ABSTRACT

Disposition time of major trauma patient at Emergency Department HUSM Kelantan.

Introduction

This is a cross-sectional observational study over a period of 7 months from December 2009 to June 2010 looking at the mean disposition time of major trauma patient in Emergency Department (ED) HUSM Kelantan.

Objectives

The objectives of this study were to determine the mean disposition time of major trauma patient and to determine the factors affecting disposition time of major trauma patient in Emergency Department HUSM

Methodology

The study was conducted at Red Zone Emergency Department HUSM. Inclusion criteria was patient with Injury Severity Score >15. This study was approved by the Ethical Committee on 3rd June 2009. Patients' clinical parameters, injury characteristics, ED interventions and radiological investigations were documented in data entry form.The time interface for every patient from the time of arrival to the disposition time.

Results

Seventy patients were recruited in this study. Mean ED resident response time was 2.7 minutes (sd= 2.2). While mean specialty unit response time is 45.7 minutes (sd= 35.7). Mean disposition time of major trauma patient is 272.7 minutes (sd= 200.1)

Multiple comparisons of disposition unit using one-way ANOVA showed a statistical difference between the groups. ICU disposition time (mean 369.18 minutes, sd=287.58) was significantly different from the OT disposition time (mean 209.25 minutes, sd=86.89) and the mortuary disposition time (mean 154.6 minutes, sd=94.21). Patient's systolic blood pressure (SBP) and oxymetry were noted to correlate with the disposition time with $r=0.237$ and $r=0.244$ respectively, $p<0.05$.

Conclusion

This study showed that major trauma patient were managed for 209 minutes in ED prior to operative care and 369 minutes before sending to ICU.

ABSTRAK

Suatu kajian pemerhatian keatas masa disposisi pesakit trauma major di Jabatan Kecemasan Hospital Universiti Sains Malaysia.

Pengenalan

Ini adalah suatu kajian pemerhatian silang dijalankan selama 7 bulan bermula daripada Disember 2009 hingga Jun 2010 untuk melihat masa disposisi pesakit trauma major di Jabatan Kecemasan (ED) Hospital Sains Malaysia

Objektif

Objektif kajian ini adalah menentukan purata masa disposisi pesakit trauma major dan menentukan faktor-faktor yang mempengaruhi masa disposisi pesakit trauma major.

Tatacara kajian

Kajian ini dijalankan di Zon Merah Jabatan Kecemasan HUSM. Kami mengambil pesakit berdasarkan Skor Keterukan Kecederaan (ISS) >15. Kajian ini telah mendapat perakuan daripada Majlis Etika pada 3 Jun 2009. Data-data mengenai bacaan klinikal pesakit, perwatakan kecederaan, intervensi dan penyiasatan radiologi dicatatkan di dalam borang data pesakit. Jarak masa dari waktu pesakit tiba di Jabatan Kecemasan sehinggalah waktu pesakit keluar dari jabatan juga direkodkan.

Keputusan

Seramai 70 orang pesakit berjaya dikumpulkan di dalam kajian ini. Purata masa tindakan doktor di Jabatan Kecemasan adalah 2.7 minit (sd=2.2) manakala purata

masa tindakan doktor dari unit kepakaran yang berkaitan adalah 45.7 minit (sd=35.7). Purata masa disposisi pesakit trauma major adalah 272.7 minit (sd=200.1). Perbandingan berganda ke atas unit disposisi pesakit secara ANOVA searah menunjukkan perbezaan statistik diantara unit-unit tersebut. Masa disposisi ke Unit Rawatan Rapi (purata 369.18, sd=287.58) adalah sangat ketara berbanding masa disposisi ke Dewan Bedah (purata 209.25, sd=86.89) dan masa disposisi ke rumah mayat (purata 154.6, sd=94.21). Tekanan darah sistolik dan bacaan oximeter juga menunjukkan korelasi tehadap masa disposisi dengan r=0.237 dan r=0.244.

Kesimpulan

Kajian ini menunjukkan pesakit trauma major berada di Jabatan Kecemasan selama 209 minit sementara menuggu rawatan pembedahan dan 369 minit untuk mendapatkan tempat rawatan di Unit Rawatan Rapi.

1

INTRODUCTION

1. INTRODUCTION

In 1998, World Health Organisation (WHO) estimated about 5.8 million people worldwide died because of trauma, which correspond to a rate of 97.9 in 100 000 population (Krug *et al.*, 2000). Road traffic and self-inflicted injuries are the leading causes of trauma-related deaths worldwide and considered as one of the main cause of hospital admission nationwide and worldwide. In 2006, accidents remained the top three principal causes of hospitalisation and contributed 5.59% of total in-hospital death in Ministry of Health (MOH) hospitals in Malaysia. For every death it is suggested that 30 patients require hospitalisation and 300 require out-patient management for their injuries (Holder *et al.*, 2001) Clearly this is a major strain on healthcare cost. Additionally, as this is a disease that disproportionately affects young people and has an uneven sex distribution, there is a further cost in terms of disability. The magnitude of this proportion can be explained by the fact that injuries affect many young people, resulting in a large number of years lost because of premature death or a large number of years lived with disability (Krug *et al.*, 2000). In 2004 European countries spent 80 to 290 billion Euros in treating non fatal trauma (Racioppi *et al.*, 2004) and clearly this put a major strain on the gross domestic product of Europe.

The principle of trauma management started in the pre-hospital care and subsequently managed in the definitive care unit. During pre-hospital care, patient is usually transported to the nearest hospital but it is advocated that patient is transported to the trauma center that is appropriate to the injury that the patient sustained. This is to ensure that the correct patient is managed at the right trauma care. The regionalisation of trauma care has lowered the preventable death rate and morbidity due to major injury

(Shackford *et al.*, 1989) .The improvement has been attributed to multiple factors, including effective pre-hospital advanced life support systems, rapid transport to a trauma centre and better management of life- and limb-threatening injuries. Donald Trunkey had brought the concept of trimodal death pattern which reflect so much to the concept of "golden hour" where during the first hour of injury, if the appropriate patient is sent to the appropriate center of care, may reduce the mortality and morbidity (Baker *et al.*, 1980).

In March 2010 United Nation General Assembly had requested World Health Organisation (WHO) to proclaim 2011-2020 as a Decade of Action for road safey. Therefore, WHO in cooperation with United Nations Road Safety Collaboration with other stakeholders had prepared Plan of Action for the Decade which delineate 5 pillars in trauma care concentrating in prevention of road traffic injury. The plan was to encourage countries at national level to implement the following five pillars, based on the recommendations of the World Report on Road Traffic Injury Prevention as proposed by the Global Road Safety Commission.

Pillar 1 Road Safety Management	Pillar 2 Safer Roads and Mobility	Pillar 3 Safer Vehicle Design	Pillar 4 Safer Road User	Pillar 5 Post Crash Care

The objective to be achieved in pillar 5 is to increase responsiveness to post crash emergencies and improve the ability of health systems to provide appropriate and adequate emergency treatment and longer term rehabilitation for crash victims. Among the recommended national activities are 1) To develop prehospital care systems, including the extraction of a victim from a crash and implementation of a single

nationwide telephone number for emergencies 2) To develop hospital trauma care systems and evaluate the quality of care through the implementation of good practice guidelines on trauma care systems and quality assurance and 3) To provide early rehabilitation to injured patients to minimize both physical and psychological trauma.

Trauma cases are routinely encountered in Emergency Department and substantial proportion of these cases are major trauma cases which require immediate medical attention in order to reduce the mortality and morbidity. Trauma has a great impact to the healthcare burden (Finkelstein *et al.*, 2004). Majority of them received medical attention as early as on-scene medical care also known as pre-hospital care. Injury Severity Score (ISS), which is the most widely used measure of injury severity in patients with trauma is adapted from Abreviated Injury Scale (AIS). In Emergency Department (ED) HUSM, major trauma patient received are either referred from other hospital or health clinic or new cases attending the department by various means. The in-hospital care starts once these patients were traiged to resuscitation zone. Upon triaged, these patients are immediately seen and managed by the ED resident. Almost always, these patients were subjected to various life saving interventions such as intubation, chest tube drainage etc depending on the presentation injuries. They are also needed to undergo certain radiological investigation to aid in definitive management of the patient. Subsequently, patients were referred to the respective unit and eventually the final disposition unit is made by the respective specialty units.

Disposition time of major trauma patient remains a dilemma in most ED in Malaysia especially in teaching hospital namely Hospital Universiti Sains Malaysia, Pusat Perubatan Universiti Kebangsaan Malaysia and Pusat Perubatan Universiti

Malaya. The disposition time of these patient will be affected by the severity of injuries sustained thus usually requiring multidisciplinary approach management. The extend of severity of the injuries made them amenable to resuscitation and stabilization in ED.

Delay in delivering patients to their final disposition unit not only affect the overall morbidity and mortality, it will also affect the patients' and the patient's relatives satisfaction of trauma care provided at the very initial site of in-hospital care which is the Emergency Department. There are some factors contributing to the delay of disposition time such as unavailability of in-house beds in the general wards, intensive care units (ICU) or operation theater (OT), delayed review by the ED residents or the respective units doctors and delayed in getting the radiological investigations or on-going life-saving procedure in the ED itself.

Another important issue which resulted from the delay in disposition of major trauma patients is ED overcrowding which conseqently will affect the workflow of ED staff and cause 'paralysis' of the department or better known as access block (Twanmoh and Cunningham, 2006), thus cause more aggression either by the staffs or the patients' companion.

2

LITERATURE REVIEW

2. LITERATURE REVIEW

2.1 Trauma as a disease

Trauma is a disease with a high risk of recurrence. This is highly related to chronic high-risk behaviors such as alcohol or drug abuse, preexisting psychopathology and cultural acceptance of violent resolution of personal conflicts, all of which adversely affect patients' lives (Poole *et al.*, 1993) Injuries have been shown to account for a significant health burden on all populations, regardless of age, sex, income, or geographical region. Decreasing the burden of injury is one of the main challenges for public health is to in the next century. Important lessons learned during the past decades is certainly that injuries are preventable (Krug *et al.*, 2000).

As trauma or injury is often predictable, therefore it is preventable. Trauma prevention are possible through various public health programs led by governmental and non-governmental agencies. The 4-Es of effective strategies of trauma prevention are “Engineering”, “Enforcement”, “Education” and “Economics” (Garrison *et al.*, 1997) which is well understood as the table below;

Table 2.1 The 4-Es of injury prevention

Engineering	Installation of product or environmental design to provide protection such as airbags in automobiles and sprinkler systems in buildings.
Enforcement	Enforcing laws and administrative rules in order to change behavior such as use of seatbelts or helmets.
Education	Persuade persons at risk to change their behavior towards increased self-protection such as wearing seatbelt campaign.
Economics	Provide monetary incentives for those who adhere to trauma prevention program such as discount coupons on purchase of child safety seats.

There are many models to use in approach to trauma prevention (Ivers *et al.*, 2008) but the effective model is the Haddon matrix. Applying principles of epidemiology, Dr Wiliam Haddon Jr explained that trauma prevention involved the interaction of three factors; the host (human factors), environment (physical and socio-cultural environment) and agent (vehicle or energy). Haddon matrix is a two-dimentional framework, incorporating these factors according to three event phases; pre-event, event and post event (Ivers *et al.*, 2008, Runyan and Yonas, 2008).

Trauma accounts for 10% of measurable healthcare expenditures, but probably has a significantly greater impact if other measures such as value of life lost to premature mortality, loss of patient and caregiver time, nonmedical expenditures (e.g., wheelchair ramps), insurance costs, property damage, litigation, decreased quality of life, and diminished functional capacity are factored into the calculation (Finkelstein *et al.*, 2004).

2.2 Acceptance of trauma as part of World Health Organization (WHO) Action Plan

As today's healthcare perspective had changed from managing illness to promoting wellness. Trauma prevention had moved beyond promoting good health to added dimension of reducing healthcare costs.

In 2009, The Commission for Global Road Safety issued a call for a Decade of Action Plan for Road Safety. The proposal came from a wide range of public figures as well as the UN Road Safety Collaboration. The UN Secretary- General, in his 2009 report to the General Assembly encouraged Member States to support efforts to establish a decade of action. A decade of plan would provide an opportunity for long-term and coordinated activities in support of regional, national and local road safety. The action plan consists of 5 pillars which include 1. Road safety management, 2. Safer roads and mobility, 3. Safer vehicle design, 4. Safer road user and 5. Post crash care. Countries are encouraged to implement activities according to the 5 pillars based on the recommendations of the Global Road Safety Commission (WHO, 2010).

Pillar 1: Road safety Management

The goal is to create a multi-sectorial partnership to develop road safety strategies and targets. The partnership which is led by certain agencies will then be able to establish a data collection system for on-going monitoring and evaluation of road traffic deaths, injuries and crashes.

Pillar 2: Safer Road and Mobility

To achieve safer road design in pillar 2, the activity plan is directed towards improving road design adhering to the safety and protective quality of road networks for the benefit of all road users especially the cyclist, motorcyclist and pedestrians.

Pillar 3: Safer Vehicle Design

Action plan in Pillar 3 encourages universal deployment of improved vehicle safety technologies through a combination of relevant global standards, consumer information schemes and incentives to accelerate uptake of new safety technologies.

Pillar 4: Safer Road User

The action plan is to develop comprehensive traffic safety programs to improve road user behavior. With increased enforcement of road traffic law standards and rules combined with public awareness/education activities will improve compliance to key road safety rules to reduce the impact of risk factors such as speeding, drink-driving and non-use of seat belts, helmets and child restraints.

Pillar 5: Post Crash Care

In pillar 5 which is post crash care, the aim of the activities is to increase responsiveness to post crash emergencies and improve the ability of the health system to provide appropriate emergency care and longer term rehabilitation for crash victims.

2.3 Accepting trauma care as the 5th pillar in trauma prevention

Among the suggested activities in the Plan of Action of the 5th pillar are:

1. To develop a good prehospital care system which include extrication of crash victim and implementation of a single nationwide telephone number for emergencies. Malaysia has advocated the use of a single number for all kinds of emergencies. In 2009, the establishment of 999 as a single emergency number would ease the activation of any emergency services.
2. To develop hospital trauma care system and implement good practice guidelines on trauma care systems and quality assurance.
3. To provide early rehabilitation to injured patients to minimize physical and psychological trauma
4. To encourage the establishment of appropriate road user insurance scheme to finance the rehabilitation services for crash victims.
5. Encourage a thorough investigation into the crash so that a fair and timely settlements are provided the injured and/or to their families.

Trimodal distribution of deaths and the golden hour concepts are in part responsible for the development of all modern trauma systems but these concepts have been challenged. Several authors have discussed the trimodal concept. Demetriades et al. challenged the trimodal concept for trauma mortality based on the fact that fewer patients are dying after 1 week. They hypothesize that the improvement in clinical care and the development of trauma systems reduces late deaths to the minimum (Demetriades *et al.*, 2005) and concludes that the classical trimodal distribution of deaths does not apply to their trauma system. Demetriades *et al* presented an analysis of

4,151 deaths over a 3-year period in a trauma system in the USA which shows that the first peak has not changed, the third peak disappeared, so the second peak became larger (Demetriades *et al.*, 2005, Murray *et al.*, 2004)

2.4 Understanding pathophysiological reponse to trauma

Early after major trauma, hemorrhage and resucitation, patients develop a state of systemic hyperinflammation that is collectively defined as systemic inflammatory response syndrome (SIRS)(Demling *et al.*, 1993) While severe insult and severe SIRS can lead to early multiple organ failure (MOF) , a less severe insult may "prime" the patients such that after an early second inflammatory insult SIRS is amplified, resulting in early MOF (Friese *et al.*, 1994, Anderson and Harken, 1990) . In spite dearly management and control of the acute phase with advanced the intensive care technology, MOF is a leading cause of late posttraumatic mortality in ICU patients. At a later stage, when SIRS is down-regulated to limit an autogenous injury, delayed immunosuppression may develop, which is often associated with infection and late MOF (Alexander *et al.*, 1979). In general, the body's response to trauma or stress is mediated by mediators derived by activation of humoral cascades, such as complement and coagulation systems and/or by a variety of cells, such as the monocytes/macrophages. Such a response, manifested as inflammation, should be beneficial to the host. From a certain threshold level of activation/inactivation, however, there might be an imbalance of the mediator system that could harm the host by leading to the development of MOF.

Although the pathogenesis of MOF is most likely multifaceted, the cell's oxygen status, adherence of neutrophils to the endothelium with subsequent transmigration, gut barrier failure leading to the translocation of bacteria/endotoxin, and an initially hyperinflammatory state followed by delayed immunosupression that predispose to infection have been considered as key events in this scenario.

2.5 Stages in Trauma Resuscitation

The resuscitation can be broken down into a series of stages (Uzieblo *et al.*, 2004)

Stage 1:Damage Control

Stage 1 refers to the initial management in the emergency room, the initial diagnostic studies, and initial surgical intervention. The critical concept associated with this stage is control of hemorrhage, either definitively by splenectomy or temporarily by abdominal packing and temporary abdominal closure for a complex hepatic, duodenal, or pancreatic injury. The main focus should be applied on stopping the hemorrhage and controlling contamination of body cavities with enteric contents, pancreatic or bilious fluids, or urine. Definitive repairs should be delayed. This technique is used in patients with significant metabolic acidosis, hypothermia, or coagulopathy or in those in whom significant deterioration may ensue.

Stage II: Surgical ICU (SICU) Resuscitation

The SICU is the resuscitation area after the damage-control phase is complete. The main focus of SICU care is to complete the fluid resuscitation aiming to correct the metabolic acidosis, warm the patient, and correct any coagulopathy with blood products, when indicated. Further diagnostic studies may be performed during this phase to identify other injuries (Houshian *et al.*, 2002, Enderson *et al.*, 1990) but these should ideally be performed at the bedside until the patient is completely resuscitated. This phase may last from 24 to 72 h. If the patient fails to respond to the SICU resuscitation and exhibits continued signs of blood loss, hypothermia, or coagulopathy, there may be a continued source of surgical bleeding requiring early re-exploration.

Stage III: Completion Workup/Re-exploration

Once the patient's hypothermia, acidosis, coagulopathy, and hemodynamic status has improved, a complete radiographic work-up outside the SICU may be performed and the patient may be returned to the operating room for definitive repair of injuries.

2.6 Trauma Scoring System

Characterization of injury severity is crucial to the scientific study of trauma, yet the actual measurement of injury severity began only 50 years ago. In 1969, researchers developed the Abbreviated Injury Scale (AIS) to grade the severity of individual injuries. Since its introduction, by the Association for the Advancement of Automotive Medicine (AAAM) International Injury Scaling Committee (IISC), the parent organization of the AIS modified the AIS, most recently in 2005 (AIS-2005). The AIS is the basis for the Injury Severity Score (ISS), which is the most widely used measure of injury severity in patients with trauma. Attempting to summarize the severity of injury in a patient with multiple traumas with a single number is difficult at best; therefore, multiple alternative scoring systems have been proposed.

The AIS is a simple numerical method for grading and comparing injuries by severity. Although originally intended for use with vehicular injuries, its scope is increasingly expanded to include other injuries. The AIS is a consensus-derived, anatomically based system of grading injuries on an ordinal scale ranging from 1 (minor injury) to 6 (lethal injury). Scales for all anatomic regions and organs can be found at the American Association for the Surgery of Trauma Web site.

The AIS does not reflect the combined effects of multiple injuries; however, it forms the foundation for the ISS. Baker et al introduced the ISS in 1974 as a means of summarizing multiple injuries in a single patient (Baker *et al.*, 1974). The ISS is defined as the sum of squares of the highest AIS grade in the 3 most severely injured body regions. Six body regions are the thorax, abdomen and visceral pelvis, head and

neck, face, bony pelvis and extremities, and external structures. Only one injury per body region is allowed to be included in the calculation of ISS. The ISS ranges from 1-75, and an ISS of 75 is assigned to anyone with an AIS of 6. An example of an ISS calculation is shown in the table below

Table 2.6 ISS

Region	Injury	AIS	AIS^2
Head/Neck	Single cerebral contusion	3	9
Face	No injury	0	
Chest	Flail chest	4	16
Abdomen	1.Liver laceration 2.Completely shattered spleen	4 5	25
Extremity	Fractured femur	3	
External	No injury	0	
Injury Severity Score (ISS) = 50			

The ISS has several limitations. The most obvious limitation is its inability to account for multiple injuries to the same body region. Similarly, it limits the total number of contributing injuries to only 3. This seriously impairs the usefulness of the ISS in penetrating injuries, in which multiple injuries are common. The ISS weights injuries to each body region equally, ignoring the importance of head injuries in mortality from trauma. Furthermore, mortality is not strictly an increasing function of the ISS. The mortality rate for an ISS of 16, therefore, is higher than the mortality rate for an ISS of 17 because of the different combinations of AIS scores that comprise

each. Another idiosyncrasy of the ISS is that many ISS values cannot occur, while other ISS values can result from multiple different combinations of AIS scores. Obviously, this makes the ISS a heterogeneous score and reduces its predictive ability.

Osler et al reported a modified ISS (new ISS or NISS) based on the 3 most severe injuries regardless of body region (Osler *et al.*, 1997). This simple but significant modification of the ISS avoids many of its previously acknowledged limitations. By preserving the AIS as the framework for injury severity scoring, the NISS remains familiar and user-friendly. Preliminary studies suggest that the NISS is a more accurate predictor of trauma mortality than the ISS, particularly in penetrating trauma. Other researchers demonstrated that the NISS is superior to the ISS as a measure of tissue injury in predictive models of post-injury multiple organ failure. Osler et al recommend that the NISS replace the ISS as the standard anatomic measure of injury severity (Osler *et al.*, 1997).

2.7 The impact of length of stay in ED overcrowding

Emergency Department overcrowding or access block and delays in ED throughput have several important consequences, such as boarding of admitted patients in the ED, longer hospital stays, the inability of patients to gain access to appropriate hospital beds, lost opportunities to treat patients due to ambulance diversion, and "left without being seen" (LWBS) patients (Magid *et al.*, 2004, Fatovich *et al.*, 2005, Davis *et al.*, 1995, Liew and Kennedy, 2003) Current research suggests that factors external to the ED, such as hospital bed availability, laboratory turnaround, specialist consultation availability and elective surgery schedules may be more important in determining ED throughput than internal bottlenecks such as ED staff availability and bed shortages (Magid *et al.*, 2004, Fatovich *et al.*, 2005)

The 2001 position statement on ED Overcrowding by the Canadian Association of Emergency Physicians stated that hospital overcrowding was the primary cause of ED overcrowding (CAEP, 2001). That is, patients who should be admitted are held (boarded) in the ED because there are no hospital beds available, and this in turn uses ED resources and prevents other patients from being treated in a timely manner in the ED. In addition to the potential health impact of admission delays, there may be an economic impact (Castille, 2003).

2.8 Improving Trauma Care

Ancient history proved that trauma care and system explicitly linked to war. The use of *epaoide* to control haemostasis by the Greek soldier, the development of *valetudinara* as a trauma center during the Roman empire, and *Syalyarara* as a recognized "trauma surgeon" for the Indian army were some of the examples of existence of trauma care in early mankind history (Trunkey, 2005).

In modern medicine, trauma system included pre-hospital and hospital components, each contributing its own degree of importance towards improving patient care (Smith *et al.*, 1990). A good trauma system is the one able to assemble early and rapid experienced clinical decision makers for rapid assessment, resuscitation and operative or intensive care intervention for potentially major trauma patient which has a likelihood of life-threatening of life-disabling injury (Rainer *et al.*, 2007).

Emergency physicians have increasingly play an important role in the evaluation and initial trauma management (Coscia and Meredith, 2006) and master in time-sensitive, non-operative procedure including airway management and resuscitation (Ciesla *et al.*, 2005). Charles *et al* demonstrated the positive association between trained emergency physician involvement in trauma care and patient outcome, where there was a drop of overall mortality by 8.3% (95% CI 2.1%-14.4%) upon the incorporation of Emergency Medicine residency into the emergency and trauma care system (Gerardo *et al.*, 2009).

Currently in Malaysia, there is no hospital with a dedicated trauma team. Trauma is primarily managed by the ED residents initially and subsequently referred to surgical specialties depending on the injury sustained for definitive operative or intensive care. And the only established trauma center in Malaysia is Hospital Sungai Buloh.

This study aimed to look at the trauma management in terms of time interface in ED which includes time of ED resident response time, specialty unit response time and the overall disposition time.

3

RESEARCH OBJECTIVES

3. RESEARCH OBJECTIVES

3.1 General Objective

To determine the mean disposition time of major trauma patient in ED HUSM.

3.2 Specific Objectives

3.2.1 To determine the mean of all time interface of major trauma patient.

3.2.2 To determine the mean response time of ED residents reviewing major trauma patient.

3.2.3 To determine the mean response time of respective units reviewing major trauma patients in ED.

3.2.4 To compare the mean disposition time with different aspects of the the injury in terms of

3.2.4.1 Demography of patients

3.2.4.2 Demography of injury

3.2.4.3 Clinical parameters

3.2.4.4 ED interventions

3.2.4.5 Radiological investigations

3.2.4.6 Disposition unit

3.2.5 To determine factors affecting the disposition time of major trauma patient in Emergency Department

3.3 Research Hypothesis

3.3.1 Null hypothesis

There is no difference of mean disposition time of major trauma patient with different aspects of injury.

3.4.2 Population

The study was conducted in HUSM involving trauma patients triaged to Red Zone.

3.4.3 Study outcomes

i. Mean disposition time of major trauma patient attending ED HUSM.

ii. Factors contributing disposition time of major trauma patient.