**ADDIS ABABA UNIVERSITY**

**FACULTY OF INFORMATICS AND FACULTY OF MEDICINE**

**GRAGUATE PROGRAM IN HEALTH INFORMATICS**

# TRAUMA SEVERITY SCORING AND ITS IMMEDIATE OUTCOME MEASURE AMONG PATIENTS WITH TRAUMA INCIDENT ATTENDED BY EMERGENCY MEDICAL SERVICES, THE CASE OF TIKUR ANBESSA AND YEKATIT 12 HOSPITALS

**BY**

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**A Thesis Submitted to School of Graduate Studies of Addis Ababa University in Partial Fulfillment of the Requirements for the Degree of Master of Science in Health Informatics**

**August 2010**

**Addis Ababa; Ethiopia**

**ADDIS ABABA UNIVERSITY**

**SCHOOL OF GRADUATE STUDIES**

**FACULTY OF INFORMATICS AND FACULTY OF MEDICINE**

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## DECLARATION

I, the undersigned, declare that this is my original work and has never been presented in this or any other University and that all the source materials used for this thesis have been duly acknowledged;

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The thesis has been submitted for examination with our approval as University advisors.

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## ACKNOWLEDGMENT

I would like to thank my advisors Dr. Aklilu Azaj, Dr. Dereje Teferi and Dr Ayele Belachew for their unreserved assistance in giving me timely comments and relevant guidance.

Moreover, I would like to thank Tikur Anbessa Specialized Hospital and Yekatit12 Hospital Emergency Department Staff for their assistance in supplying all the necessary data for the completion of this research.

Last but not the least, I would like to thank the School of Public Health, Medical Faculty Library Staff.

# ABSTRACT

Trauma is the leading cause of morbidity and mortality all over the world .Trauma can be a threat to life through damaging different body part that involve the most active group of society and can result in prolonged compensation.

The severity of trauma and immediate outcome of trauma measure can enable to evaluate health care intervention for an emergency trauma patient.

In this research, retrospective patient care record review design is used for trauma patients who attended the emergency department of Tikur Anbessa and Yekatit 12 Hospital. The research is conducted from August 2009 to June 2010, and the record review and data collection period was from March to April 2010. All identified trauma patient care record about patient with altered level of consciousness who attend emergency medical service throughout the previous year and those who fulfill inclusion criteria was reviewed. Data was analyzed using SPSS 15.0 statistical package. In descriptive statistic frequency, median, and standard deviations were computed. The TRISS methodology was used to score trauma severity and to compare the data outcome.

Among 328 trauma patients 72.9% were males and 27.1% were female. The median age was 30 years. 86.0 of them were below 54 years. From the total patient care record review the median of ISS and RTS were 25 and 7.84 with range 16 – 75 and 0.00 – 7.84 , and standard deviation of 12.60 and 1.54 respectively. Sustained penetrating trauma were accounted for 30(9.1%) of the total trauma incidents and sustained blunt trauma were accounted for 298(90.9%) of total trauma incidents. The majority of the trauma patients (49%) were sustained road traffic accident followed by strike by blunt object (18%) and fall > 5 meter (15%). Out of the total 328 trauma patients 18.3 % of them were died. The area under the curve at the ROC analysis was 0.967 for TRISS, 0.127 for ISS, and 0.903 for RTS ($P < 0.0001$ for each). Regarding actual survival status against TRISS, the use of a cut-off point of greater than 67.3 provided a sensitivity of 97.39% and a specificity of 65%.

The overall severity rate, mortality rate and Hospital length of stay were higher in these two Hospitals with larger involvement of young adult and male. Head and groin region accident was more commonly altered anatomical region.

Key words: Trauma incident, Trauma scoring, Trauma outcome

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# List of Acronyms

| | |
|---|---|
| AAU | Addis Ababa University |
| AIS | Abbreviated Injury Scale |
| ASCOT | A Severity Characterization of Trauma |
| ANN | Artificial Neural Net Work |
| EMS | Emergency medical service |
| HIT | Health Information Technology |
| ICISS | International Classification Disease Injury Severity Score |
| ISS | Injury Severity Score |
| MTOS | Multiple Trauma Outcome Study |
| NPV | Negative predictive value |
| OIS | Organ Injury Scaling |
| PPV | Positive predictive value |
| ROC | Receiver optimization Curve |
| RR | Respiratory Rate |
| SB/P | Systolic Blood Pressure |
| SNNPR | South Nation Nationalities people's Region |
| SPSS | Statistical Package for Social Sciences |
| TRISS | Trauma and Injury Severity Score |

# CHAPTER ONE

## 1 Introduction

Trauma is the leading cause of death and disability throughout the world that involves the most active group of the society. The prevention of avoidable deaths are among the main goals of health care systems of many countries. Thus evaluating the processes of care and outcomes of injured patients are important, if improvements in the quality of care delivered to injured patients have to be accomplished [1]. Severely injured traumatic patient needs immediate emergency management.

The term emergency management refers to care given to patients with immediate and critical needs. Emergency patients have the highest priority—their conditions are life threatening, and they must be seen immediately [2].

Emergency service has become one of the health concern in Health Sector reforms in 1990 in Ethiopia [2]. Emergency service requires immediate response in order to overcome life threatening situation. The severe trauma incident requires fast time and high level immediate health care which is tried in the current four-tier health care system. Thus severe trauma care requires relevant timely information and documentation that is measurable for better patient care outcome. Emergency health service should be provided 24 hours a day, 7 days a week and 365 days a year[2].

### 1.1 Statement of Problem

Trauma is a threat to life which results death and disability in all developed and developing countries. Complications during treatment of seriously injured trauma patients cause an increase in mortality rates, and increased treatment costs including bed occupancy [4].

Globally, 16, 000 people die every day from all type of trauma incident. Of these, one fourth death were due to road traffic accident [5]. Each year over 1.2 million people die on the world's roads, and between 20 and 50 million suffer non-fatal injuries due to road traffic trauma incident which accounts the 9$^{th}$ leading cause of death for all ages [5].The 70% road traffic accident were in developing countries [6]. A community based survey in Ghana indicated that trauma incident related death in the urban was 83per 100,000 and in the rural 52 per 100, 000[7]. In Ethiopia, more than 2,300 people die every year due to road traffic accident and more than 8,696 people were disabled in 2008/9 [6].

The prompt and accurate assessment of the severity of injury and early initiation of critical care should be critically emphasized for preventing deaths and disabilities related to inaccurate assessment resulting to inappropriate treatment. Trauma scores attempt to calculate severity of injuries and its extent to threaten life, while trauma outcome measures aim to assess survival or functional improvement following medical intervention. In essence, trauma scores predict outcome and outcome measures provide a yardstick by which those predictions can be evaluated [8]. In the last two decades, many scores have been introduced to assess patient status, describe injuries, and predict outcome[7-8].

Such a data set can be used to identify features in trauma patients that are associated with an adverse outcome and to develop models for predicting the probability of an outcome [9-11].

Trauma scores and trauma outcome measures are complementary instruments in patient management. The wish to analyse trauma severity in order to prioritize treatments is not previously practiced. Currently trauma severity scoring and outcome measure become complementary to trauma health care intervention [8]. Study shows that the Ancient Egyptians prioritized cases into treatable, contentious and untreatable. The use of outcome measures and statistical analysis to improve performance also has a distinguished history."Florence Nightingale not only analysed the outcomes of wounded soldiers, but learnt lessons from patterns of mortality and was able to reduce death rates drastically". Further, she was able to use statistical arguments to challenge the military establishment and fight for the changes and funding she felt were necessary [8].

Scoring systems in medical practice are used to measure deficits of physiology and disability in order to provide standard reference points immediately recognizable by other observers, and from which response to treatment can be measured. The need to audit existing levels of pre-Hospital and trauma care has become necessity, and not an option. In other country like United States of America, scoring systems were first used widely. It is an absolute requirement of a regional trauma centre that there should be an established system for outcome audit. In general the use of trauma scoring and trauma outcome measures includes:

auditing the trauma patient care management; Research on therapeutic interventions; comparison of treatment centres, triage and plotting patient recovery [12].

In Ethiopia there is no accurate and comprehensive data about trauma scoring and mechanism of injury that is used as useful predictor in pre-Hospital trauma triage and Hospital trauma triage. The health facilities did not have data that indicate what is the appropriate triage strategy for patients who suddenly deteriorate at the scene or during transport. Similarly, there is no accurate and comprehensive data about trauma scoring and mechanism of injury to quantify and compare the severity of injuries and also to measure the recovery of trauma victims during hospital stay. This study therefore is an attempt to identify severe trauma cases to score severity and its outcome based on TRISS model. The computed measure can be compared with actual outcome.

Therefore, the purpose of the study is to provide trauma patient profile about trauma severity scoring system by identifying the level of severity of trauma incident cases to measure extent of severity and predict the patient's probability of survival that should be comparing with the actual outcome of trauma patient. Thus it may be able to propose appropriate health care service with proper management to monitor and evaluate the health care service for the best interest of trauma patients.

## 1.1 Objective of the study

### 1.2.1 General objective

To assess the severity and immediate outcome of trauma among patients with Injury Severity Scoring greater or equal to severe and /or altered level of consciousness in Tikur Anbessa and Yekatit 12 Hospitals Emergency Department.

### 1.2.2 Specific objectives

The following specific objectives were set:

- Determine the magnitude of different type of trauma
- Identify the level of severity and the physiological status of the traumatized patient
- Measure the severity of emergency trauma incident and the observed outcome using scoring system for patient with Injury Severity Scoring greater or equal to 16 and/or altered level of consciousness.
- Compare the observed with predicted outcome for patient with Injury Severity Scoring greater or equal to 16 and/or altered level of consciousness.

## 1.3 Significance of the study

There has not yet been comprehensive study in Ethiopia at emergency medical service that addresses trauma incident response service and outcome information. Although there are few studies conducted based on mechanism of injury, study has not been conducted on

physiological state, pattern of injury, anatomical region and mechanism of injury that can be organized to measure trauma severity scores, all addressed in the current study unlike others. The extent of injury either minor or major are differentiated and scored accordingly based on the standard trauma scoring system. From this study trauma severity scoring uses not only for the determination of patient status compared through time and intervention, but it also improves emergency management in the continuum of care.

Through measuring trauma severity and trauma outcome, appropriate information will be generated from patient care record for trauma incident response service providers.

# CHAPTER TWO

## 2 Literature Review

Trauma is the major cause of physical injury that can be a threat to life. It involves the most active group of the society that have major financial consequences and can result in prolonged compensation going on. Trauma is a physical wound or injury that can be scored in numerical systems for assessing its severity and outcome of serious injuries.

By their very nature, major trauma incidents are unpredictable then unexpected will happen. But when it does, the health services must be able to respond rapidly by mobilizing additional human and material resources. Procedures must also be in place to make the most efficient use of those resources in the given circumstances. Achieving this requires the health services to be proactive in the planning of emergency management measures, thus reducing the need for reactive management in an extremely stressful situation [3,4,5].

Global burden of diseases report indicates that 12% of burden of disease is related to trauma incident. Although traumatic incident accounts for 12% of global burden of diseases, it is one of the tip of an iceberg showing a wide gap that indicate 1 death among 30 to 50 traumatic incidents [5]. In literature, there are two disabled survivors of trauma for every trauma death, resulting in immense physical, psychological and financial costs.

Among trauma incident, road traffic injuries are the major health problems that needs greater attention. In the United States alone automobile crashes result in over 40,000 deaths per annum [13].

The study conducted in Iran showed that among the study sample who were exposed to traumatic incident, 78% were males and 27% were aged <15 years and had a 6% mortality rate [14]. According to traffic police report in Ethiopia, there were 2300 death, 79% of them were male and from 3367 severe injury, 75% of them were males in 2007/8. From this it is estimated that there were 80 deaths per 10,000 vehicles [6].Based on Addis Ababa traffic office report, there were 371 deaths and 731 severe injuries in 2008/9[15]. An injury surveillance in Addis Ababa shows 45.7% were stick, 24.2% were road traffic trauma incident and 11.5% were due to falling down [16].

Since the last two decades, through an effort to treat trauma 'epidemic' in an organized way, a trauma scoring systems have evolved alongside systems of trauma management [17]. In Ethiopia, even though there were trauma incident management 24 hours a day and 7days of a week, there were no an organized trauma scoring system. We did not have such practice still now. The pervious researcher in Ethiopian uses trauma data from Hospital trauma registry or from a specific trauma population study [16, 18]. It was stated that improvement of trauma care and prevention of avoidable deaths are among the main goals of health care systems of many countries.

A study in Addis Ababa has shown that timely emergency medical response to the trauma incident can significantly reduce the likelihood of death and disability consequences [11, 18].

Trauma scoring should be performed on admission and recorded on patient care record. The standard of trauma management is the main factor that affect trauma outcome. Now days , there are many methods or indices to measure or compare the standard of trauma management. such as AIS (Abbreviated Injury Scale), ISS (Injury Severity Score),

RTS (Revised Trauma Score), TRISS (Trauma and Injury Severity Score), ASCOT (A Severity Characterization of Trauma). Nowadays, TRISS methodology is widely applied to review the quality of trauma outcome [11]. TRISS methodology was established in 1987 that involve the summary of physiology and anatomic scoring system. This study examines the contribution of each relevant assessment record for trauma incident in our current practice and explores how trauma measurement systems may evolve in the future [8. 12].

### 2.1 Trauma Scoring System

Trauma scoring scales allow a comparison of an institution's outcomes to a national standard. It was stated that in devising and evaluating new systems to deal with victims of trauma a means of assessing trauma incident severity and its outcome is essential. One role for a scoring system is to act as an audit or outcome measurement tool. Using a scoring instrument allows comparison between different treatment methods or different centers while correcting for any difference in the severity of injuries treated [19].

The resulting mortality accounts for a higher number of life years lost. The severity and the resulting disability is higher than in any other disease.

There are three types of scoring system available to assess trauma Patients which involve: The anatomical scoring systems, which depend on accurate description or measurement of the injury itself; the physiological scoring system, these scores are derived from observation and measurement of vital signs and blood indices to determine the degree of physiological derangement caused by the injury: and finally a combination of anatomical and physiological scoring systems[17].

### 2.1.1 **Anatomical Scoring System**

Many of the present generation of trauma scoring systems have their origins in the Abbreviated Injury Scale (AIS), which was originally described in 1969.This is a descriptive system designed for use in the context of automobile accidents. The Injury Severity Score (ISS) was an attempt to refine the AIS to correlate mathematically with trauma outcomes [8].

In trauma scoring system the most widely used anatomical scoring system is the Injury Severity Score (ISS) [20] which is derived from the Abbreviated Injury Scale (AIS). The AIS is a comprehensive coding system for injuries of all types in every part of the body, with a description of the characteristics defining each grade of severity from 0 (no injury) to 6 (unsurvivable injury)[21]. Based on this scoring, a study Khon Kaen University in 2005, indicated that 38.42% patients had ISS <= 15, and 61.58% patients had ISS > = 16[10].

### 2.1.2 **Physiological scoring systems**

Physiological scoring systems can also be organ specific. In the physiological scoring system a familiar example is the Glasgow coma score (GCS) in which scores for eye opening, verbal response and motor response are added to yield a score between 3 and 15 A GCS of 13 or 14 may correlate with a minor head injury, but the score can change with time and it could also therefore represent the early stages or lucid interval for a major head injury. Similarly, a score of 9 - 12 represents a moderate head injury. A score of less than 9 usually corresponds to a loss of consciousness and implies actual or imminent danger to the patient's airway, due to neurological compromise [8].The revised trauma score (RTS) incorporates a score for the GCS along with scores for respiratory rate and systolic blood pressure [9].

Based on this scoring the study reveals from patients attended by Emergency Medical System in Victoria: Australia, 3% were in physiological distress [22].

### 2.1.3 **Pattern of Injury**

Penetrating injuries differ from blunt injuries, owing to the structure of tissue damage, physiological responses and primary treatment.

Pattern of Injury categorizes each region of the body that is involved in traumatic incident having specific injuries and penetrating and/or blunt injury. The study conducted in Australia showed that blunt injuries were >13 times more frequent than were penetrating injuries.

Head and neck injuries accounted for 83% of the blunt injuries and 64.4% of the penetrating injuries [22].

### 2.1.4 Mechanism of Injury

The mechanism of injury categorizes injury in terms of the cause of trauma such as road traffic accident, falls, explosion, gunshot, strike by blunt object and stab wound.

The study shows that one key aspect of improving clinical decision making for trauma victims would be to provide a complete view of information about the patient, including the events surrounding a trauma incident, and the care provided to that patient from the time of scene call through paramedic response, through the receiving trauma center, and patient rehabilitation [ 23-26].

However, in Ethiopia , such a complete and unified approach is not currently accessible and viewable across the range of health care providers involved .

### 2.1.5 Outcome scoring systems (combined scoring System)

The combined scoring system weights the contributions of age, ISS, and RTS components to provide a probability of survival. . TRISS offer a Ps (probability of survival statistic) for each individual patient against which actual outcomes can be compared. The probability is a statistical figure only and not an accurate prediction of individual actual outcome.

Nonetheless, it provides a basis for guarded reassurance or otherwise of patients and relatives [17]. Identification of unexpected outcomes (such as the death of a patient with a high probability of survival) prompts further investigation of the individual cases to discover diagnostic pitfalls or inadequacies in management [23].

The scoring systems described above focus on survival of the initial trauma. The outcome scores by contrast attempt to describe or predict longer term impairment following trauma [14]. To calculate the TRISS score (probability of survival, Ps); RTS, ISS, age and mechanism of injury should be determined first [24]. It has become the standard tool for evaluating the performance of trauma centers and for identifying cases for critical discussion and areas for improvement [25]. Based on this scoring the study in Khon Kaen University shows that the range of TRISS was 0.017-0.997[6].

Survival is easy to record and has major relevance to patients and trauma care performance.

The MTOS (Multiple Trauma Outcome Study) design is based on TRISS model.

MTOS produces several statistical indices by which the populations from individual centres can be weighed against those from the parent database [8].

Primarily, without record of cause of death, its capacity to alter practice is limited.

Secondly, if a researcher wishes to investigate a subgroup of trauma patients, the large number of survivors compared with a small number of deaths can mean that comparing two interventions is difficult due to lack of statistical power. Finally, survival alone is inadequate because it cannot reflect morbidity or quality of life in survivors [26-28].

All the above tools help to provide standard patient profile for our country who lacks a timely collected information at the scene that are useful to emergency medical practitioners for making decisions about trauma incident victims to improve trauma incident response service and outcome . Till now health care professionals collect information starting from the patient, person around the patient , police and the ambulance that supporting and transport the patient to Hospital emergency service.

However, information from these various parts could not avail accurate, timely and comprehensible information to be shared across the incident response health care providers and continuum health care. As the patient makes his/her way to the Hospital, critical data that could aid in saving his/her life is often misplaced, forgotten, or otherwise not reported to care givers.

### 2.2 Outcome scores against immediate actual outcome

Outcome scores provide a measure of health status over time. Based on the TRISS statistics the actual outcomes can be compared with the calculated probability of survival.

In fact survival alone is not adequate because it cannot reflect morbidity or quality of life for survivors [8]. An ideal system would provide indications of change in disability, handicap, impairment, health status and quality of life.

Therefore, trauma patients may be assessed in terms of length of stay and complications- Complications from trauma and treatment as well as the requirement for further intervention do relate to morbidity in surviving patients. It may be the result of pre-existing disease or the condition being treated. They may be divided into major and minor. A major complication may prolong the hospital stay that lead to increased requirement for treatment or become more life threatening. They also correlate with many trauma scores. These parameters are particularly heterogeneous and difficult to mould into an objective outcome measurement system. Stay on intensive care and in Hospital may be used in an attempt to quantify morbidity, but each are open to many other confounding influences such as local provision of services [8].

Functional scores- Improvement in the quality of care available to patients with severe trauma has led to improved survival with a consequent need to assess functional outcome of patients surviving from trauma incident. One may look at function in two ways. The first involves the assessment of the quality of life of patients who survive injuries by using quality of life instruments and measuring disability, handicap and impairment. The other involves specific assessment of the functional outcome of a specific region such as central nervous system, limb reconstruction, and so on. [8,9].

Since the actual outcome measure requires long time patient observation for survivors after discharge, in this study the hospital stay period and the immediate actual survival status during hospital stay period due to trauma are used to measure trauma incident out come.

The trauma severity score can be differently measure to improve the scoring performance. International Classification Disease-9 and International Classification Disease-10 have also been used independently. It predicts patients' survival, cost and length of treatment in hospital and offers relative ease of use and reproducibility. Surgical procedures and causes of injury can be taken into account. Studies indicate that the ICISS is a better predictor of outcome than TRISS [8]. It also outperforms TRISS in predicting survival rates for elderly patients after low falls resulting in isolated pubic ramus fracture or fractured neck of femur.

However, the ICISS tends to under predict mortality of patients with a small number of injuries and over predict mortality in those with large number of injuries [12,8]. In the absence of facilities such as emergency ultrasonography and Computed Tomography scan, the correct value of ISS may not always be calculated. TRISS in such circumstances may predict false high survival.

In recent years, outcome prediction models using artificial neural network and multivariable logistic regression analysis have been developed in many areas of health care research.

Reports in medical literature suggest that ANN ANNs have also been successfully applied in clinical outcome prediction of trauma mortality , surgical decision making on traumatic brain injury patients , recovery from surgery , outcome in pediatric meningococcal disease and transplantation outcome.

Almost all of the published articles indicate that the performance of ANN models and logistic regression models have been compared only once in a dataset and the essential issue of

internal validity (reproducibility) of the models has not been addressed[29,30]. A limitation of the neural network approach is that standardized coefficients and odds ratios corresponding to each independent variable cannot be easily calculated and presented as they are in logistic regression models. Weights are generated in a neural network analysis, but their interpretation is difficult and the weights may be influenced by the program used to generate them [31,32].

This lack of interpretability at the level of individual variables (predictors) is one of the most criticized features in neural network models [29]. Several early applications of neural networks in medicine reported an excellent fit of the model to a given set of data. The impressive results usually were derived from over fitted models, where too many free parameters were allowed [32, 33].

Logistic regression also allows the investigator to place confidence limits around model outputs and parameter estimates after the underlying structure of relationships among variables is identified. Clinical predictive ability may be enhanced through the use of neural network analysis that is able to examine non-linear interactions among variables [29].

Despite different options for trauma severity and out come measure such as the new trauma injury severity score and organ specific score, such measure requires advance diagnostic test and sophisticated resource. So that for our setting TRISS model is appropriate.

# CHAPTER THREE

## 3. **Subject and Method**

In this research process the basic research method was followed to collect data, to analyze data, to interpret and to draw conclusion out of it. Specific to trauma scoring and out come measure TRISS model was used. Therefore, to meet such health service requirement evidence based practice should be incorporated for optimal health care outcome through conducting methodologically sounded research.

### 3.1 Study area and period

The study was conducted at Tikur Anbessa Hospital and Yekatit12 Hospital emergency departments in Addis Ababa.

#### 3.1.1 **Tikur Anbessa Hospital**

Tikur Anbessa specialized Hospital is a teaching as well as national tertiary level referral Hospital in the four health care tier system in the Faculty of Medicine, Addis Ababa University under. The currently existing Tikur Anbessa Specialized Hospital has been established for the memorial of prince Mekonnen. The Hospital totally holds 123000 $m^2$area of land and its building has settled on 45000$m^2$ area.

The Hospital has 500beds, and has well planned, accommodated and facilitated with the outpatient department (OPD) as well it has seven x-ray, nine surgical and two laboratory diagnostic rooms.

The Hospital was the biggest in Ethiopia during establishment period and was regarded as an exemplary Hospital with out other superior one in the continent of Africa[34].

In 2007, the total number of employee was 1234; of which 444 were medical professionals, 97 were contract employees of medical professional and 693 were employees of management.A total of 1234 employees have been working[34]. The Emergency Department located in front of other department near the main door of the campus. Near to patient reception there were emergency triage followed by examination and resuscitation room. Similarly, emergency beds are arranged according to the case that came to receive service. The emergency flow per day is estimated to be 70 to 80 patients . Of which about 70% were trauma and the rest were medical cases. Of these 70% trauma patients, about 90% were road traffic incident [34].

### 3.1.2 Yekatit 12 Hospital

Yekatit 12 Hospital is a referral Hospital in third health care tier system which is under Addis Ababa city Administrative Health Bureau. The current existing Yekatit 12 Hospital has been established in 1923 by Dr Aner ,a Swedish physician. At the time of its establishment, there were one physician , two nurses and three Ethiopian health assistants with 25 beds. In 1928's Italian invision in the country, the hospital renamed as"Batoria Amanuale" and the health service provision was increased by new building . In 1941 after the Italian invision is over , the British Red Cross increased the bed number to 140 that serve for two years for traumatic patient and those patient fall under control by war. In 1949 and 1954 the Sweden increases the service by employing physician and nurses.

Starting from 19 55 the Hospital managed by “Charter” under His Imperial Majesty Haile Slassie I.

At the time of Dergue the Hospita was renamed as “Yekatit 12 Hospital “ and managed under Ministry of Health. From 2009 up to now the Hospital is managed by board with 7 board member and 15 management member. Mainly the Hospital provides health promotion and heath prevention service using 318 health professional and 300 beds. The health care service receives an average 600 per day which includes:

1. Outpatient and Inpatient Medical Service
2. Gynecology and Obstetrics, Vaccination
3. Pediatric and Infant Care
4. Surgical Service, etc.[35]

The emergency department located in front of other department next to the main entrance door. The daily patient flow estimated to be more than 40 cases

In both hospitals documentation has been used as a record of proof for authorized person. A record serves as a valuable source of data that is used by all members of the health care team. Its purpose includes:

**Communication**

Patient’s record should communicated to all members of the health care team to avoid care fragmentation , repetition of tasks occurs and therapy delay ace.

**Financial Billing**

The patient care record is a document that shows the extent to which health care agencies should be reimbursed for services.

**Education**

A patient's record contains a variety of information, including diagnoses, sign and symptoms of disease, successful and unsuccessful therapies, diagnostic findings, and client behaviors.

**Assessment**

Assessment data entered accurately by each health care team members reveals the patients health status.

**Auditing**

Monitoring or reviewing records throughout the year regularly could used to determine the degree to which quality improvements are met. This area was less practice in both hospital. This study may initiate auditing activity.

**Legal documentation**

Care could be documented including all instructions and referrals.

**Research**

Documentation has been performed in parallel with service provision in both hospital since their establishment. Data can be gathered from patient records for statistical analyses and interpretation. Even though long period documentation is available in both hospital, due to

shortage of time , convenience of data access and other resource a 2008/2009 one year document was reviewed for this research.

The research was conducted from August 2009 to June 2010, and the record review and data collection period was from March to April 2010.

### 3.2 Study design

A retrospective record review cross-sectional study using patient care record review method was used for trauma patients attended at Tikur Anbessa and Yekatit12 Hospitals emergency department.

### 3.3 Source population and Study population

#### 3.3.1 Source Population

Individual trauma patient care record(PCR) for 2008/9 was reviewed for all trauma patients treated in Yikatit 12 and Tikur Anbessa Hospitals with subsequent identification of severity of trauma cases.

#### 3.3.2 Study subjects

The trauma patient care record, that hold data about emergency trauma patient with severe injury, critical injury, unsurvival injury and/or abnormal level of consciousness which arrive at Tikur Anbessa Hospital and Yekatit 12 Hospital Emergency Department to receive emergency health care service .

## Inclusion criteria

The inclusion criteria was all patients > = 15 years old with severe injury and abnormal level of consciousness that had sustained trauma due to road traffic incidents, industrial incidents, burns/explosions, or trauma who were transported and evaluated by emergency service health professional.

## Exclusion criteria

The exclusion criteria included: all patients less than 15 years age who had sustained a fall from the standing position; the traumatic patient who referred or transferred to other Hospital were not included.

Similarly, the trauma patient care record with identity number identified from document, but the number was replaced by new PCR number which made difficult to pick PCR from record keeping area by previous patient care record number at time of data collection , and the incomplete Patient care record did not included to be studied.

### 3.4 **Sampling Technique and sample size**

#### 3.4.1 Sample size

All identified trauma PCRs about patient who attend emergency medical service throughout 2008/2009 period and that fulfill inclusion criteria was reviewed. The number of patient care record was 7852 out of which 328 ( severe , critical and Un-survivable) patient's patient care record was thoroughly reviewed .

### 3.4.2 Sampling technique

Selecting the two Hospital was done by using purposive sampling from Addis Ababa city Hospitals. After arranging the environment for study with Tikur Anbessa and Yekatit 12 Hospital Emergency Department , each individual trauma list was searched from patient document book .

Then each patient care record (PCR) meeting the inclusion criteria to be a study subject was selected .The pertinent data that exist in individual trauma PCRs about a person was reviewed . Despite record review permits to examine trends in the past and less expensive, it has a disadvantage of not accessing data, incompleteness, disorganized and not precise enough.

## 3.5 Variables in the study

### Dependent variable

- Trauma outcome
- Trauma outcome against actual outcome

### Independent variable

A trauma patient might have exposed to injury in different mechanism of injury and pattern of injury that result anatomical and physiological response. Measuring the trauma level require a quantitative scale. To quantify the extent of trauma the following variable has been used as independent variable.

- Anatomical response which is described by body region(, Head and neck ,Face, Chest, Abdomen and pelvis, Extremities ,Skin/general)
- Physiological response which is described by GCS, SBP and RR)
- Pattern of injury which is described by blunt injury, penetrating injury and specific injury)
- Mechanism of injury which is described by road traffic accident , strike by blunt object, falling down accident, industrial incident, stab wound, cuts and gunshot.

### 3.6 Data collection tool

Patient registration book was used to pick the patient identification number and the patient care record was picked up from card room using patient identification number .Data was collected using patient care record review from PCR with record review guide list adapted from other study [16] and Hospital protocol.

### 3.7 Data collection procedure

The permission from emergency department was obtained. Following permission, searching and screening for inclusive criteria for each individual trauma PCR was ensured. For those who fulfill the criteria the reviewed data was entered into a secure data repository. The data sets was reviewed to ensure that only one PCR per patient per incident was included in the data repository. The review guide was developed in English and used with no translation since communication in the Hospitals was in English.

The data was collected by nurses. Data collectors was supervised by a nurse and a physician. Training was given to all data collectors and supervisors.

During data collection the supervisor reviewed the same PCR to check for completeness. Data collectors were supervised and data was checked for completeness and accuracy to improve quality.

Pre-testing was done in Ras Desta Hospital. Based on the findings of the pre –test some modification and development of the tool was done.

### 3.8 .**Data processing and analysis**

Data was checked, sorted, categorized and coded. After coding the data was entered to the computer to make them ready for processing and analysis. Data was analyzed by using the SPSS 15.0 statistical package. In the descriptive statistic median, standard deviations, and ranges were computed. In the TRISS methodology ISS, RTS, Ps, ROC analysis , sensitivity and specificity measures were used.

### **3.9 Ethical Considerations**

Ethical clearance was obtained from Addis Ababa University, Faculty of Medicine prior to enrollment. Permission to conduct the study in Tikur Anbessa Hospital and Yekatit12 Hospital was obtained from the medical director's office of both Hospitals through the support letter sent from graduate program in Health Informatics, Addis Ababa University. The privacy and confidentiality of patient care records was kept for protecting anonymity and ensuring confidentiality by using patient identification number and not using patient name.

### 3.1**0.Data quality assurance**

To assure trustworthiness of the data the researcher worked with data collector to minimize

inter-observer bias and the medical practitioners have checked the reviewed patient care record , evaluated, and corrected them (when necessary) based on fixed protocols. Extensive human and computer checks for data completeness, consistency, and accuracy minimized the possibility of errors in data collection.

### 3.11. **Operational definition**

**Trauma**:- is a physical wound or injury, such as fracture , burn and other tissue damage.

Trauma scoring:- is a numerical systems for assessing the severity and prognosis of series injury.

**Emergency:-** is a sudden serious and dangerous event and situation which needs immediate action to deal with it.

**Accident**- trauma incident involving any part of the body

**Anatomy**- the science of the form and the gross structure of the various part of the body

**Physiology-** the science of the function of human body and of its component parts

**Impairment:–** is disturbance at organ level

**Disability-** is the consequence of impairment in terms of functional performance

### 3.12 Reporting and dissemination of finding

The finding of this study will be disseminated through presentation, publication, and distribution to relevant bodies. The study provides information for health professionals and concerned body about emergency trauma status.

# CHAPTER FOUR

## 4 Data presentation and Analysis

### 4.1 Descriptive Analysis

#### 4.1.1 Demographic data finding

A one-year period patient care record reviewed for a month's period showed that 328 patients with an ISS equal to or higher than 16 were arrived at the Department of Emergency. Among 328 PCR 239(72.9%) were males and 89(27.1) were females. The median age of the study subjects was 30 years. One hundred ninety three (58.8%) were below 35 years of age. Of the 328 severely injured patient the majority 186(56.7%) were from Addis Ababa followed by 102 (31.1%) from Oromia. Of the 328 trauma patients 60(18.3%) were died during treatment (mortality rate 18.3%). The demographic finding are presented in (Table 1).

**Table 1 Demographic Data of traumatic patient in Tikur Anbessa and Yikatit12 Hospitals**

**April 2010(n=328)**

| **Variable** | | **Frequency** | **Percent** |
|---|---|---|---|
| Age(years) | 15-34 | 193 | 58.9 |
| | 35-54 | 89 | 27.1 |
| | >=55 | 46 | 14.0 |
| Sex | Male | 239 | 72.9% |
| | Female | 89 | 27.1% |
| Survival at discharge | Alive | 268 | 81.7% |
| | Not Alive | 60 | 18.3% |
| Address: | Addis Ababa | 186 | 56.7% |
| | Oromia | 102 | 31.1% |
| | Amhara | 21 | 6.4% |
| | SNNPR | 8 | 2.4% |
| | Harari | 6 | 1.8% |
| | Tigray | 5 | 1.5% |

### 4.1.2 Categorizing Mechanism of Injury

Of the total number of trauma patients attended by Emergency Department, the majority of the trauma patients (49%) were sustained road traffic accident of which 70% were males followed by strike by blunt objects (18%) of which 90% were males and Fall down > 5 meter (15%) of which 35% were male . The remaining 18% were Gunshot, Stab wound, Falling down < 5 meter. These mechanisms of injury had caused potentially the larger portion of the major trauma for all traumatic patients who experienced potential major trauma. *( A summary of the mechanism trauma profile are presents in Figure2.)*

Figure 1 Image of traumatic injury with road traffic accident mechanism of injury

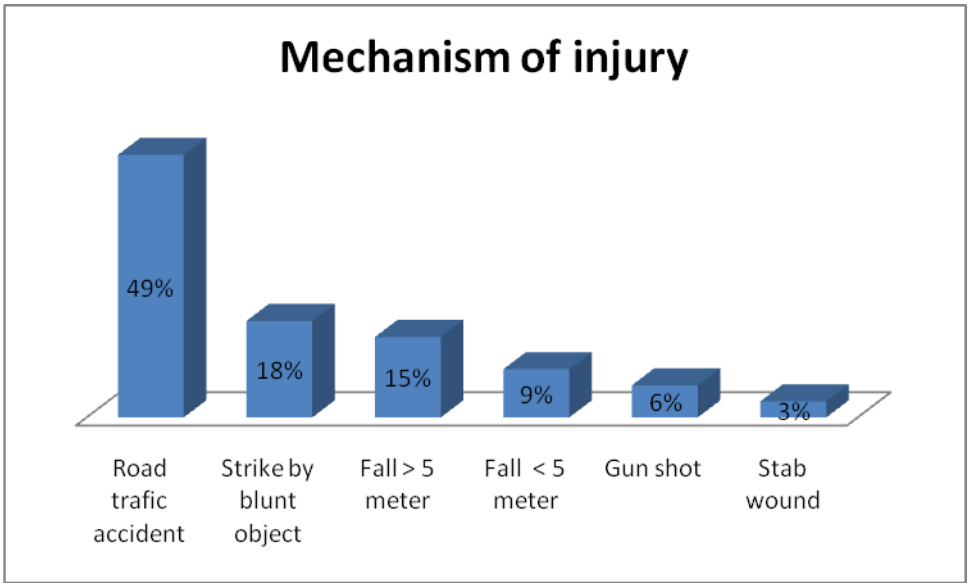


**Figure 2 Bar chart for Mechanism of Injury of Trauma Incidents in Tikur Anbessa and Yikatit 12 Hospitals, April 2010(n=328)**

### 4.1.3 Typing Pattern of Injury

The majority of major trauma incidents 298(90.9%) were exposed to sustained blunt trauma. The rest trauma patients 30(9.1%) were exposed to sustained penetrating trauma. Out of 298 cases of trauma patients, 142(48%) were exposed to poly trauma that increases the number of trauma patient from 328 to 476 as result of counting repeatedly. Regarding the anatomical location of blunt injuries, head and neck were commonly affected. This accounts to 141(29%) , while groin accident cases were 138(28%)of trauma incident cases.. From the total of 30(9.1%) the penetrating trauma cases the majority of trauma incident 11(3.6%) were involved the groin followed by head injury 6 (1.9%) . Among 328 total trauma accidents 122(37,2%) exposed to the specific types of trauma injuries.

Out of the specific injuries 49(40.2%) were exposed to suspected spinal injuries of which 84 % were male, while 25 (18%) were exposed to fracture of pelvis of which 52% were males imposed and 22(18%) were exposed burn > 25% surface area of which 55% were male.

**Table 2 Pattern of Trauma Incidents in Tikur Anbessa and Yikatit12 Hospitals April 2010(n=328)**

| Anatomical Region | Penetrating Injury (30= $n_2$ ) | Blunt Injury(298= $n_1$) | Both |
|---|---|---|---|
| Head/Neck | 6(1.9%) | 141(29%) | 147(30.9%) |
| Thorax | 5(1.7%) | 63(13%) | 68( 14.7%) |
| Abdomen | 5(1.7%) | 38(8%) | 43(9.7%) |
| Pelvies | 3(0.2%) | 64(13.4%) | 67(13.3%) |
| Groin | 11(3.6%) | 138(28%) | 149(31.6%) |
| Axilla | 0 | 2(0.3%) | 2(.03%) |
| Total | 30(9.1%) | 446(90.9%) | 476(100%) |

Of the 328 traumatic injuries 122(37%) were exposed to specific injury.

Among the specific injuries suspected spinal injuries 49(40,2%) were comprised a large proportion of the injuries followed by fractured pelvis 25 (20.5%) and burn >25% 22 (18%) .

The specific injuries are summarized in (Table 3).

**Table 3 Specific injury of Trauma Incidents in Tikur Anbessa and Yikatit12 Hospitals April 2010(n=328)**

| Variable | number | Percent for specific injury |
|---|---|---|
| Suspected spinal injuries | 49 | 40.2 |
| Pelvic fracture | 25 | 20.5 |
| Burn > 25%surface area | 22 | 18 |
| Limb amputation | 4 | 3.3 |
| Fracture of two or more long bones | 3 | 2.4 |
| Serious crush injury | 9 | 7.4 |
| Major compound fracture | 10 | 8.2 |

### 4.2 TRISS Analysis

#### 4.2.1 Computed Trauma severity scoring finding

From the total patient care record review the median of ISS and RTS were 25 and 7.84 with the range of 16 – 75 and 0.00 – 7.84 , and the standard deviation of 12.60 and 1.54 respectively. The median of TRISS measure and the median length of Hospital stay were 0 .97 and 10 with the range of 0.014 – 0.99 and 1 – 128, and the standard deviation of 0.25 and 28.01 .respectively.

The mean, standard deviation and the range of ISS, RTS, TRISS, and Hospital stay are summarized in (Table 4).

**Table 4 ISS, RTS and TRISS data of traumatic patient in Tikur Anbessa and Yikatit12 Hospitals**

**April 2010(n=328)**

| Variable | Median | Standard Deviation | Range |
|---|---|---|---|
| ISS | 25 | 12.60 | 16 – 75 |
| RTS | 7.84 | 1.54 | 0.00 – 7.84 |
| TRISS | 0.97 | 0.25 | 0.014 – 0.997 |
| Hospital stay(days) | 10 | 28.01 | 1 - 128 |

### 4.2.2 Computed Outcome Scoring Systems

A ROC analysis was performed for analysis of trauma scores for mortality risk of trauma incidents in order to determine the classification performance of RTS, ISS and TRISS probability survival for both survival and non survival determination.

Based on the calculation of trauma scores that was carried out according to the Injury Severity Score (ISS), Revised Trauma Score (RTS), and Trauma and Injury Severity Score (TRISS) probability of survival, the ROC analysis were performed. The ROC analysis indicate that RTS and TRISS values increase under the ROC curve area in contrast the ISS value decreased under the ROC curve area .

The area under the ROC curve at the ROC analysis was 0.97 for TRISS, 0.13 for ISS and 0.90 for RTS (P < 0.0001 for each). The area under the ROC curve for ISS fell below reference line (0.5),( Figure 3).

After observing the ROC analysis the cut-off point for each scoring system was determined for survival and non survival category in order to evaluate the TRISS measure performance. These leads to the next computation about the sensitivity of test result, specificity of the test result, positive predictive value (PPD), and negative predictive values (NPD) for TRS, ISS and TRISS trauma severity scoring to be calculated.

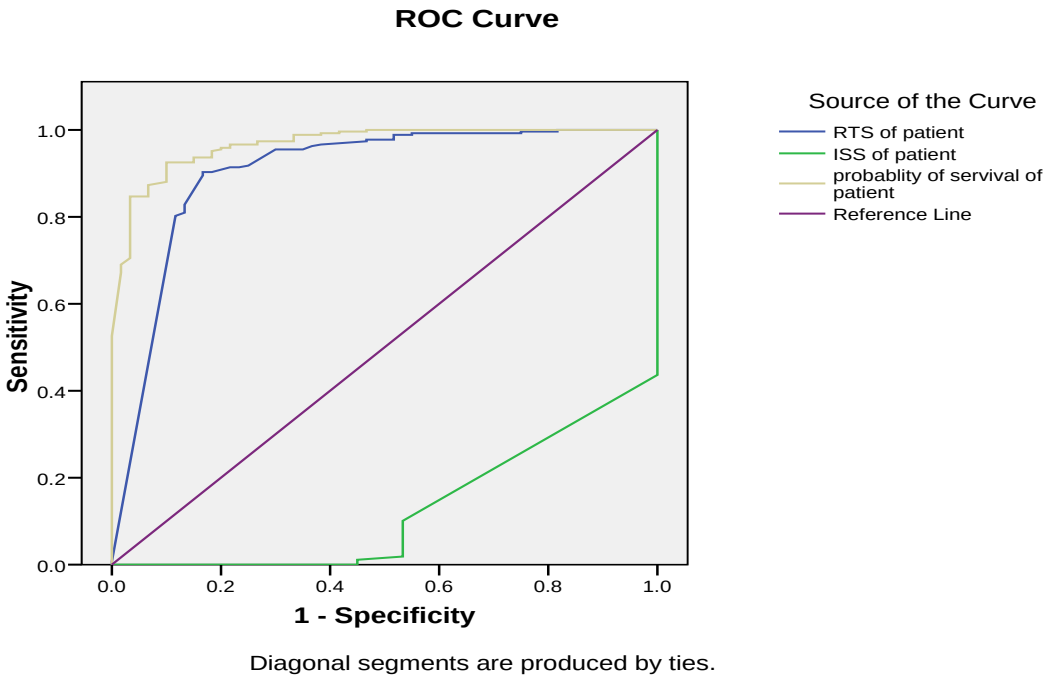


**Figure 3 ROC analysis for trauma scores on mortality risk of trauma incidents in Tikur Anbessa and Yikatit12 Hospitals, April 2010(n=328)**

### 4.2.3 Computed Outcome scoring systems against actual outcome

Table 5 reveals a cross tabulation for the result of computed RTS for trauma patient that predict the patients either alive or none alive measure and the actual trauma patient outcome measure result of the patient who were either alive or non alive .

**Table 5 Computed RTS survival status measure and actual survival status measure of trauma incidents in Tikur Anbessa and Yikatit12 Hospitals April 2010(n=328)**

| | **Actual survival status** | | |
|---|---|---|---|
| Computed RTS | Alive | Not alive | Total |
| Alive | 266 | 43 | 309 |
| Not alive | 2 | 17 | 19 |
| Total | 268 | 60 | 328 |

Table 6 reveals a cross tabulation for the result of computed ISS for trauma patient that predict the patients either alive or none alive measure and the actual trauma patient outcome measure result of the patient who were either alive or non alive .

**Table 6 Computed ISS survival status measure and actual survival status measure of trauma incidents in Tikur Anbessa and Yikatit12 Hospitals April 2010(n=328)**

| | **Actual survival status** | | |
|---|---|---|---|
| **Computed ISS** | **Alive** | **Not alive** | **Total** |
| Alive | 261 | 28 | 289 |
| Not alive | 7 | 32 | 39 |
| Total | 268 | 60 | 328 |

Table 7 reveals a cross tabulation for the result of computed TRISS for trauma patient that predict the patients either alive or none alive measure and the actual trauma patient outcome measure result of the patient who were either alive or non alive .

**Table 7 Computed TRISS survival status measure and actual survival status measure of trauma incidents in Tikur Anbessa and Yikatit12 Hospitals, April 2010(n=328)**

| | Actual survival status | | |
|---|---|---|---|
| Computed TRISS | Alive | Not alive | Total |
| Alive | 261 | 21 | 282 |
| Not alive | 7 | 39 | 46 |
| Total | 268 | 60 | 328 |

Table 8 reveals the sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of ISS, RTS and TRISS with respective of cut points for ISS, RTS and TRISS score. A cut-off point of ISS score of less than 38.5 score provided the highest sensitivity of 97.38% and the highest specificity of 53.33%.. The positive predictive value and the negative predictive value for ISS were 90.31 and 82.05 respectively.

With regard to RTS, the use of a cut-off point of greater than 4.05 provided the highest sensitivity of 99.25% and the highest specificity of 28.33%. The positive predictive value and the negative predictives values for RTS were 86.08 and 89. 47 respectively.

The TRISS score with a cut-off point of greater than 67.3% provided the highest sensitivity of 97.39% and the highest specificity of 65%. The positive predictive value and the negative predictive value for TRISS were 92.55 and 84.78 respectively (Table 8).

**Table 8 Mortality predictive values according to trauma scores in Tikur Anbessa and Yikatit12 Hospitals, April 2010(n=328)**

| | Cut off | Sensitivity | Specificity | PPV | NPV |
|---|---|---|---|---|---|
| ISS | 38.5 | 97.38 | 53.33 | 90.31 | 82.05 |
| RTS | 4.05 | 99.25 | 28.33 | 86.08 | 89.47 |
| TRISS | 67.3 | 97.39 | 65 | 92.55 | 84.78 |

### 4.3 Discussion

Of the total trauma incident 72.9% were males and 27.1 were females. This result show large proportion of male which is almost similar to other study conducted in Iran 78% [14] .This may be due cultural expectation of male to confront risk or engaged in risk business such as drinking, chewing chat . In current study, the majority of traumatic patients 58% arre of aged between 15 and 35 years, and a lower proportion of the trauma incidents 14% are elders (>54 years of age) .The study showed that trauma involves the most active group of the society which is agreed with other international studies [13].This may be as a result of their adolescence and young adulthood stage of age to test different socialization and to engage in risky behavior.

In this study the overall mortality rate is 18%,. This shows a greater proportion of death occurred compared to the mortality rate in University of Groningen: Netherlands, 13% (11). This may be due to little attention paid to prevention of trauma and management of trauma before its occurrence, management at the scene, during transport and during continuous management .

The majority of the patients 160 (49%) were exposed to road traffic accident. This is higher than the previous study in Tikur Anbessa Hospital (24%)[16]. This may be due to the focus of this study on severe, critical and unsurvival trauma cases without including the mild, the moderate and the serious trauma incidents measure and its outcome measure. From severely traumatized road traffic accident 116(70% ) were male which is almost similar to Addis Ababa traffic police report that was 75% [6].

Blunt injuries were 10 times (90.9%) more frequent than penetrating injuries (9.1%).

This figure is less frequent compared to the study conducted in Victoria in which blunt injuries were was 13 times frequent than penetrating injuries [22].

Head injury accounts 29% of the total trauma incident. This may be due to the head region prone to exposure to road traffic accident and strike by blunt object. Groin accident accounts for 28% which is the second major trauma. The possible suggestion may be due to its relation to locomotion that prone to falling accident.

This study shows that the median of ISS is 25 with the range of 16 - 75, the median of RTS is 7.84 with the range of 0.00 to 7.84 .The median of TRISS is 0.97 with the range of 0.014 to 0.997.The range of TRISS in this study is almost similar to a study in Khon Kaen University (0.017 to 0.997)[6]. The overall injury severity of our trauma patient is higher compared to other studies in Iran (9).

The ISS is the most important factor that defines the seriousness of body region in traumas but in this study the ISS from ROC analysis did not show accurate result , as RTS and TRISS .

Thus ISS scale result that fall below reference line (0.5) is not a valid scale result regarding the mortality state of a patient, while results obtained from the RTS and TRISS scales have been found more useful and appropriate. The possible reseason for non valid ISS may be the diagnostic test like Ultrasonography and computed tomography scan were not available in emergency setting as commonly used X-ray .Therefore, ISS scale result is not a valid scale result to make a decision regarding the mortality state of a patient while results obtained from the other two scales are found more useful and appropriate.

The sensitivity test result were 97.38 for ISS, 99.25 for RTS and 97.38 for TRISS that reveal higher sensitivity than specificity. These highly sensitive test results were worse than high specificity result that categorizes non survival as survival which may delay immediate diagnostic verification and prompt health care provision, since trauma incident has life threatening penalty for failing to detect a severely traumatized patient.. The positive predictive value for ISS, TRS and TRISS were 90.31%, 86.08% and 92.55% respectively. These high positive predictive values indicate high proportion of test positive for those who are truly positive. But the negative predictive value for RTS is 89.47 with lower positive predictive value that is 86.08. This reveals high proportion of test negative for those who are truly negative.

Accuracy of TRISS methodology for prediction in this two hospital is improved by adjusting the cut-off value. The most accurate level of TRISS is 97% sensitivity and 65 % specificity, at the cut-off value of Ps > 0.63. This is a higher result compared to other studies in Thailand ( < 90% sensitivity) [4]. Therefore, it could be used as a description of overall injury severity for injured patients and to compare the results between alternative treatments to improve the quality of trauma system in these hospitals.

On the other hand survival alone is inadequate because it cannot reflect morbidity or quality of life in survivors [4]. Stay on intensive care and in Hospital may be used in an attempt to quantify morbidity, but each are open to many other confounding influences such as local provision of services [4].

The presented study confirms that the traditional TRISS had limited ability to predict survival after trauma.

Accuracy of prediction can be improved by recalculating the TRISS coefficients. In addition, the problem associated with the ISS was found in the TRISS particularly the inability to account for multiple injuries to the same body region in which the multiple injury assigned a single value as a single injury. The variations in trauma outcomes might be a result of a number of factors, such as trauma patient severity epidemiology and co-morbidities, individual practitioner management and facility -specific systems management of trauma which are not address in this study. In general the finding reveals greater number of sever trauma with higher sensitivity than specificity

# CHAPTER FIVE

## 5 Conclusions and Recommendations

### 5.1 Conclusion

The overall severity rate, mortality rate and Hospital length of stay of trauma incident are higher, in these two Hospitals, with larger involvement of adolescent and young adult and males who are more prone to head and groin body region accident. Thus this indicates that these study population practiced in minimum for promoting and preventing health care management of trauma incident and its outcome. There is also major trauma involvement in different anatomical body part that exists greater number of multiple trauma rather than a single trauma in a given body part which increase worsening of trauma out come. Therefore, major trauma with multiple involvements are more risk for danger of increasing severity and premature death. The ROC curve analysis indicate that the predictive ability of a trauma score, the ISS scale result is not a valid scale result to make a decision regarding the mortality state of a patient while results obtained from the TRISS and RTS scales have been found more useful and appropriate. Thus the author find that the accuracy of TRISS methodology for prediction in these two Hospitals will be improved by adjusting the cut-off value.

The sensitivity test result reveals higher sensitivity than specificity. Fore instance, RTS and ISS have lower specificity, the ability to detect those with true non survival is low.

In other words it has higher false survival values (those who are not really survive are classified as survival by RTS and ISS approach).

Similarly, these tests have less negative predictive value than positive predictive value. Therefore, this highly sensitive test results show failing to detect non survival cases that result death penalty for severely traumatized patient. Therefore, based on this study detecting survivors are more accomplished than detecting no survivors in the emergency health care provision. Thus there is less the risk management practice.

In general, the investigator concludes the result of this study is a more accurate computation of overall injury severity score for trauma incident cases and can be compared with actual outcome of trauma . However, it is apparent that further studies are needed with wider study groups to detect the superior scoring system.

## 5.2 Recommendation

In fact the population of Ethiopia suffer from trauma incident, there is no accurate and comprehensive data about trauma scoring and mechanism of injury that is used as useful predictor in pre-Hospital trauma triage and Hospital trauma triage, and data that indicate what is the appropriate triage strategy for patients who suddenly deteriorate at the scene or during transport. Similarly there is no accurate and comprehensive data about trauma scoring and mechanism of injury to quantify and to compare the severity of injuries and to measure the recovery of trauma victims during Hospital stay. Therefore, based on the research findings the following recommendation have been made:

- Since trauma result subsequently damage starting from the onset of accident, it is important to consider Hospital trauma triage scoring and management guide lines for health care providers for better patient management.
- Lack of database for trauma profile and lack of guide lines for severity trauma scoring with management protocol for multidisciplinary team patient care, epidemiological trauma evaluation, treatment evaluation and emergency management system should not be over looked in this two Hospital Emergency Department.
- Calculating TRISS coefficients, from local large database should be considered to decrease the limitation of TRISS scoring.

Artificial neural network is not used for outcome prediction due to lack of software and time for its better performance and to cross validate the TRISS probability of survival prediction.

- Similarly other scoring systems like New Trauma Severity Scoring(NTSS) for better scoring were not used due to lack of sophisticated clinical diagnostic procedure. Therefore, additional methods like Artificial Neural Network for survival prediction and New Trauma Severity Scoring (NSTSS) for trauma severity scoring should be used in order achieve cross validation and better scoring performance.

### 5.3 Strength and Limitation of the Study

The study uses the TRISS (Trauma and Injury Severity Scoring ) method which is an International standard for measuring trauma severity scoring system. The TRISS method is yet used neither in research nor in practice in our country. The study will provide patient profile database for accurate and timely information utilization.

It will provide information for improving the standard and the protocol of the emergency system for better and quality emergency health care service.

The study comprehensively gathers and organized the trauma severity and trauma outcome measure scoring system.

The two hospitals had been a long time record , but it is difficult to access more than a year document due to rearrangement and introduction of new record keeping style. Thus, shortage of large number of data may reduce the statistical power since sample size did not use calculated sample size .

Besides due to time and sophisticated diagnostic instrument shortage other more specific severity scoring measurements were not used.

Since the study requires extensive and intensive work with more time and human resource to cover all Hospitals in Addis Ababa City, the study is only limited to Tikur Anbessa and Yekatit 12 Hospitals emergency department cases.

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**APPENDICES**

**Annex I Need assessment check list**

**Requirement (need) assessment check list for health professionals:**

For whom do you provide emergency service?

_____

From all emergency cases who are the large number of your patient?

_____

How many of your patients come with life threading condition that need real time clinical management?

_____

Is there any problem in you service provision activities?

Which one is your major problem?

How do you solve the problem?

_____

_____

How many of patients directly come from scene?

What kind of patients information do you get from the patients and persons who accompany the patient?

_____

What will be your opinion for expected and actual situation regarding information access?

**Requirement (need) assessment check list for patient:**

Do you remember what happened to you?

_____

What type of help did you get before reaching here?

---

Did you face any probem during the accident to transport you to the hospital?

Is there any support at time of transporting?

---

Could you properly give information to health care providers?

Can you able to share the information that you have to your health care provider?

Would you tell me some more information?

_____

Do you have information about the intervention made to help you?

_____

**Requirement (need) assessment  check list for patient care record:**

Review for completeness of information about patient profile

Observe way of record keeping

Review for trauma incident registry

Observe for information sharing#

Assess the convenience of environment for data collection

**Annex II. Record review guide list for data collection tool**

## Section – one: Demographic information

**Please, carefully read the following about patient's demographic status and circle the number which best describe patient's demographic information.**

| No | Questions | Coding Categories |
|---|---|---|
| 01 | Sex of participant | 1. Male 2.Female |
| 02 | Age in years | _____ |
| 03 | Record No. | _____ |
| 04 | Address | _____ |

**Record for the physiological status of the patient**

| |
|---|
| Revised trauma score(RTS) _____ |
| Respiratory rate :breath per minute _____<br><br>Systolic B/P in mmHg_____<br><br>Consciousness state (GCS) in number_____ |

**Please, carefully read the following about patient's trauma information and tick the number which Best describe patient's pattern of injury and its severity for penetrating injury**

| Penetrating injuries/trauma | | | | | | | |
|---|---|---|---|---|---|---|---|
| Trauma | 0<br>No injury | 1<br>Minor injury | 2<br>Moderate injury | 3<br>Serious injury, not life threatening | 4<br>Severe injury, survival expected | 5<br>Critical injury, survival doubtful | 6<br>Fatal injury |
| Head/Neck | | | | | | | |
| Thorax | | | | | | | |
| Abdomen | | | | | | | |
| Pelvis | | | | | | | |
| Groin | | | | | | | |
| Axilla | | | | | | | |

**Please, carefully read the following about patient's trauma information and tick the number which best describe patient's pattern of injury and its severity for blunt injury**

| Blunt injuries/trauma | | | | | | | |
|---|---|---|---|---|---|---|---|
| Trauma | 0<br>No injury | 1<br>Minor injury | 2<br>Moderate injury | 3<br>Serious injury, not life threatening | 4<br>Severe injury, survival expected | 5<br>Critical injury, survival doubtful | 6<br>Fatal injury |
| Head/Neck | | | | | | | |
| Thorax | | | | | | | |
| Abdomen | | | | | | | |
| Pelvis | | | | | | | |
| Groin | | | | | | | |
| Axilla | | | | | | | |

**Please, carefully read the following about patient's trauma information and tick specific injury**

| **Specific injuries** | |
|---|---|
| **0. Suspected spinal injuries** | |
| **1. Fracture pelvis** | |
| **2. Burn > 25% or respiratory trac burn** | |
| **3. Limb amputation** | |
| **4. Fracture two or more long bones** | |
| **5. Series crush injury** | |
| **6. Major compound fracture** | |

**Please, carefully read the following about patient's trauma information and tick the number which best describe patient's mechanism of injury/trauma**

| No | Trauma | Tich | Frequency |
|---|---|---|---|
| 01 | Road traffic accident<br>-patient ejected from vehicle<br>- Patient in vehicle rollover<br>-Death of other vehicle occupant<br>-Pedestrian hit>30km/hou | | |
| 02 | Falls>5m | | |
| 03 | Strike by blunt object | | |
| 04 | Cuts | | |
| 05 | Stab wound | | |
| 06 | Gunshots | | |
| 07 | Motor cycle accident >60km/hour | | |
| 08 | Object failing from >5m | | |
| 09 | Motorcyclist/cyclist | | |
| 10 | Explosion | | |
| 11 | Patient trapped> 30min | | |
| 12 | Falls <5m | | |

**Please, carefully read the following about patient's trauma information and write the number which best describe patient's immediate trauma measure and its outcome**

| |
|---|
| Hospital length of stay (days)_____<br><br>Admission date ___,____,___<br><br>Discharge date ____,_____, ____ |
| Survival<br><br>alive __<br><br>died ___<br><br>Calculated TRISS(Predicted death) _____ |