AMBULANCE RESPONSE TIME AND EMERGENCY MEDICAL DISPATCHER PROGRAM: A STUDY IN KELANTAN, MALAYSIA

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Abstract. This study provided data by a simple method of acquiring information related to ambulance response time (ART) and determined whether it met the international standards of ART. Additionally, this paper also compared the duration of ART at this hospital before and after the implementation of an Emergency Medical Dispatcher (EMD) program. The ART, which started when details like phone number of the caller, exact location of the incident and the nature of the main complaint were received and ended when the emergency team arrived at the scene of the incident. The parameters recorded include call processing time, time taken to prepare the team and time taken to travel to the scene. The results of the study revealed that the ART for the university hospital (HUSM) was at 913.2 ± 276.5 seconds (mean ± SD) and it was far below the international standard of ART as a benchmark of a good ambulance service. However, the study suggested that the EMD program that was recently implemented at the HUSM gave a significantly improvement to the ART score.

INTRODUCTION

Hospital Universiti Sains Malaysia (HUSM) is one of the largest teaching hospitals in Malaysia. It is located about six kilometers from Kota Bharu, the capital city of Kelantan State. With a population of 398,835, Kota Bharu has two major ambulance services, and one of them is operated by HUSM (Hospital Universiti Sains Malaysia, 2005). HUSM is also recognized as the regional tertiary referral center for the east coast region of peninsular Malaysia. The total area of coverage for the HUSM services is about 65,000 km^2. The Emergency Department (ED) of HUSM manages approximately 600 to 700 of emergency calls per year (Shaharudin *et al*, 2005). There have been no studies done to measure the efficiency of ambulance services in Kelantan. In fact, a review of the literature also reveals that there were no similar studies being undertaken at the national level in Malaysia.

Throughout the world, ambulance services measure their performance using indicators such as response time, on-scene time, and clients' satisfaction (MacFarlane and Benn, 2003). The objective of this paper was to measure the total response time, which is defined as the time taken from receiving an emergency call until the time of arrival at the incident site, and to compare times between two study groups: Group 1 that consisted of non-Emergency Medical Dispatcher (EMD) and Group 2 that was the EMD. For the purpose of this study, the total response time was equal to Ambulance Response Time (ART).

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Table 1
Time taken to manage an emergency call by two study groups.

Variable	Group[a]	*n*	Mean score (SD) (sec)	Mean diff	p-value[b]
Call processing time	1	150	130.3 (50.8)	12.68	0.039
	2	150	117.7 (55.2)		
Time to prepare the team	1	150	270.7 (101.6)	25.36	0.039
	2	150	245.3 (110.4)		
Time to arrive at the scene	1	150	905.3 (301.4)	355.03	<0.001
	2	150	550.2 (173.8)		
Ambulance Response Time	1	150	1,306.3 (450.0)	734.71	<0.001
	2	150	913.2 (276.5)		

[a] Group 1 = Non-EMD; Group 2 = EMD
[b] Independent *t*-test, significant at $p < 0.05$

The ART consists of call processing time, time taken to prepare a team, and the time taken to travel to scene (Guppy and Wollard, 2000).

MATERIALS AND METHODS

This was a cross-sectional study conducted at the ED of HUSM. Information about genuine emergency ambulance calls was recorded from June 2004 for a period of 12 months. All information related to ambulance calls collected from June to December 2004 was managed by Group 1, while the information obtained from January until June 2005 was managed by Group 2. In Group 2, the "Ambulance Service Form" that had been validated earlier (Zainalabidin *et al*, 2005) was used, while in Group 1, the manual department protocol procedure was used. The outcome of this study was measured in terms of ART. All the information obtained in this study was analyzed by using commercially available software, Statistical Program for Social Science (SPSS). In order to avoid any information bias or measurement bias, the researcher periodically followed the ambulance teams to the site of incidents.

RESULTS

During one-year study period, 300 ambulance calls were recorded from clients who urgently need our ambulance services. Group 1 managed 150 calls, while the other half was managed by Group 2. Taking into account all aspects of time spent in managing calls for ambulance services, the researcher found that (Table 1):

1. There was a significant difference for both groups to process the emergency call, where the Group 2 spent less time than Group 1. The mean time different was 12.7 seconds.

2. Group 2 spent less time in preparing the team as compared to Group 1.

3. Although there are many factors that can influence ambulance driver's capacity to reach the scene site, the time spend by Group 2 was still shorter when compared to Group 1.

4. The overall time spent to manage the ambulance call, Ambulance Response Time (ART), was significantly shorter in Group 2 when compared to Group 1. The mean time difference was 393.1 seconds.

DISCUSSION

At the ED of HUSM, ambulance services are run under the system called the hospital-

based system whereby all ambulances were located in the hospital compound (near the Emergency Department). During an emergency situation, requiring ambulance assistance, the client or victim will activate the EMS system using the emergency number, 991. An ambulance is then sent to the scene as soon as possible. Prior to the establishment of the present system, HUSM or Kelantan state did not have any specifically dedicated unit or trained personnel to manage ambulance calls. Staff who were involved in managing ambulance calls were actually the same people who need to do important daily work in the department. The mean ART recorded prior to the establishment of the EMD squad was 21.8 minutes.

With the introduction of present system, all ambulance crews at the ED of HUSM were trained to be an Emergency Medical Dispatcher (EMD). This training was started in the middle of 2004. The candidates have to complete 46 credit hours before they can sit for the final examination. If they succeed, they graduate as an EMD personnel. The syllabus for the EMD course was modified from that of the Emergency Medical Services Authority of California. The EMD squad was officially launched in January 2005. Since then, the EMD personnel managed all the ambulance calls in this hospital. In this study, the result showed that the mean ART was reduced by 69.7% from 21.8 minutes to 15.2 minutes after the implementation of EMD program. It was statistically significant if we compare the mean ART between the study groups ($p < 0.001$). It shows that, with the present of EMD personnel, time taken to manage the emergency call has improved.

The EMD training was successful in the inculcation of the values of ambulance crews who understand and appreciate the philosophy of emergency services. Enforcement carried out during the course and checks on crews compliance contributed towards better emergency services. A similar study carried out by local EMS agencies in California showed that only 57% of Californian county ambulance services regulate their response times. Many of the ambulance enforcement programs in California have an 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 (Narad and Driesbock, 1999).

Another call-response interval study was undertaken in the Turkish city of Ankara with the aim of determining the times related to the ambulance activities of the Ankara Emergency Aid and Rescue Services (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 mean response time of the Ankara EARS was found to be 9 minutes. With this result, they concluded that there should be more ambulance vehicles in order to improve the response time for Ankara (Altintas and Bilir, 2001). Nevertheless, in our set up, we have four ambulances that are used to manage all emergency calls. We believe that with the current number of facilities that we have, it will not influence the speed of ART within the study area.

Table 2 shows the comparison of ART among selected countries of the world. It shows that the current ART recorded in this study that represented Kota Bharu city was slower than the international standard. However, our figure is not much different than that for Singapore (Seow and Lim, 1993). Many other factors need to be considered if we want to achieve the international standard. These factors may include the types of ambulance services, socio-demographic patterns, and geographical differences as well as public behavioral influences toward good behavioral practices.

The overall philosophy and functions of

Table 2
A comparison mean time of ART for selected locations.

Country	ART(minutes)
United Kingdom	7.00-14.00
Australia	7.00-11.00
Ankara, Turkey	± 9.00
Singapore	± 15.00
ED of HUSM	± 15.20
City of New York	± 11.40
City of Chicago	± 11.30

Emergency Medical Services (EMS) system in Malaysia, however, are still unclear. Substantial attention from the authorities is found wanting regarding the improvement of the ED services in all hospitals in Malaysia (Abu Hassan, 2005). In the developed countries, their EMS systems are more managed by an independent body. In the USA for example, they have a special unit to take care of EMS system, including ambulance services; some studies have shown significant improvement of ambulance services after being taking care by this special unit (Robertson, 1999; Wilson *et al*, 2002). They not only train ambulance personnel but also develop protocols for the management of pre-hospital care and prepare career pathways for their staff, which include courses and programed leading to bachelors and advanced degrees. Conversely, the EMS system of Malaysia is run by the same personnel who are also part of the ED staff. The drivers, medical assistants, and staff nurses are all work for the hospital, and at the same time, they were given the task to manage the EMS. As a result, the person in charge is faced with considerable difficulty that will subsequently have a negative impact on the quality of the services.

Therefore, we suggest that a special dedicated unit with its own staff should manage the EMS system to ensure better outcomes and client satisfaction (Wan Adnan, 2002). The *modus operandi* for this operation could be developed and suggested to the Ministry of Health Malaysia as a custodian of health care services in the country. The present study suggested that ambulances services in the local setting still have not reached the international standard for ART, although they show some improvement after the implementation of the EMD program. In order to achieve the standard goal, the system in ED of HUSM may require modifications and adjustments, if not a major overhaul.

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