

A STUDY ON THE WAITING TIME AND PROCESSING
TIME OF GREEN ZONE CASES WHEN TRIAGE BY A
DOCTOR APPLIED TO EDHUSM

by

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LIST OF ABBREVIATIONS

ATS	Australasian Triage Scale
AEBA	Acute Exacerbation of Bronchial Asthma
BSA	Body Surface Area
CRAMS	Circulation, Respiration, Abdomen, Motor and Speech Score
CTAS	Canadian Triage Acuity Scale
ECG	Electrocardiograph
ED	Emergency Department
EDHUSM	Emergency Department Hospital Universiti Sains Malaysia
EMS	Emergency Medical Service
ESI	Emergency Severity Index
GCS	Glasgow Coma Scale
HPPPC	Health Policy Priorities Principal Committee
HR	Heart Rate
HRPZ II	Hospital Raja Perempuan Zainab II
HUSM	Hospital University Sains Malaysia
IMPACT	Improving Patient Processing Assisted by Consultant at Triage
ISS	Injury Severity Score
LOS	Length of Stay
MO	Medical Officer
MTS	Manchester Triage Scale

NNJ	Neonatal Jaundice
NTS	National Triage Scale
OSCC	One Stop Crisis Center
PHI	Pre-Hospital Index
PM	Latin word – post meridiem, referring to evening Shift
POCT	Point of Care Testing
RTS	Revised Trauma Score
SAVE	Secondary Assessment of Victim Endpoint
START	Simple Triage And Rapid Treatment
TLP	Triage Liaison Physician
TS	Trauma Score
TT	Triage Team
SD	Standard Deviation

ABSTRAK

KAJIAN JANGKAMASA MENUNGGU DAN JANGKAMASA PEMROSESAN APABILA TRIAJ OLEH DOKTOR DIAPLIKASIKAN DI JABATAN KECEMASAN HOSPITAL UNIVERSITI SAINS MALAYSIA.

Pengenalan: Di kebanyakan negara, Jabatan Kecemasan mengalami masalah yang berkaitan dengan peningkatan permintaan bagi perkhidmatan yang disediakan. Hasilnya, jangkamasa menunggu dan jangkamasa pemprosesan setiap kes di Jabatan Kecemasan telah meningkat melangkaui tahap yang telah ditetapkan oleh kerajaan. Dalam menangani masalah yang timbul akibat peningkatan permintaan, pelbagai projek seperti trek pintas, pasukan triaj, pemetaan aliran pesakit dan seumpamanya telah dilaksanakan. Sehubungan itu, kajian ini dijalankan dan ianya tertumpu kepada kesan triaj oleh doktor terhadap jangkamasa menunggu dan jangkamasa pemprosesan dan juga faktor-faktor yang mempengaruhi hasil kajian.

Objektif: Secara amnya, objektif kajian ini adalah untuk mengkaji jangkamasa menunggu dan jangkamasa pemprosesan kes di zon hijau apabila triaj oleh doktor diaplikasikan dan untuk menentukan faktor yang mempengaruhi hasil kajian. Secara khususnya, kajian ini adalah untuk mengkaji purata perbezaan terhadap jangkamasa menunggu dan jangkamasa pemprosesan antara pesakit yang ditriaj oleh doktor dan triaj tanpa doktor. Seterusnya, meneliti faktor-faktor yang mempengaruhi keseluruhan jangkamasa pemprosesan kes dan mengkaji perkaitan kepuasan pesakit dengan keputusan kajian.

Tatacara kajian: Kajian secara prospektif ini telah dijalankan di Jabatan Kecemasan HUSM bermula 1 Mac 2013 sehingga 30 April 2013, iaitu selama 6 jam setiap hari. Semua kes zone hijau dimasukkan ke dalam kajian. Kriteria pengecualian adalah kes-kes yang melalui trek pintas seperti NNJ,OSCC ,AEBA dan psikiatri, kes zon kuning dan kes zon merah. Masa pendaftaran, masa triaj, masa dilihat oleh doktor di triaj dengan perawatan dan masa di rujuk, didiscaj atau masa dimasukkan ke wad di catit di dalam borang kajian. Selain itu, setiap prosedur termasuk perubatan, radiograf, persampelan darah, ECG, POCT dan sebagainya di lengkapkan didalam borang kajian. Jangkamasa menunggu bermula dari masa pendaftaran sehingga ke masa pesakit di rawat oleh doktor di triaj atau di bilik perawatan. Jangkamasa pemprosesan pula bermula dari masa pendaftaran sehingga masa pesakit di discaj atau dirujuk atau dimasukkan ke wad. Apabila keseluruhan perawatan selesai, pesakit ataupun ahli keluarga pesakit diminta mengisi borang maklumbalas.

Keputusan: Seramai 260 pesakit dipilih untuk kajian ini (130 pesakit setiap kumpulan kajian). Jangkamasa menunggu dan jangkamasa pemprosesan bagi pesakit yang ditriaj oleh doktor adalah signifikan secara statistic berbanding pesakit yang ditriaj tanpa doktor ($p < 0.001$). Manakala jangkamasa menunggu bagi pesakit trauma berbanding pesakit bukan trauma tidak signifikan secara statistic dengan nilai $p = 0.238$. Analisis regresi linear berganda menunjukkan rawatan tanpa doktor, bilangan prosedur, dan hari bekerja adalah faktor-faktor yang mempengaruhi keseluruhan jangkamasa pemprosesan ($p < 0.001$). Selain itu, jangkamasa penyakit ($p = 0.004$), jangkamasa menunggu ($p < 0.001$) dan jangkamasa pemprosesan ($p < 0.001$) telah dikenalpasti merupakan faktor-faktor yang mempengaruhi rasa puashati pesakit di Jabatan Kecemasan.

Kesimpulan: Secara keseluruhan triaj oleh doktor dapat memendekkan jangkamasa menunggu dan meningkatkan jangkamasa pemprosesan. Secara tidak langsung akan meningkatkan kualiti perawatan dan mutu perkhidmatan pesakit dengan cara mengurangkan kesesakan pesakit di kecemasan. Seterusnya meningkatkan rasa puashati pesakit.

Kata kunci: jangkamasa menunggu, jangkamasa pemprosesan, kepuasan pesakit

ABSTRACT

A STUDY ON THE WAITING TIME AND PROCESSING TIME OF GREEN ZONE CASES WHEN TRIAGE BY A DOCTOR APPLIED TO EDHUSM

Introduction: In many countries, hospital Emergency Departments (ED) are experiencing problem associated with increased demand for their services. As a result, patient waiting times and overall processing time in the ED have increased beyond the acceptable level set by the government. In order to address the problems associated with this increased demand, numbers of projects were undertaken such as fast track approach, team triage, and mapping patient flow in ED. Thus, this study focused on effect of triage by doctor on waiting time and overall processing time and factors influencing the outcome.

Objectives: Generally the objectives of this study were to determine the waiting time and processing time of green zone cases when triage by doctor applied to EDHUSM and to determine factors influencing outcome. Specifically, to study mean difference in waiting time and processing time between patient with triage by doctor and triage without doctor. Then, to study on factor influencing overall processing time and to determine association between patient's satisfaction with the outcome.

Methods: This prospective study was conducted in EDHUSM from 1st March 2013 to 30th April 2013, for only 6 hours a day. All green zone cases were included in this study. Exclusion criteria were all fast track patients (NNJ, psychiatry, Bronchial Asthma, OSCC), all yellow zone cases, and all red zone cases. Their time of registered, time of triaged, time seen by doctor and time of referred or discharged or admitted were

monitored. Apart from that, every procedures including medications, radiograph, blood sampling, ECG, POCT were stated and ticked in the study form. Waiting time means the time they registered to the time they first seen by doctor with intervention. Processing time means time of registered to the time of discharged or referred or admitted. After overall processed, patient or their relatives were asked to fill up satisfactory feedback form.

Results: There were total of 260 subjects (130 subjects each group) in this study. Waiting time and processing time among patient who have been triaged by doctor was significant with $p < 0.001$ compared to patient triaged without doctor. No significant difference between trauma and non-trauma patient in terms of waiting time when triaged by doctors with p value = 0.238. The factors that influencing the processing times in both groups were treatment without doctor, number of procedures and weekdays ($p < 0.001$). In multiple logistic regression analysis only three factors were found to have significant association with poor satisfaction when triaged by a doctor applied to EDHUSM. They were the duration of their illness ($p = 0.004$), prolonged waiting time ($p < 0.001$) and longer processing time ($p < 0.001$).

Conclusion: We concluded that, triage by a doctor can shorten waiting time and improved the processing time by quick assessment and intervention. Indirectly, it will reduce overcrowding in emergency department. Hence, reduce complaints and dissatisfaction.

Keywords: waiting time, processing time, satisfaction

CHAPTER 1

INTRODUCTION

1.1 Introduction of Triage in Emergency Medicine

Malaysia healthcare is mainly under the responsibility of the government's Ministry of health, which provide quality health care through wide range of nationwide networks of clinics and hospitals. Primary care services and tertiary centres are link together in which primary care services whose team by family medicine physicians, nurses and assistant medical officer runs the government clinics (Health, 2008).

However, there is still a significant shortage in a medical facility especially medical doctors and well trained specialists. The ministry of health try to overcome this by making improvements including refurbishment of existing hospitals, build and equipping new hospitals and add-up of the number of polyclinic (Lee, 2011).

There is a recent successful establishment of '1 Malaysia Clinics' in 2010. This clinic offers medical treatment for common illness such as fever, flu and cold. However there is still some limitation because the clinic runs by assistant medical officer and a nurse, no blood taking and no injection such as analgesic are advised.

Despite so many alternatives provided by Ministry of Health to the locals; polyclinics and 'clinic 1 Malaysia' but we have been frustrated by the problem of overcrowding in Emergency Department in many hospitals in Malaysia (Ismail *et al.*, 2008). Pressures on Emergency Department in Malaysia have never been greater to see more patients more quickly.

Schemes aimed at educating the locals about this unnecessary visit have been carried out however, have not improved the situation regardless our health care point of view, patients keep on perceiving that their problem to be emergency that need urgent

treatment. Furthermore, this situation is further complicated by the lack of comprehensive and systematic primary health care and consequently the emergency department has become more common entry point to them (Choi *et al.*, 2006).

Due to such of problems, all Emergency Departments (ED) applied triage system. Triage system aim to identify the cases with potential life threatening emergencies by looking at vitals sign parameters and brief history. The principle of triage system is the same, to make sure that the most critical cases are dealt with first, either take longer or use alternatives methods for dealing with less critical case (Bruijns *et al.*, 2008).

HUSM is regional tertiary referral centre especially for Kelantan state other than HRPZ II. It is a teaching institution involving undergraduate and postgraduate, specialty training in various fields. Yearly, total numbers of patient attended at ED increasing in trends average of 50,000- 60,000 per year.

Every day, emergency departments are facing with large numbers of patients suffering from a wide range of problems. The workload varies from day to day and from hour to hour and depends on the numbers of patients. It is absolutely essential that there is a system in place to ensure that these patients are seen in order of clinical condition rather than in order of attendance.

Triage is a term to describe the process by which patients are sorted into categories according to the urgency of their need for medical care. This means that the patients with more serious problems must be treated first, no matter time they arrive (Travers *et al.*, 2002).

The importance of triage system in emergency department is sorting cases into categories that reflect different levels of attention and care required. Emergency Department University Science Malaysia (HUSM) triaging is divided according to

clinical zones based upon our Malaysia triage system. Our triage system is a three tier system where the cases are categorized by acuity.

Critical cases or resuscitation case (red zone) are attended immediately by a dedicated resuscitation team. Semi-critical cases (yellow zone) are the cases which attended within 30 minutes upon arrival by dedicated yellow zone team. The rest non-critical cases (green zone) will be attended within 60 to 90 minutes.

Based on emergency department HUSM statistic 2010-2011, 50% -70% of the total number of patients seen were from non-critical cases (green zone). While, 25% of cases were from semi-critical case (yellow zone) and the rest were from critical case (red). These group of patients (non-critical) that had the longest waiting times and highest levels of dissatisfaction and complaints (Maitra and Chikhani, 1991; Fernandes *et al.*, 1996).

To systematically address the problem and establish effective interventions to reduce the profoundly complex problem of ED overcrowding, it is imperative to accurately assess the flow of patient through the ED and to understand the many processes taking place in the ED (Fernandes and Christenson, 1995; Miro *et al.*, 2003).

<u>Input</u>	<u>Throughput</u>	<u>Output</u>
Referrals	Triage	Admission
Ambulance	Immediate treatment	Referrals
Walk- in	Assessment	Transfer
	Diagnostic investigations	Discharge/ death
	Stabilisation & management plan	

From the above overview, there are multidimensional nature of problems and the various operational processes in the ED that may be optimized to help in reducing overcrowding in ED. As we know, apart from the substantial increase of ED visits there also lots of contributing factors to the ED overcrowding such as nursing shortage, lack of inpatient beds and delay in laboratory result (Fernandes and Christenson, 1995).

Based on Subash and colleagues in 2004, they did combined doctor and nurse for triage for three hours study in 8 selected days. They found that, the combination of doctor and nurse triage significantly reduced the time to medical assessment, radiology, and to discharge during the intervention period.

Whereas, Choi *et al*, in his study on 2006 carried out by putting a senior emergency doctor in triage to screen patient and to initiate prompt investigation and treatment. They concluded that, a doctor at triage could improve the waiting time and processing time of category 4 and 5 patients in busy ED.

From the study of Holroyd *et al* in 2007, Triage Liaison Physician improved important outcomes in an overcrowded Emergency Department (ED) and could improve delivery of emergency medical care in similar tertiary care EDs by reducing length of ED stay (Holroyd *et al.*, 2007).

Terries *et al* 2004, did a study by placing a senior clinical team consist of Emergency Medicine Consultant and senior ED nurse, known as IMPACT team staffed a triage area. By using an IMPACT team, the numbers of patients waiting fell dramatically throughout the ED.

The study that carried out by Azzopardi *et al*, 2011, stated that 76.8% of patient from non urgent group waited for more than 1 hour for their first assessment and patient who requiring laboratory and imaging investigations had prolonged length of stay.

With the various options we had, we admitted that triage was a breakthrough point for improving the emergency services. Therefore, based on Hongkong study by Choi *et al.* 2006, and a study from UK by Subash *et al.* 2004, we interested to modify their study since we don't have any similar local study as such.

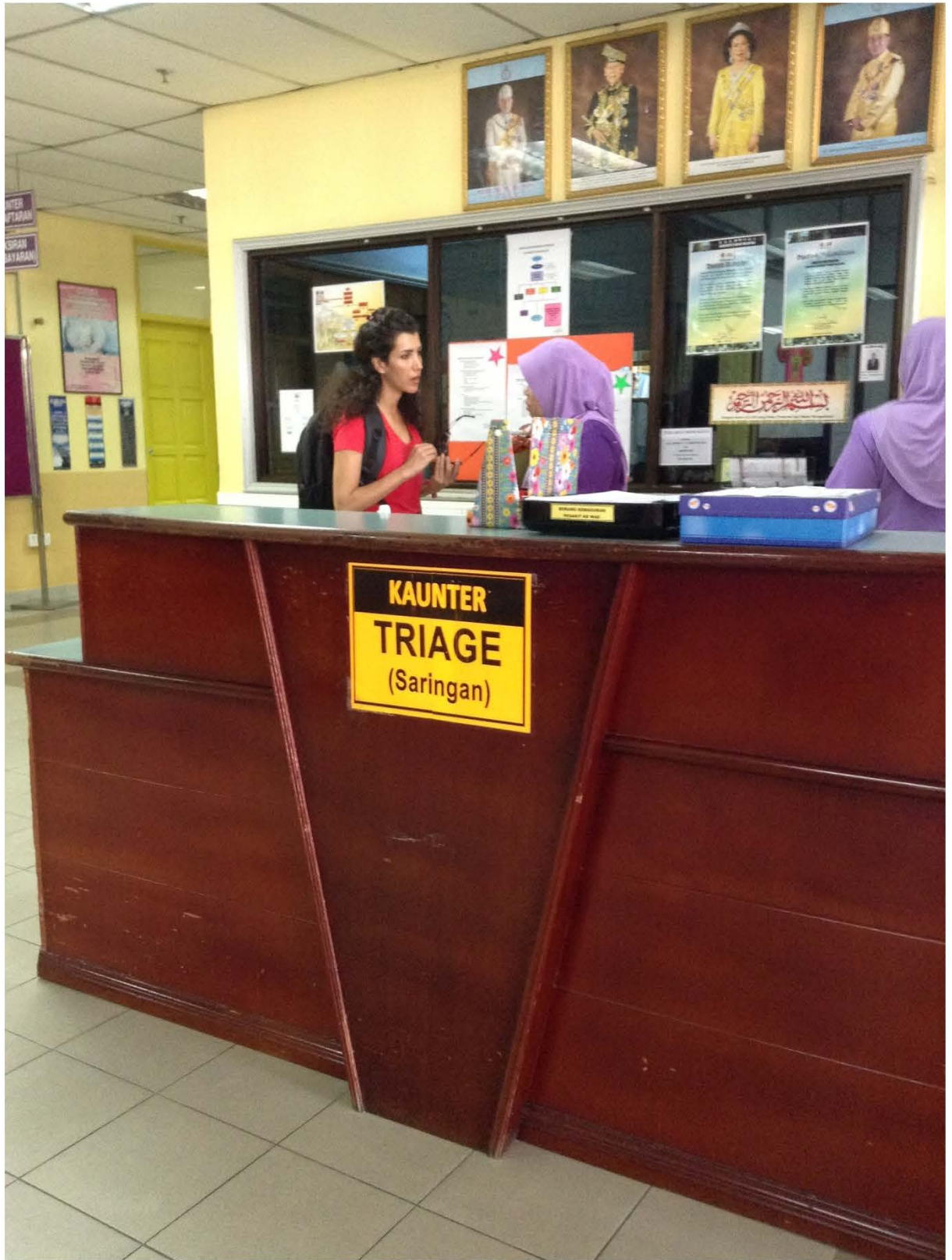
This study mainly conducted at ED HUSM and its aimed was to carry out a data on waiting time and processing time of patient at green zone from the time they registered to the time of seeing a doctor and time of discharged. To look any mean difference in waiting time and processing time with and without doctor at secondary triage. Besides, the factors contributing for long processing time in ED HUSM identified and the outcome to the patient who involved in this study also identified. Hopefully this interventional study could bring benefit to the patient and hence reduced the ED overcrowding by reduced the waiting time and improved overall ED efficiency.

1.2 Rational/ Justification of The Study

- 1.2.1 Significantly increases in the number of Emergency Department visits in government hospitals.
- 1.2.2 To overcome the dissatisfaction and complaints, because the longer people wait, the more people get anger and unsatisfied.
- 1.2.3 Lack of data regarding causes of long processing time and its outcome to patient at ED HUSM.
- 1.2.4 To improve the ED system and care.

1.3 Research Question

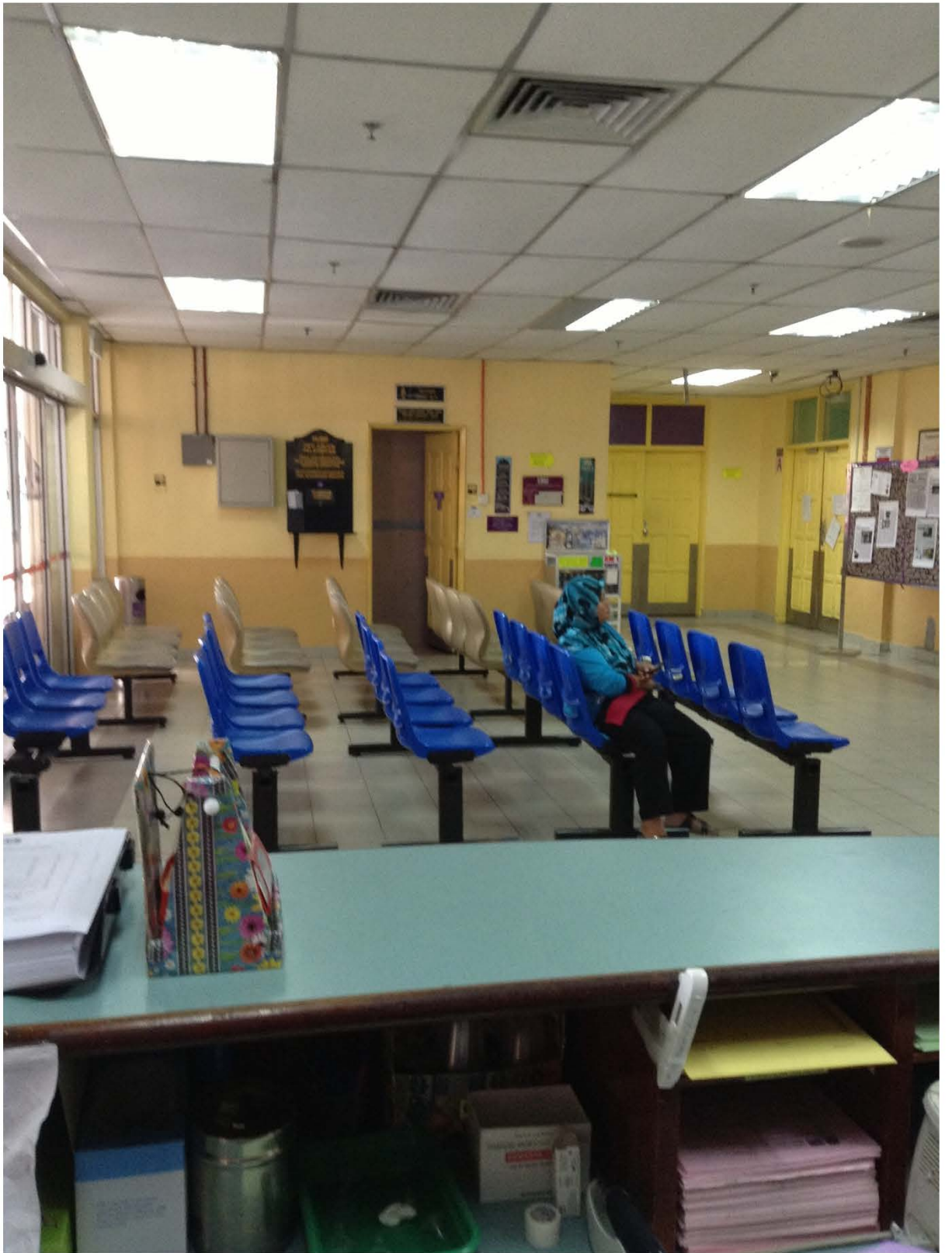
- 1.3.1 What is the mean waiting time from registration time to the time of seeing a doctor with triage without doctor and triage by a doctor.
- 1.3.2 What is the mean processing time from time patient registered to the time of admit or discharged.
- 1.3.3 What are contributing factors to the delay in processing time.
- 1.3.4 Is there any relationship between long waiting time and processing time to the patient's outcome.



TRiage COUNTER



REGISTRATION COUNTER



WAITING AREA



GREEN ZONE

CHAPTER 2

LITERATURE REVIEW

2.1 HISTORY OF TRIAGE

The word triage originated from French word “trier” mean to sort out into 3 group. First described by Baron Dominique Jean Larrey, Surgeon in Chief to Napoleon’s Imperial Guard, who was developed the first field ambulance. It has been used previously in the other industries such as railway, mining and agricultural. Then it was adopted by Medical Fraternity in order to sort out patients or casualties and to prioritize depending on severity of the condition (Robertson-Steel, 2006).

The original concepts of triage were primarily focused on mass casualty situations for example in battlefield settings where many of injured soldiers that need to prioritize. So, the emergency department overwhelm the capabilities and resources, the health care officers must decide which patients requiring immediate treatment and which patient were stable to wait (Mitchell, 2008).

The official history of the United States Army in First World War conflict used the word triage when describing the physical area where sorting was done, rather than a description of the sorting itself. Triage has continued since then to be the cornerstone of military medicine and in fairly recent times been formerly adopted in the management of most civilian emergency departments (Robertson-Steel, 2006).

Today, triage widely use in medical, both in pre-hospital and in-hospital care. With the development of organised medical systems, especially in the early 1900s, triage emerging in the emergency department (Mitchell, 2008). It consisted of a brief clinical assessment that determined the time and sequence in which the patient should then be seen by the limited resources or if applied in the field, the speed of transport and choice of hospital destination for initial treatment (Prince, 2013).

Three phases of triage have been determined. First phase, prehospital triage where in order to dispatch ambulance and prehospital care resources. Second, triage at scene by the first health care responder who attending the patient. Lastly, triage on arrival to emergency department hospital or receiving hospital.

2.2 PREHOSPITAL TRIAGE AND CARE RESOURCE

Pre-hospital triage is the capability to appropriately dispatch emergency medical services (EMS) resources, to provide feasible, suitable and medically acceptable pre-hospital triage and treatment of patients. Also known to provide transport as well as medical care en-route to an appropriate receiving facility and to track patient to a treatment facility (Boyd and Cowley, 1983).

The scope of pre- hospital service in Emergency and Trauma Department include primary responder services, ambulance response services, inter-facility transfer, emergency call management system, major medical incident and disaster management, and mass gathering and major event medical coverage (Physicians, 1987).

The successful component of this service determined by several factors including location of the hospital, geographically and access of network, and availability of resource and expertise (Physicians, 1987).

The team members involve trained personnel who able to perform and provide medical care coherent with clinical needs of the patient, well equipped ambulance with standard medical equipment and devices (Medical development Division, 2012).

Once trained personnel arrived, the injured person was assessed and treated at the scene and may receive one or more interventions associated with advanced prehospital trauma care such as adequate immobilization of fracture, intravenous fluid

and support of oxygen and if possible to do endotracheal intubation (Boyd and Cowley, 1983; Sasser *et al.*, 2009).

Goals of prehospital triage and care are to make sure the victims receive fast and rapid assessment, stabilize and able to transport to facilities that can provide definitive care (Blackwell and Kaufman, 2002). Besides, it will increase the likelihood that severely injured patients survive and reach the nearest hospital or other formal health care setting (Ornato *et al.*, 1985). Hence, reduce the incidence of long term disability and generate the basic surveillance and quality improvement (Blackwell and Kaufman, 2002; Organization, 2005).

2.3 FIELD TRIAGE

Field triage is a triage that performed outside the hospital usually at the scenes. It is the process by which emergency medical services (EMS) providers decide on the destination for the injured person according to the severity of patients' injuries (Sasser *et al.*, 2009).

Careful triage is needed to ensure that resources available in a community are properly matched to each victim's need. If too many patients regularly bypass the local clinic in favour of the regional hospital, the latter facility will be overwhelmed. If however, severely ill or injured patients are seen at a local clinic rather than being stabilized and promptly transferred to a high facilities hospital, needless death will result (Organization, 2005).

Two factors play an important role are the number of patients and the severity of injuries to the patients. If both of these do not exceed the capability of the staff and resources therefore patient with life threatening problems are treated first. However in vice versa situation, when staff and resources overwhelm, patient with greater chance of

survivor are managed first. It employs techniques of identifying and prioritizing patients according to their clinical urgency in order to appropriate timely and effective emergency care (Mackersie, 2006).

In mass casualty incidents, in which EMS personnel and resources are overwhelmed by the number and severity of victims, triage is a crucial process in determining casualties who require immediate treatment and transportation (Blackwell and Kaufman, 2002). Besides, a patient's condition may improve or deteriorate en route to ED. Hence, the patient's urgency on arrival may change and therefore will need reassessment at each point of contact and transfer of care. While accepting that re-triage is necessary (Committee, June 2011).

Usually the first arriving crew, ideally the most experience personnel; emergency physician, paramedics or EMS personnel will conduct triage (Blackwell and Kaufman, 2002). Pre-hospital emergency triage, generally consist of a check for immediate life-threatening concerns, usually lasting no more than one minute per patient. The START system (Simple Triage and Rapid Treatment) is the most common and considered the easiest to use. This system checks three things: breathing, circulation and consciousness and based upon medical responder's findings, assign each casualty to one of four colour-coded triage levels (Cone and MacMillan, 2005).

Other than START system, several primary and secondary triage tools have been developed including JumpSTART, Care Flight Triage, Triage Sieve, Sacco Triage Method, SAVE (Secondary Assessment of Victim Endpoint), Triage Sort and Paediatric triage Tape (Jenkins *et al.*, 2008)

There are also various trauma scoring, such as the Trauma Score (TS), the Revised Trauma Score (RTS), the Circulation, Respiration, Abdomen, Motor and

Speech Score (CRAMS), the Pre-Hospital Index (PHI), and the Injury Severity Score (ISS) (Greaves *et al.*, 2008).

2.4 TRIAGE IN EMERGENCY DEPARTMENT

2.4.1 Overview

The unpredictable nature of emergency medicine often results in the presentation of more patients than expected. Usually total numbers of patient often exceeded than the staff numbers resulting in a long waiting time (Fernandes *et al.*, 1996; FitzGerald *et al.*, 2010). In this situation where the triage comes in and it found very helpful to sort patient, to ensure that those most in need of immediate care receive treatment and care immediately (Eitel *et al.*, 2003).

Triage is the process of sorting patients into categories based on the clinical severity of their illnesses which subjected them to be served immediately in term of treatment and care. Every new patient arrived in emergency department need to be triage as it is a routine daily operation in every emergency department in the country (Eitel *et al.*, 2003). In large urban hospitals, two to three triage personnel assign at the counter, who may work simultaneously and continually to assess long lines of waiting patients.

Triage itself is a risk procedure especially in the urban and tertiary hospitals, the pressure from long patients may cause triage personnel to perform triage too quickly to perceive subtle signs of high risk disease (Forero *et al.*, 2010). There is great concern that many emergency departments will no longer be able to provide timely quality care without increasing numbers of adverse outcome.

Overcrowding in emergency department has many negative effects on quality of care, patient satisfaction, and staff-related outcomes, including decrease productivity, poor morale, and staff dissatisfaction (Wiler *et al.*, 2010).

2.4.2 Triage System

There are vast variations in existing triage categories and systems within and between different countries. Triage may be divided into categories according to severity. The number of severity categories can vary and the typical emergency department triage system divides patient into three to five point triage scale.

The use of 5-point triage scale appears to be the most valid method. Studies have reported a greater reliability with 4 to 5-level triage scales than with 3-level scales (Travers *et al.*, 2002; Eitel *et al.*, 2003; Fernandes *et al.*, 2005). It has also been noted that a 5-point scale is more accurate and has less under- or over-triaging when compared to other scales (Travers *et al.*, 2002).

The Australasian Triage Scale (ATS) is based on a revised version of the national triage scale (NTS) developed in the early 1990s. The revised triage scale was implemented in Australian and New Zealand in 2000 (Considine *et al.*, 2004; Pardey, 2006). It is a five-point scale that is used by hospital based emergency services throughout Australian and New Zealand to help sort patient by clinical urgency (Pardey, 2006).

The ATS standardised approach to triage has been shown to facilitate equitable access to emergency care services based on urgency and regardless of patient demographics (Gerdtz *et al.*, 2009). The 5-point scale consists of 5 categories, each of which correlates to an ideal maximum waiting time for a patient to be treated by a

doctor. Patients are allocated a category based on their clinical urgency, and access to emergency treatment is prioritised accordingly (Pardey, 2006).

Outsides Australia, the three most commonly described triage scales are the Manchester Triage Scale (MTS), Canadian Triage Acuity Scale (CTAS) and the Emergency Severity Index from the USA. These scales are similar in that they are all 5-point scales based on urgency, although the timeframes vary.

The Manchester triage scale was developed in 1994 by a group of emergency nurses and doctors in the city of Manchester in UK. It has subsequently been published and has gained widespread acceptance throughout the UK. It makes use of 52 flow charts that algorithmically lead the triage nurse to a logical triage choice for almost any presenting complaint (Storm-Versloot *et al.*, 2009). It uses five-point scale similar to that described in the ATS. It was adopted by the Nepean Hospital emergency department as the standard triage tool in 2000 (Grouse *et al.*, 2009).

In Canada, a 5-level triage system has been widely discussed and published. Many Canadian Emergency Departments have adopted this system, which allow for comparison of patients among emergency department because of consistency in triage. This occurs by using standardized guidelines. Some United States emergency department, primarily at teaching hospitals, have tried the five-level Canadian system (J Murray, 2003).

The Emergency Severity Index (ESI) is a five-level triage system that was developed to improve reliability and validity of triage decision making (Tanabe *et al.*, 2004). In addition to fulfilling the traditional purposes of triage, the ESI triage system has shown the ability to predict hospitalization, resource utilization and ED length of stay (Wuerz, 2001; Tanabe *et al.*, 2004).

2.4.3 Triage Protocol

Written protocols should be a part of any triage system. They can be as simple as general statements on triage or as elaborate as having a specific algorithm for each presenting complaint. An algorithm is a question that branches into either another question or final statement, depending on a yes or no answer. The degree of independent medical decision-making is a function of the expertise of the person utilizing the algorithm. If someone without medical knowledge is trained as triage person, it may have all decisions derived from strictly followed algorithm.

For example, the Manchester Triage Scale comprises of 52 flowcharts based on patient complaints. The presenting complaint is indicative of the severity and defines which flowchart is to be followed (Storm-Versloot *et al.*, 2009).

2.4.4 Triage Personnel

All patients presenting to the emergency department shall be triaged on arrival by a trained and experienced triage person. They could be a trained paramedic or a trained registered nurse. The triage is an ongoing learning process which would not be acquired by attendance at a triage course alone. However, it is recognised that supporting and providing triage training will give some added values. There was a study conducted by Health Policy Priorities Principal Committee (HPPPC) on Australian Triage Process Review (ATPR) stated that nurses with 5-10 years experience were most consistent in completing triage within the recommended time i.e 3-5minutes. The staff shall have access to appropriate educational programmed to maintain and augment their professional competency. Equitable and nurturing system for recruitment, credentialing, performance management and staff retention are required in all emergency departments. The role of triage personnel are maintain privacy and confidentiality, visualize all

incoming patients even while interviewing others, maintain good communication between triage and treatment area, maintain an excellent communication with waiting area and use all the resources to maintain high standard of care.

2.4.5 Triage Counter

The triaging services counter is the first point of contact for all patients accessing the Emergency Department care. The triage area occupies the frontage area of the Emergency Department, immediately can be visible and accessible to all categories of patients and modes of arrival. It covers the ambulance or vehicle drop zone, walking entrance and main patient waiting area of the department and form a strategic gateway or corridor to the major patient clinical care zones namely red zone (critical), yellow zone (semi- critical) and green zone (non-critical).

2.4.6 Primary Triage and Secondary Triage

The primary triage included the process of acquiring the main presenting complaint and rapid identification of patients with evidence or potential life threatening injuries or illnesses. Patient who exhibit the life threatening condition should be accorded a triage category of higher acuity immediately. While, other patient are subjected to a secondary triage process which includes objective vital signs, point of care testing and brief clinical assessment. There are also initiation of management including pain management, wound dressing and immobilization.

2.4.7 Triage System In Malaysia

Many triage systems are in use in Malaysia but most of the emergency departments in Malaysia practice a three-level triage system. The triage system in the Emergency Department HUSM used a three-level categorical scale based on Malaysia triage scale. One study carried out at Emergency Department Hospital Kuala Lumpur on 2003, was observed the higher rate of paramedic-medical officer inter-observer agreement with this triage system (Razak, 2003).

Table 2.1: Triage system in Malaysia

Color code and category	Sub category	Usual presentation
RED-CRITICAL		Cardiac arrest Stridor / respiratory arrest/ RR >30 or < 10 Severe respiratory distress/ agonal or gasping type respiration SPO2 <90% Unresponsive trauma patient Severe bradycardia (HR<60) or tachycardia (HR>150) with sign of hypo-perfusion Trauma patient who requires immediate fluid resuscitation Chest pain (angina type) ,pale, diaphoretic Anaphylactic reaction Baby that is flaccid (unresponsive) Unresponsive with history of poisoning Hypoglycaemia with a change in mental status Exsanguinations haemorrhage Severe crush injuries to limbs Extensive burn (>than 25% BSA) or involve facial region Near-drowning Firearms wounds to head, neck, trunk or abdomen Elevated BP systolic>220mmHg or diastolic >120mmHg with systemic symptoms or neurological deficit Elevated blood sugar with neurological or systemic impairment

(Medical development Division, 2012)

Color code and category	Sub category	Usual presentation
YELLOW Semi-critical High risk	High risk situation Or Confused / lethargy/ disorientated Or Severe pain/ distress Or Unable to walk but airway is secure, haemodynamically stable and on trolleys	Altered conscious level but not comatose Head injured GCS >13, GCS full but pupils unequal Fracture of long bones of lower limbs/pelvis Active chest pain, suspicious for coronary syndrome but does not require an immediate life-saving intervention, stable Chest pain visceral and not associated with other symptoms Immunocompromised (on chemo) with fever A suicidal or homicidal patient Open fracture of upper limbs Spine injuries Eye injuries with loss or impaired vision Dislocation of major joints Limb amputation Burn 15-25% of BSA regardless of depth and /or 10-20% 3 rd degree burns with no compromise to airway and circulation. Vascular injuries Uncontrollable major bleeding Patient with acute abdomen Chemical exposure involving eyes Poisoning with drug overdose with impairment of conscious level Severe pain ; pain score > 7/10 Post ictal state with neurological deficit Mild to moderate dyspnea Hyperventilation and unable to maintain posture Arrhythmias HR >60 bpm <150 bpm Others :- Dehydration Diarrhea with vomiting Adult pyrexia >40 degree Child age 1-3months temp > 38 degree Sign of infection Dialysis problems Chemotherapy or immunocompromise

(Medical development Division, 2012)

CHAPTER 3

OBJECTIVE

The objectives of this study are as follows

3.1 GENERAL OBJECTIVE

To determine the waiting times and processing times of green zone cases when triage by a doctor applied to ED HUSM and to determine factors influencing outcomes.

3.2 SPECIFIC OBJECTIVES

1. To compare waiting times among patients who have been triaged by doctor and without doctor.
2. To determine the processing times who been have triaged by doctor and without doctor.
3. To study waiting times between trauma and non-trauma patients when triaged by a doctor
4. To study factors that influence the processing times in both groups
5. To study patient's satisfaction when triage by a doctor applied to EDHUSM.

3.3 HYPOTHESIS

1. The mean waiting times in the emergency department for green cases are 60 to 90 minutes and triaging by a doctor shorten the waiting times and processing times.
2. There is no mean difference in waiting time between trauma and non-trauma patient.
3. Several factors could contribute to the long processing time in emergency department.
4. Patient's satisfaction are improve when the waiting time are shorten.