

**A STUDY ON
AMBULANCE SERVICES AND EMERGENCY
CARE AT LOCAL HOSPITALS:
PERCEPTION OF CLIENTS AND HEALTH CARE
PROVIDERS**

By:

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LIST OF ABBREVIATIONS

HUSM	Hospital Universiti Sains Malaysia
HRPZ II	Hospital Raja Perempuan Zainab II
EMS	Emergency Medical Service
ED	Emergency Department
EMT	Emergency Medical Technician
JPA 3	Jabatan Pertahanan Awam
BLS	Basic Life Support
EMD	Emergency Medical Dispatcher
FRLS	First Responder Life Support
BTLS	Basic Trauma Life Support
NGO	Non Government Organization
GP	General Practitioner
EP	Emergency Physician

ABSTRAK

KAJIAN MENGENAI PERKHIDMATAN AMBULANS DAN PENJAGAAN KECEMASAN DI HOSPITAL TEMPATAN: PERSEPSI KLIEN DAN PERAWAT JAGAAN KESIHATAN

Perkhidmatan ambulans dan Jabatan Kecemasan adalah nadi kepada perkhidmatan perubatan kecemasan di Malaysia. Perkhidmatan ini telah lama bertapak dengan dengan rasminya sejak 50 tahun dahulu dan masih berterusan sehingga sekarang. Model yang dipraktikkan di Malaysia adalah adaptasi daripada dua model yang terkenal, iaitu model '*American-Angelo*' dan '*German-Franco*'. Sehingga kini, pemusatan penempatan ambulans di kawasan hospital menjadi ikon kepada jaringan perkhidmatan ambulans negara.

Kajian prospektif ini bertujuan untuk mengenalpasti dan menilai tanggapan pelanggan dan kakitangan kesihatan yang lain terhadap perkhidmatan kecemasan dan ambulans. Kajian ini memakan masa setahun bermula dari Januari sehingga Disember 2004 di dua buah hospital iaitu Hospital Universiti Sains Malaysia (HUSM) dan Hospital Kota Bharu (HKB) ataupun sekarang ini dikenali sebagai Hospital Raja Perempuan Zainab II (HRPZ II)

Sepanjang tempoh kajian dijalankan, sebanyak 741 panggilan ambulans direkodkan. Daripada jumlah tersebut, hanya 631 orang responden yang memberikan pandangan terhadap perkhidmatan yang mereka terima. Keputusan kajian menunjukkan daripada jumlah keseluruhan 631 responden, 80.1% (N=505) menyatakan perkhidmatan ambulans adalah cekap dan efisien. Hanya 19.9% (N=126) berpendapat perkhidmatan ambulans adalah lemah. Kajian ini juga mengambilkira pandangan 100 orang responden terhadap perkhidmatan Jabatan Kecemasan dan keputusannya menunjukkan 83% (N=83) responden berpendapat jabatan kecemasan memberikan

perkhidmatan yang cekap dan efisien dan hanya 17% (N=17) responden berpendapat sebaliknya.

Berdasarkan min tempoh selamasa panggilan ambulans (27.9 minit) dan min tempoh keseluruhan episod kecemasan (53.9 minutes), persepsi responden terhadap perkhidmatan ini menunjukkan bahawa ianya cekap, efisien dan mempunyai kualiti yang baik. Walaupun jika dibandingkan dengan piawaian antarabangsa selamasa panggilan ambulans ialah 4 hingga 5 minit ianya amat lambat. Besar kemungkinan polar persepsi ini dipengaruhi oleh biografi dan kerjaya responden. Selain daripada itu ia juga menunjukkan bahawa pengetahuan responden terhadap mutu dan kualiti perkhidmatan kecemasan negara lain amat terhad. Respondan tidak mempunyai parameter yang khusus dan sesuai untuk membandingkan mutu perkhidmatan yang mereka terima. Kajian kesusasteraan juga membuktikan tidak ada lagi kajian seumpama ini dilakukan untuk membandingkan hubungkait perkhidmatan ambulans dan perkhidmatan kecemasan di Jabatan Kecemasan HUSM dan HRPZ II dengan piawaian antarabangsa. Ia juga jelas membuktikan bahawa masih belum ada lagi kajian yang seumpama ini dijalankan di seluruh Malaysia untuk menilai tahap perkhidmatan yang diberikan oleh kakitangan perkhidmatan ambulans setempat.

ABSTRACT

A STUDY ON AMBULANCE SERVICES AND EMERGENCY CARE AT LOCAL HOSPITALS: PERCEPTION OF CLIENTS AND HEALTH CARE PROVIDERS

Ambulance services together with hospital Emergency Department act as the core for Emergency Medical Services (EMS) System in Malaysia. The existence of this service started officially since 50 decade ago and is still actively running to the present moment. The Malaysian model was adapted from two famous models, which is the Anglo-American, and German-Franco models. Centralization of the ambulance at hospital compound was the icon for Malaysian EMS system until now.

This prospective study attempts to identify and evaluate the clients and other service care providers' perception towards emergency care and ambulance services for the year starting from January to December of 2004 at Hospital University Science Malaysia (HUSM) and Hospital Kota Bharu (HKB), now known as the Hospital Raja Perempuan Zainab II (HRPZ II). This study attempts to evaluate the perception towards information related to the emergency care and ambulance services from clients who use ambulance to get to the Emergency Department (ED) of both hospitals. Additionally, this study also looked at the perception of clients who did not use ambulance services but still had contact with the ED.

A total of 741 of respondents who used ambulance services were involved in this study and only 631 of them were willing to give their opinion regarding the services. The results show that from a total of 631 respondents, 80.1% (N=505) claimed that ambulance services were very fast and efficient while 19.9% (N=126) had the opposite opinion. This study also examined the perception from 100 respondents towards Emergency Department services. The result show similar findings where 83% (N=83)

mentioned that ED services were very good and efficient; however, 17% (N=17) of them claimed the opposite.

Based on the mean time of the ART (27.9 minutes) and EMS episode (53.9 minutes) recorded in this study, client's perception towards ambulance services and emergency care were that the services were very good and efficient despite the fact that this ART was too slow if compare to the international standard of ART is which is 4 to 5 minute. Generally, the results of the present survey show that the patterns of client's perception could have possibly been influenced by their background and career. The study also reveals that they did not have any specific parameter or a benchmark to measure the quality of services received by them. Client's knowledge and attitude towards others EMS system were also limited. A literature review undertaken in this study showed no similar study had been undertaken for the whole Malaysia. Further, it was noted that no studies were undertaken to compare the relationship between ambulance services and emergency care at local hospitals. This is especially so with regards to the perception of clients and others service- care providers at both ED of the HUSM and HRPZ II as compared to that of the international standards.

CHAPTER 1

INTRODUCTION

1.0 GLOBAL VIEW OF EMERGENCY MEDICAL SERVICE SYSTEMS

"The ideal Emergency Medical Services (EMS) system (delivery of care in the following setting; the pre hospital care environment, the interface between the community and the hospital and in-hospital environment especially at the Emergency Department) would satisfy the agendas of public and elected officials, government administrators, public safety officers, taxpayers, insurance companies, corporate organizations and medical societies. In order to achieve that standard, a comprehensive system defines elements necessary to all well developed EMS system. There are twelve essential elements required for the assessment of such a system and they are as follow..." (Ali. A., 2004):

- 1) Regulation and Policy
- 2) Resources Management and System Financing
- 3) Human Resources
- 4) Training, Education and Certification
- 5) Medical Direction
- 6) Communication
- 7) Patient Transportation
- 8) Facilities
- 9) Public Information
- 10) Trauma System
- 11) Disaster Management & Mass Casualty Preparation
- 12) Valuation and Quality Assurance and Improvement

The perception of the Emergency Medical Services (EMS) as a defined specialty may vary widely with different location around the whole world. While no single modality of emergency medical care can fulfill the needs of all countries and peoples of the world, three models emerged (Robertson, B., 1999). Over the last several decades, it was well known that most countries around the world had some form of emergency medical services based on their specific philosophies and types of task at hand. The presence of many variants and unique characteristic of these services notwithstanding, three models of EMS delivering systems are the mainstay. These are the European model, the Anglo-American model, and the Neglect Model (Anderson, 1992).

In the 'European' or 'Franco-German' model, the Emergency Physicians (EP) delivers resuscitation to seriously ill patient in the field, often anesthesiologists, in the hope of providing a higher level of care. After which, the patient is immediately referred to definitive care facilities within hospitals. The sorting and triaging of critically ill patient occurred in the field. According to Anderson (1991), there are a few or no specially trained emergency physicians at the hospital-admission interface. In addition, patients who are not critically ill attend a hospital or a 'polyclinic' and are seen directly by a medical or surgical physician, or a physician of other specialty. Different specialists may discuss and decide who should be admitted to hospital and to which department. Countries that follow this model include Austria, Finland, France, Germany, Latvia, Norway, Portugal, Russia, Slovenia, Sweden, and Switzerland.

The 'Anglo-American' models of emergency care delivery, however, patients are expected to be transported to hospital, where they receive a higher level of care. In this

model non-physician, Emergency Medical Technician Paramedics (EMT-Ps) initiate emergency care in the field and transport critically or injured patients to the hospital-based Emergency Departments (ED), where emergency physicians (EP) provide definitive treatment (ACEP, 1998). The emergency physicians will also assess anyone who attends the hospital on their own accord. Hence, they require training and experience in a broad range of assessment techniques. In addition, they will resuscitate critically ill individuals and deliver a broad range of emergency services. The growing list of countries or regions adopting the Anglo-American model includes Australia, Canada, Costa Rica, Hong Kong, Iceland, Ireland, Israel, Malaysia, the Netherlands, New Zealand, Nicaragua, the Philippines, Poland, Singapore, South Korea, Taiwan, Turkey, the United Kingdom, and the United State of America. The conflict within this system lies in defining the scope of care and where the boundaries in delivering this important and often critical service lie. In theory, the potential is unlimited. In practice, clear limits need to be set and outlined due to constraints of finance and human resource (Anderson, 1991).

While in the 'neglect model', emergency care is not considered a national priority. From the point at which patients first feel that they need care to the point at which they receive care that is appropriate to resolve their needs (definitive care), there are several important practical steps that developed (Anderson, 1991). The subpopulation that requires medical care needs to be flagged before those needing in-hospital management can be identified. This procedure may be initiated by attending an out-of-hospital doctor or by calling for paramedical staff (e.g. the ambulance service), or by self-referral to a hospital to see a physician at the interface between community and hospital.

Currently, no multinational studies have been done that directly compare the 'Franco-German' and 'Anglo-American' models. Nevertheless, studies revealed in the literature showed that the mortality rate of patients who have sustained multiple-trauma in Germany stands at 14%, compared with 5-9% in the US (ASCOT, 1993). Emergency Medical Service systems involve the delivery of care in the following setting: the pre hospital environment, the interface between the community and the hospital and the in-hospital environment especially at the Emergency Department. Emergency care varies greatly in different areas of the world, but in general, paramedical groups were the mainstay of players in pre hospital environment (University of North Dakota, 2000).

"The population is made up of communities, which include a large pool of healthy individuals who do not require medical care. Within a community, however, there are also individuals who have acute or chronic illness, which range in severity from minor to critical. While some of these people can be seen as out patients, some require immediate attention. Yet others require immediate resuscitation at the interface between hospital and community, and some require admission to medical, surgical, or other facilities within the hospitals. There are also those that require only a quick consultation with a trained individual, reassurance, or minor treatment..." (Anonymous, 2001). To quote another quotation, "There has always been a need for proper 'emergency care' but the organization of such care under defined national medical banner originated only in the 20th century. Ideally in EMS system, especially pre hospital care services should provide the most experienced personals with appropriate knowledge and expertise to be made available as soon as possible and in the most cost-effective manner..."(West *et al.*,1998). But in a heterogeneous population with such variable needs, who decides the level of treatment that each patient receives, who should deliver the appropriate care, and how can emergency treatment can

be delivered in the most effective manner remained the pertinent questions and how to develop a proper plan system which could help to return patient to health and normal functional life as fast as possible. All of these questions need evaluation and detailed thoughts by the appropriate organization.

As mentioned earlier, EMS system involved the delivery of care in the following setting; the pre hospital care environment, the interface between the community and the hospital and in-hospital environment especially at the ED. Despite that, the emergency care services vary greatly in different parts of the world. There were special personnel that took care of this part of services. In general, paramedical groups were the mainstay of players in pre hospital care environment (University of North Dakota, 2000).

1.1 EMERGENCY MEDICAL SERVICE SYSTEMS IN MALAYSIA

Malaysia with 14 states, have established the EMS delivering systems that run independently from one state to another. The Ministry of Health (MOH) is the main body responsible for the provision of policies and has overall control of these systems. Concurrently, several Non-Governmental Organization (NGO) and private hospitals do also run similar kind of services. The MOH divided their hospitals, including the EMS delivery system, into three levels which are tertiary hospitals, secondary hospitals and primary hospitals, based on the level of care given by the particular hospital. Level of care is usually identified or classified by the number of specialty disciplines (Abu Hassan. A., 2005).

A tertiary hospital, which is basically an organization with their own pool of physicians and advanced equipments, are those having large number of beds. In our setting, there are two category of tertiary hospital; one own by MOH like the Hospital Kuala

Lumpur, Hospital Selayang and all the leading state hospital like Hospital Kota Bharu, Hospital Pulau Pinang and others. Whereas other tertiary hospitals are under the ageist of the Ministry of Education such as Hospital Universiti Sains Malaysia, Hospital Universiti Kebangsaan Malaysia (HUKM) and Pusat Perubatan Universiti Malaya (PPUM). These hospitals are also known as teaching hospitals where their role includes the provision of environment for teaching and learning while also giving patient care services. Presently, the tertiary hospitals of the MOH are also running as teaching hospitals for some local public and private universities with medical, nursing and allied health professional courses.

Secondary hospitals are nominated as district hospital. These are like the Hospital Pasir Mas, Hospital Gua Musang, and Hospital Tanah Merah etc. Their levels of services are lower than that of the tertiary hospitals and are usually devoid of their own pool of physicians. Currently, the process of up-grading some of these types of hospitals is in progress. This will mean that they will have their own specialty care sooner or later as and when their services are upgraded or the increase in population would dictate the upgrading processes. Primary health care facilities are referred to as 'Klinik Kesihatan' and Medical Assistants, Nurses and other auxilliary staffs manned these entities. Visiting Medical Officers will be available once or twice a week depending on patient load.

Another organization, which provides ambulance services in almost every state in Malaysia, is the Department of Civil Defense or the 'Jabatan Pertahanan Awam' (JPA 3). "JPA 3 is basically a government body directly under the Prime Minister Department [Jabatan Perdana Menteri (JPM)] that was given the task of providing help or assistance to other ministries including the Health Ministry in emergency situation especially during disasters..." (Abdullah, B., 2003). They have their own ambulances and crew members

called the Rescue 991 team with specialty in managing medical cases including the handling of ambulance services. This group actively participates in providing ambulance services in certain states such as Penang Island, Kelantan, and Melaka.

In addition, NGOs like St. John Ambulance, Red Crescent Society, the 'Pandu Puteri' (equivalent to the Girls-guide movement/society) and several others, which also have their own ambulance services with their own crew members. These organizations also provide similar services as the MOH but at a purportedly lower level of care. Others include institutions that are profit-orientated and the provide their own ambulance services, like the Ampang Puteri Hospital, Glen Eagle Hospital, Kota Bharu Medical Center and the like. The ambulance services carried out by these institutions, however, do not have emergency services.

Like the Governments of other developing countries, the Malaysian government subsidizes a substantial portion of the healthcare cost. There is, however, a lack of effort and money spend towards the development of EMS especially in the pre-hospital care component and ambulance services as compared to expenditure and concern given to public health and in-hospital care (Wan Aasim, W.A., 2002). These ambulance services are hospital based and emergency services are present. However, as mentioned earlier, pre-hospital care services especially emergency ambulance services experience lack of funds or allocations towards the development of these components. It is also possible that lack of proper planning during the initial phase of the development of these hospitals may also contribute to this state of affair. Budgeting for these areas could be of low priority. Further, no single body or organization has taken serious attention to this matter (Abu Hassan, A., 2005). Different states of affairs are seen in European countries or in North America. In

these advanced countries, EMS is totally run by dedicated national level single body or organization. These organizations are accountable and are responsible for their own running and budget.

In MOH hospitals or teaching hospitals, EMS system is totally run by personals that are also hospital staffs. The drivers, medical assistants and staff nurses are all under the hospital payroll and at the same time are given task to manage EMS. This system is known to be difficult to run properly. Suggestion have been made that there should be a dedicated body with their own staffs in order to manage EMS system (Wan Aasim, W.A., 2002). The philosophy and function of EMS system in Malaysia may still be unclear and therefore require substantial attention from the authorities. To meet the needs of the community it serves, an EMS system, whether in civil, disaster or war situations must function as a unified whole, as a series of links in a chain (Abu Hassan, A., 2005). In the present study, attention is being focused only on patient transportation. Information gathered could be of utmost importance towards the formation of a proper EMS in the country.

1.2 PATIENT TRANSPORTATION

When we discuss about patient transportation in the EMS system, it is in fact referred to the special kind of vehicle known as ambulance. Generally there are three types of ambulances i.e. land, water and air ambulances. Patients who are transported under a good EMS system, whether by ground, water or air services should be taken to the nearest appropriate medical facilities or hospitals. Ideally this action must be based on the needs of the patients and the availability of services (Britten, N., & Shaw, A., 1994)

1.2.1 HISTORICAL OVERVIEW OF THE GLOBAL AMBULANCE SERVICES

The concepts of ambulance services were first introduced in 1797. When Baron Jean Larrey coordinated the first battlefield medical plan including transportation of the casualties, he recognized the importance of reducing time to definitive surgery by using an ambulance. The first civilian ambulance service was formed in Cincinnati, Ohio in 1865. Then the New York City Health Department Ambulance Service and Bellevue Hospital followed this concept, which started in 1869. Both these ambulance services were especially designed horse drawn carts staffed with physician interns from the various hospital wards (Bledsoe *et. al.*, 2000).

During the Korean and Vietnam conflicts, there were too many victims in the field and had to be transported to the field hospital for treatment as soon as possible in order to save their lives. It was the first time where wounded victims were evacuated by helicopters to field hospitals.

The evacuation process occurred within 10 to 20 minutes in most cases. From that experience, a great deal of changes in the transportation of the patient or victims were developed or improved upon. It was then realized that by decreasing time taken for definitive care plus the advances in medical care procedures significantly reduced mortality and morbidity (Cone, D. C. 2002).

In the late 1960s, several countries, especially from the European region started to provide civilian pre hospital emergency care and six years later, pre hospital emergency care were incorporated in the development of EMS systems. The training of pre hospital

care crews and the upgrading of ambulances and their equipment were recorded. (Cone, D.C, 1998).

1.2.2 AMBULANCE SERVICES IN MALAYSIA.

Emergency ambulance services being a part of pre-hospital care services started a decade ago. This developed together with the EMS system in the country. Relatively this part of services came together with other similar services like triaging, observational wards and some services provide by ED of the representative hospitals. MOH dominated this part of services as well as the main player and coordinator of the system. Emergency ambulance services presently are provided countrywide. Ambulances are located in the hospital compound especially near the ED. This is the icon of the Malaysian system and is still being actively run to the present time.

Ambulance services are well known to the public all over the country. However, as mentioned earlier, the quality of pre-hospital care services, especially emergency ambulance services is thought to be found wanting due the possible lack of funds allocated for the development of vital components within these services. It is also possible that the lack of proper planning during the initial phase of the development of these hospitals could have contributed to this state of affair.

Further, budgeting for these areas could have been categorized as of low priority. In addition, there was no single body or organization that has been given responsibility for this matter. This situation could be rectified by establishing an independent body to oversee all the emergency services system under one body as can be seen in most European countries and North America. In these countries, EMS is totally run by dedicated single body or

organization. We need this kind of system in order to make our standard acceptable or perhaps meet the internationally recognized standard for ambulances services.

1.2.3 AMBULANCE SERVICES IN KELANTAN.

In the Kelantan state, being part of Malaysia and located at the east coast, EMS delivery system is similar to those found in other states. Kelantan consists of 9-district namely Kota Bharu, Pasir Mas, Gua Musang, Jeli, Tanah Merah, Pasir Puteh, Bachok, Machang and Tumpat. Out of these districts, only Bachok did not have its own district hospital. The district of Kota Bharu has two major hospitals, which are responsible for the catering of all emergency calls.

In the district of Kota Bharu itself, other than government institutions, NGO's namely the St. John Ambulance, the Malaysian Red Crescent Society also play an important role. Currently, the most popular institutions in delivering an ambulance services are HKB, HUSM and JPA3. JPA3 with a designated unit named Rescue 991 is one of the active organizations in providing ambulance services especially in Penang, Melaka, Kelantan, Kelang Valley and Terengganu. Most of the Rescue 991 crewmembers that are dealing with ambulance services are with non-medical background, but they were trained in Basic Life Support (BLS), First Responder Life Support (FRLS), and Basic Trauma Life Support (BTLS). Different from HRPZ II and others institution that provided ambulance services, ED of HUSM has been run through a special course called Emergency Medical Dispatch (EMD) in 2004 and since that they managed all calls for HUSM

1.3 AMBULANCES SERVICES SYSTEM AND ITS EFFICIENCY PARAMETERS

Ambulance services throughout the world measure their performance through the use of performance indicators such as response time, on scene times and customers satisfaction (MacFarlane & Benn, 2003). Despite concerns about subjectivity and utility, the use of satisfaction as a key performance indicator for ambulance services is well accepted throughout the world. It has been define as being the expectations of patients and families being met by the services provided. It can also be used interchangeably with the dimension of acceptability. This is achieved when the care or services provided met the expectations of the clients, community, providers and paying organizations. These expectations include the extent to which ambulance services were accessible and in the face of financial, geographic, organizational and culture behavior were clinically effective; appropriate to needs; timely; in line with agreed standards and delivered by trained and educated staff (Booth *et al.*, 1992).

1.3.1 AMBULANCE RESPONSE TIME

For the purpose of this study, ambulance response time is defined as when the call is received by call center of HUSM or HKB until the ambulance team reaches the site of incident. Only this ART will be focused on, this being a part of EMS episode. The Emergency Medical Services (EMS) system comprises of a comprehensive network of personals, equipment and resources basically established with the aim of delivering aid and emergency medical care to the community. Wilson *et al.*, (2002) mentioned that these services are meant also to ensure that deliveries of care are partaken rapidly, effectively and with quality assurance. EMS efficiency can be measured in many ways.

The most important way of looking at this system is by examining the whole process of EMS episode that starts from the point of receiving the call until the patient is brought to

the ED or hospital as mentioned by Guppy & Wollard (1999). These authors also defined the components of EMS episode based on timing as consisting of the following: call processing time, control allocation time, crew mobilization time, traveling time to the scene, time spent at the scene, traveling time to the ED or hospital and ends with time spent at ED or hospital. In fact, the whole process of EMS episode plays a crucial role in determining service output. The EMS episode consist of 7 distinct period mentioned above with a component named 'response time' consisting of 4 components namely, call processing time, control allocation time, crew mobilization time and traveling time to scene. The crucial determinant of successful EMS episode can be illustrated clearly with cases of out of hospital cardiac arrest patients. The concept that time interval between getting early initial treatment at the so-call 'golden hour' phase provided by ambulance crews has a greater effect on the morbidity and mortality rate of the victim or patient. Hunt *et al.*, (1989) stated that every minute delay in the initiation of cardio pulmonary resuscitation (CPR) during cardiac arrest for example, could increase the mortality and morbidity rate by up to 7 to 10%.

Ambulance response time is undoubtedly one of the parameters used in measuring EMS efficiency. Pell *et al.*, (2001) stated that in the United Kingdom, ambulances are expected to arrive at the designated scene within 7 to 14 minutes for 90% of the calls received. In addition, Breen *et al.*, (2000) found that 14% of calls took 5 minutes or longer to activate response while 38% of emergencies obtained responses within 9 minutes. Further, it was noted that only 4.5% of emergency calls originating from places greater than 5 miles from the ambulance bases responded to within 9 minutes.

Narad & Driesbock, (1999), in their study on all California local EMS agencies had shown that only 57% of Californian counties ambulance services regulate their response

times. Many of the ambulance enforcement programs in California have enforcement mechanism that is unlikely to promote compliance. Therefore, response time regulation is intended to improve the effectiveness of the EMS system in pre hospital care

Nichol *et al.*, (1996) performed a study with the objective to determine the relative effectiveness of differences in response time interval, proportion of bystander Cardiopulmonary Resuscitation (CPR) and type and tier of EMS system on survival after out of hospital cardiac arrest. As a result, they concluded that increased of survival rates of these patients upon discharge from the hospital might be associated with decreased response time interval and the used of two tier EMS systems as compared to a one-tier system. Another studies done in Melbourne, Australia shows similar finding. It was found that the trend in occurrence and survival following out of hospital cardiac arrest are similar to those found elsewhere (Smith *et al.*, 2001).

Another call-response interval study was done in the Turkish city of Ankara with the aim of trying to determine the various times related to the ambulance activities of Ankara Emergency Aid and Rescue Services (EARS) (Altintas & Bilir, 2001). These authors expected that results of their studies might contribute to the improvement of the EMS system. A descriptive study was planned to determine various times related to the ambulance activities of Ankara EARS. The variables of the study were: delay time, response time, time at the scene (scene time), round trip time, transport time and total run time of Ankara EARS ambulance activities. The median response time of Ankara EARS was found to be 9 minutes. In the research year, the median delay time was 2 minutes. Median arrival time to patient contact time of Ankara EARS was 2 minutes. Median time at the scene was 7 minutes. Median round trip time of the system was 44 minutes. The median time for the

arrival at the scene from the ambulance station was 8 minutes. The median transport time was 10 minutes. The median total run time was 30 minutes. As the median response time was found to be 9 minutes it is concluded that there should be more ambulance vehicle to improve this response time for Ankara EARS. It was observed by Altintas & Bilir, (2001), that due to financial problems the ambulance crew and dispatchers of Ankara EARS recorded their times manually. These authors also concluded that if digital and electronics recording systems were utilized, time recordings could be more precise.

Based on a report commissioned by The Ministry of Health and Social Affairs of Norway, Steen-Hansen *et al.*, (2001), proposed that standards for ambulance response intervals in emergencies if performed would be able to assess the current ambulance response interval. The report also proposed that an ambulance should reach 90% of the population in cities and urban areas within 8 minutes, whilst in rural areas, 90% should be reached within 25 minutes. The study concluded that the proposed standard was not achieved in any of the municipality in the country. However, the city of Tonsberg having shown the best performance can only achieved 48.9% of the populations where ambulance reaches their destination within 8 minutes.

In Singapore, a study conducted just over a decade ago had ascertained the time it took for ambulance team to reach a patient and transport the patient to an Emergency Department after an emergency call (Seow & Lim, 1993). It was reported that it took an average of 11.40 ± 4.88 minutes for an ambulance team to reach a patient and 30.50 ± 10.62 minutes for the patient to reach an emergency department. At the level of staffing in Singapore at that time, the basic life support care starts around 11.40 minutes whilst advanced life support care started 30.50 minutes after an emergency call.

1.3.2 CUSTOMERS SATISFACTION

One of the parameter to evaluate ambulance services efficiency is determine by the level of satisfaction from clients or customers. This present study will explore an aspect of satisfaction regarding ambulance services and ED among local societies as a part of EMS system.

1.3.2.1 MALAYSIAN COMMUNITIES PERCEPTION TOWARD AMBULANCE AND EMERGENCY CARE

Our Malaysian local health care agencies, whether government or non-governmental are more prone to follow the Angelo-American EMS delivery system but the level or standard of care delivered are questionable. Furthermore, Malaysian people seldom asked or express their opinion regarding this specific aspect of the health care services delivering systems, which were received by them. The present researcher felt that this phenomenon is most probably due to the fact that the communities themselves have no idea of the level of care provided to them. Furthermore they also did not have any specific parameter or bench mark to compare the services received by them.

In Kelantan, as mentioned before apart from government hospital such as HRPZ II and HUSM, NGO's namely the St. John Ambulance, the Malaysian Red Crescent Society are the institutions involved in delivering ambulance services. Another institution known as The JPA 3 also provides ambulance services. They have their designated unit named Rescue 991. Most of the Rescue 991 crewmembers that are dealing with ambulance services are with non-medical background, but they were trained in the Basic Life Support (BLS), First Responder Life Support (FRLS), and Basic Trauma Life Support (BTLS) training programs.

The MOH is well known as a dominated part of this service apart from being the main player and coordinator of the system. The question is, with so many kinds of institutions involved in providing ambulance services and with no coordination in communication system, boundary, and the level of skill and knowledge of ambulance personal. In such a situation, all of those elements acts as important parameters which determine how well the organization function. How could the standard of care be established and how and with what basis can the communities perceive this service?

Due to the lack of definitive studies of the EMS system in the local setting compared to in-hospital component, there is therefore a need for an in-depth study on EMS delivering system in Malaysia especially in relation to ambulance services.

CHAPTER 2

OBJECTIVES OF THE STUDY

2.0 TO STUDY THE PERCEPTION OF CLIENTS AND HEALTH CARE PROVIDERS REGARDING AMBULANCE SERVICES AND EMERGENCY CARE AT LOCAL HOSPITAL

To determine the level of perception of clients and health care providers regarding ambulance services and emergency care at local hospital. This is the primary objective of this study

2.1 TO IDENTIFY AND ANALYZE THE FACTORS THAT CAN AFFECT THE SPEED OF AMBULANCE RESPONSE TIME (ART)

To determine and analyze;

- the client perception toward ambulance response time (ART) and to what level they graded it
- The other factors which could affecting the speed of ambulance response time (ART)
- The level of satisfactory toward en-route care of the ambulance services

2.2 TO MAKE THE APPROPRIATE RECOMMENDATION TO THE AUTHORITIES BASED ON THE RESULTS OF THE STUDY

To make suggestion and recommendation based on the results of the study especially to improved emergency medical services system (EMS) delivering especially ambulance services and emergency department

CHAPTER 3

LITERATURE REVIEW

3.0 GLOBAL VIEW OF AMBULANCE SERVICES SYSTEM

In other countries, especially in Europe and USA, ambulance services are established. They have their own independent system with their own budget, management group, personals and equipments. They practice mobile ambulance with base station within certain coverage area. In the United Kingdom, The London Ambulance Service (LAS) itself, is the largest free ambulance service in the world, caring for more than one and a half million patients every year, have 70 ambulance stations covering 620 square miles or 1 ambulance station for 9 square miles (Department of Health of London, 2000).

Another example is the Victorian Ambulance Services of Australia where the coverage area of 9000 square miles requires 56 ambulance base stations (Department of Health of London, 2000). As mentioned above, the ambulance services system in these countries are well organized and structured. They have all the necessary sophisticated apparatus, equipments and communication system required for the job. With all the technologies at hand and dedicated crewmembers, they could achieve the international standard of ART, which is within 4 to 5 minutes from time of incident (Department of Health of London, 2001), for them to arrive at the site of incident.

3.1 PARAMETER FOR AMBULANCE SERVICES IFFECIENCY

As mentioned before by MacFarlane & Benn, (2003) Ambulance services throughout the world have their own specific measurement indicators such as response time, on scene times and customers satisfaction. Some of the indicators will be discussed in detailed below.

3.1.1 EMS EPISODE

The components of EMS episode, based on timing, consists of the following; call processing time, control allocation time, crew mobilization time, traveling time to the scene, time spent at the scene, traveling time back to the ED or hospital and ends with time spent at ED or hospital (Guppy & Wollard, 1999). In fact, the whole process of EMS episode plays a crucial role in determining service output.

As mentioned earlier, the crucial determinant of successful EMS episode can be illustrated clearly with cases of out of hospital cardiac arrest patients. The concept that time interval between getting early initial treatment at the so-call 'golden hour' phase provided by ambulance crews has a greater effect on the morbidity and mortality rate of the victim or patient. Hunt *et al.*, (1989) stated that every minute delay in the initiation of cardio pulmonary resuscitation (CPR) during cardiac arrest for example, could increase the mortality and morbidity rate by up to 7 to 10%. This chapter aims to reflect review studies conducted on ambulance interval response time in the whole world and also in the local setting. They are presented under subheadings as follows; 1) definition of the response time, 2) effects of reducing response time on patient mortality and morbidity, 3) ambulance response time in others countries, 4) factors influencing the ambulance response time and 5) patient contact interval time and influencing factors.

3.1.2 DEFINITION OF THE RESPONSE TIME

A few studies have been done to assess the responding personals understanding regarding the definition of response time. Meislin *et al.*, 1999, in his study found that the documentation of each EMS episode time was not always consistent. This study also evaluated how EMS agencies estimate time of each episode in EMS and factors that may contribute to the length of the response time. The researchers concluded that different agencies use different time points to start and end their response time measurements, making it difficult to make comparison between various agencies or region.

To maintain the standard of the ambulance response time in pre hospital emergency medical care, Committee for Regulation Information Requirements (CRIR) UK, (1999) standardized the definition of response time, where the beginning is when details of the phone number of the caller, the exact location of the incident and the nature of the chief complaint have been ascertained and ends when the emergency team arrives at the scene of incident.

The next point to assess would be how to accurately measure and record the response time. A study conducted to measure accurately the response time was carried out by Campbell *et al.*, (1997). Measurement of response time should be a simple task. The authors sought to accurately measure the emergency call receipts to vehicle departure and emergency call receipts to patient access response time by using 'Primary and Secondary Public Safety Answering Points' (PASAP). The study concluded that the emergency call receipts to vehicle departure and emergency call receipts to patient access response time can be accurately measured in a system with two separate PSAP computer aided dispatch

clocks. In the present study, however this is not possible since no system with primary and secondary public safety answering points are available.

3.1.3 EFFECTS OF REDUCING RESPONSE TIME ON PATIENT MORTALITY AND MORBIDITY

Several studies had been done in the United Kingdom specifically to determine the effects of reducing response time on deaths rate from out hospital cardiac arrest (Pell *et al.*, 2001), (Cone, D. C., 2002), (Cummins *et al.*, 1991) and (Guly *et al.*, 1995). It was found that, ambulance must arrive at the scene within 7 minutes for at least 50% of calls and within 14 minutes for 90% of calls. The relationship between response time and survival rate was noted. In their conclusion the authors stated that reducing response time could significantly decrease mortality and morbidity rate for patients who suffer from out of hospital cardiac arrest.

The above studies are extremely valuable but the question is whether the improvement in survival rate suggested here would be worth economically. There are obviously a number of approaches that could get a defibrillator to 90% of out hospital cardiac arrest patients within 5 minutes. However, none of these approaches are cheap. The survival benefit of a shortened Basic Life Support (BLS) with defibrillation first response might actually be greater than the author's estimate because they looked only at defibrillation. Percentage of patients found in asystole at 10 minutes might still show them to be in a shockable rhythm at 5 minutes. Further, questions were raised as to what benefits do patients with non-cardiac cases such as drowning, might there be? With that kind of reliable cost data, society might be able to determine whether the expense involved is worth it or not.

Another study to identify strategies that might improve the outcome was done in United Kingdom with the aim of providing a contemporary account of treatment and outcomes of acute coronary attacks in England and Wales (Norris, R.M., 1998). The author concluded that, opportunity for reducing fatality from acute coronary attacks lie mainly outside the hospital. These result and many others imply that improving ambulance response time might treble survival from cardiac arrest outside hospitals.

A similar study was done in Australia (Department of Human Services, 1999). Here, it was found that, the trend in occurrence and survivals following out of hospital cardiac arrest were similar to those found elsewhere. Other studies (Nichol *et al.*, 1996 & Fin *et al.*, 2001) were done with the objective of determining the relative effectiveness of differences in response time interval, bystander CPR and type and tier of EMS system on survival after out of hospital cardiac arrest. These authors concluded that increase of survival rates at hospital discharge might be associated with decreased response time interval and the used of two tier EMS systems compare to a one-tier EMS system.

3.1.4 AMBULANCE RESPONSE TIME IN OTHERS COUNTRIES

Ambulance response time is one of the parameters usually used in measuring EMS efficiency (MacFarlane & Benn, 2003). Pell *et al.*, (2001) stated that in the United Kingdom, ambulances are expected to arrive at the designated scene within 7 to 14 minutes for 90% of the calls received. In addition, Breen *et al.*, (2000) found that 14% of calls took 5 minutes or longer to activate response while 38% of emergencies obtained responses within 9 minutes. Further, it was noted that only 4.5% of emergency calls originating from places greater than 5 miles from the ambulance bases responded to within 9 minutes.

Narad & Driesbock, (1999), in their study on all California local EMS agencies had shown that only 57% of Californian counties ambulance services regulate their response times. Many of the ambulance enforcement programs in California have enforcement mechanism that is unlikely to promote compliance. Therefore, response time regulation is intended to improve the effectiveness of the EMS system in pre hospital care. A study done in Melbourne, Australia also shows similar findings. It was found that the trend in occurrence and survival following out of hospital cardiac arrest are similar to those found elsewhere (Smith *et al.*, 2001).

Another study was done with the objective to determine the relative effectiveness of the differences in response time interval, proportion of bystander Cardiopulmonary Resuscitation (CPR) and type and tier of EMS system on survival after out of hospital cardiac arrest (Nichol *et al.*, 1996). The authors concluded that increase of survival rates of these patients upon discharge from the hospital might be associated with decreased response time interval and the used of two tier EMS systems as compared to one-tier system.

Another call-response interval study was done in the Turkish city of Ankara with the aim of trying to determine the various times related to the ambulance activities of Ankara Emergency Aid and Rescue Services (EARS) (Altintas & Bilir, 2001). These authors expected that results of their studies might contribute to the improvement of the EMS system. A descriptive study was planned to determine various times related to the ambulance activities of Ankara EARS. The variables of the study were: delay time, response time, time at the scene (scene time), round trip time, transport time and total run time of Ankara EARS ambulance activities. The median response time of Ankara EARS was found