the effective provision of
   first aid and CPR training.

4. Future research should implement a pilot study prior to the distribution of the
   survey. The accuracy and effective of the study could be better and may
   decrease the amount of confusion related to certain questions.

If the above recommendations were followed, future studies would have better
outcome over variables and possibly produce different results.

Recommendations for Health Educators

The following recommendations are offered for health educators who are
interested in promoting first aid and CPR courses and pre-hospital care.

1. Health educators need to educate the public the benefits of receiving training
   in first aid and CPR. Not only this will provide first-hand pre-hospital care,
   but ultimately decrease the mortality and morbidity of injuries and deaths.

2. Health educators need to address the barriers of providing training in first aid
   and CPR. This should not be limited to time, cost, risk and access, but also the
   language, for example.

3. Health educators need to expand the access to first aid and CPR training to more citizens regardless of their profession, ethnicity, age, and location in the country.

4. Health educators need to advocate for legislations specific to the delivery EMS services.

5. Health educators need to keep their first aid and CPR knowledge and skills up-to-date.

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Appendix A

Access to EMS and First Aid and CPR Training, Knowledge and Perception Survey

Section I: Demographic Characteristics, Access to EMS services, and Levels of Training related to CPR and First Aid

Directions: Please respond to the following questions by either writing your answer in the space provided or circling the response that most accurately reflects your answer.

1. What is your age? ____ years

2. What is your gender?
    a. Male
    b. Female

3. What is your classification?
    a. Freshman
    b. Sophomore
    c. Junior
    d. Senior
    e. Graduate

4. What is the geographic location of your hometown?
    a. Urban (e.g., Minneapolis)
    b. Suburban (e.g., Bloomington)
    c. Non-Suburban City (15,000+ population; e.g., Mankato)
    d. Rural (less than 15,000 population; e.g., farm or small town)

5. How many minutes will it take for your local Emergency Medical Services (e.g., ambulance) to arrive at your home if you call 911 **in your home town**? ____ minutes

6. What is your level of training to perform cardiopulmonary resuscitation (CPR)?
    a. I have never been trained to perform CPR.
    b. I have been certified to perform CPR.
    c. I am **currently** certified to perform CPR.

7. What is your level of training to perform first aid?
    a. I have never been trained to perform first aid.
    b. I have been certified to perform first aid.
    c. I am **currently** certified to perform first aid.

Section II: Knowledge Related to First Aid and CPR

Directions: Please respond to the following questions by circling the response that most accurately reflects your answer.

8. If a victim appears to be unconscious, you should:
   a. Shout at them until they respond
   b. Shake them vigorously until they respond
   c. Call to them in a loud tone, and if you receive no response, gently touch or shake their shoulder
   d. Begin CPR immediately

9. You would perform CPR on a victim who:
   a. Has a pulse, and is breathing
   b. Has a pulse, but not breathing
   c. Has no pulse, and not breathing
   d. Has no pulse, but is breathing

10. What is the ratio of chest compressions to ventilations in adult one-rescuer CPR?
    a. 5 compressions to 2 ventilations
    b. 10 compressions to 2 ventilations
    c. 15 compressions to 2 ventilations
    d. 30 compressions to 2 ventilations

11. An infant's chest should be compressed when performing CPR:
    a. 1/2 inch (1.27cm)
    b. 1 inch (2.54cm)
    c. 1 1/2 inches (3.81cm)
    d. 2 inches (5.08cm)

12. How many breaths should you initially give an adult after determining they are not breathing and have no pulse?
    a. 3 quick breaths
    b. 2 slow breaths
    c. No breath until after 30 compressions of CPR
    d. 1 slow breath

13. What part of your hand should you place on the adult's sternum to deliver chest compression?
    a. Thumb
    b. First three fingers
    c. Heel of the hand
    d. Back of the hand in a fisted position

14. In order to determine if a victim is breathing and has a pulse, you should look, listen and feel for _____ seconds.
    a. 5 seconds
    b. 10 seconds
    c. 15 seconds
    d. 20 seconds

15. Which of the following should you use first in an attempt to stop severe external bleeding?
    a. Immobilization
    b. Direct pressure
    c. Elevation
    d. Pressure point

16. First aid is the immediate action taken to:
    a. Care for the injured until medical help is available
    b. Supplement proper medical or surgical treatment
    c. Preserve vitality and resistance to disease
    d. Rescue and transport the injured

17. For an adult victim 911 should be called:
    a. As soon as unconsciousness has been established
    b. After the pulse check
    c. After one cycle of CPR
    d. After the two breaths go in

18. A child is eating a piece of candy and cannot speak, breathe, or cough. What would you do?
    a. Slap the child on the back to dislodge the candy
    b. Perform back blows and abdominal thrusts until the candy is dislodged or the child becomes unconscious
    c. Leave the child alone while you call EMS
    d. Put the child on the floor and perform a head-tilt/chin-lift

Section III: Perception about First Aid and CPR Training

Directions: Please respond to the following statements by circling the response that most accurately reflects your level of agreement with the statement.	Strongly Disagree	Disagree	Don't know	Agree Disagree	Strongly Agree
19. I believe CPR and First Aid training should be free of charge.	1	2	3	4	5
20. It is hard for me to find classes for training in CPR and First Aid.	1	2	3	4	5
21. It takes too much of my time to be trained in CPR and First Aid.	1	2	3	4	5
22. It is easy for me to find classes for training in CPR and First Aid.	1	2	3	4	5
23. I believe CPR and First Aid training is too expensive if it costs more than $70.	1	2	3	4	5

	Strongly Disagree	Disagree	Don't know	Agree Disagree	Strongly Agree
24. CPR and First Aid classes are worth my time.	1	2	3	4	5
25. I believe performing CPR or first aid on a family member poses too much risk to my health.	1	2	3	4	5
26. I believe performing CPR or first aid on someone I know poses too much risk to my health.	1	2	3	4	5
27. I believe performing CPR or first aid on a stranger poses too much risk to my health.	1	2	3	4	5

Appendix B

SURVEY CONSENT FORM

We invite you to participate in a research study conducted by Health Science graduate student Feifei Sun involving a survey of students' access to emergency medical services (EMS) and their training, knowledge, perceptions related to CPR and first aid. If you agree to participate you will be asked questions about your demographic characteristics, the geographic location of your home town, the amount of time you think it would take for EMS services to arrive if you called 911 in your home town, your level of training related to CPR and first aid, your knowledge and perceptions related to CPR and first aid. All of your information will be kept private, and can be viewed only by authorized research staff members. The survey takes about 8 to 10 minutes to complete.

This research project is being directed by Dr. Marlene K. Tappe. You can contact Dr. Tappe at 507-389-2686 or marlene.tappe@mnsu.edu about any concerns you have about this project. You also may contact the Minnesota State University, Mankato Institutional Review Board Administrator, Dr. Barry Ries, at 389-2321 or barry.ries@mnsu.edu with any questions about research with human participants at Minnesota State University, Mankato.

Participation in this project is voluntary and you have the right to stop at any time. Your decision whether to participate will not affect your relationship with Minnesota State University, Mankato. There are no direct benefits to you as a result of participation in this research.

The survey is anonymous. Your consent form and completed survey will be collected separately and will be stored in a locked cabinet by Dr. Tappe for three years. The risks of participating in this study are about the same as are encountered in daily life. Participating in this study will help the researchers better understand the students' perceptions of access to EMS services and their training, knowledge, and perceptions related to CPR and first aid.

If you are at least 18 years old and agree to participate in this research, please sign below, return the signed copy in one of the self-addressed envelope and your survey in the other. Please keep the other copy for your records.

Your Name (printed) _Feifei Sun_____
Your Signature _____ Date __March 29, 2013_____
MSU IRBNet ID# 437253-1
Date of MSU IRB approval: March 28, 2013