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The admission trends of trauma patients in a tertiary South African hospital over a three-year period from April 2005 to March 2008

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THE ADMISSION TRENDS OF TRAUMA PATIENTS IN A TERTIARY SOUTH AFRICAN HOSPITAL OVER A THREE-YEAR PERIOD FROM APRIL 2005 TO MARCH 2008.

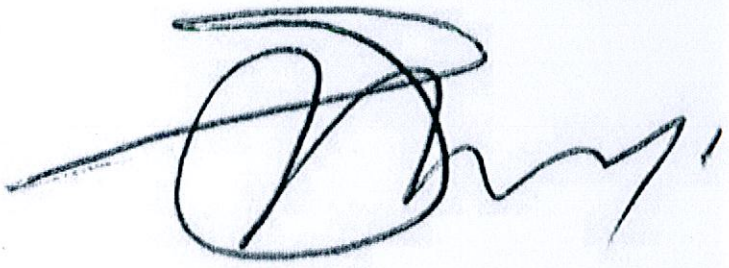
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A Research Report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in partial fulfillment of the requirements for the Degree of Master of Public Health in the field of Hospital Management

20th November 2015

DECLARATION

I, Molefe Ernest Kenoshi, declare that this research report is my own work. It is being submitted in partial fulfillment of the requirements for the Degree of Master of Public Health at the University of the Witwatersrand, Johannesburg. It has not been submitted before, for degree or examination at this or any other University.



Signature:

Date: 20th November 2015

At: Johannesburg

ACKNOWLEDGEMENT AND DEDICATION

My sincere acknowledgement goes to the wonderful people in my life who have given me all the support and encouragement that I needed during the many days and nights that I spent studying and writing to complete the course work and this research project.

Special gratitude goes to my Supervisor Professor Shan Naidoo for his patience, wise counsel and his unwavering support; to my wife Ruth and my family for their everlasting love and understanding especially during the countless hours I had to spend away from them; and to my energetic office colleagues and staff who so generously assisted in data collection, viz Dr Mathabo Mathebula, Ms Anka Grobler, Ms Cindy Paulsen, Ms Magriet Myburgh, and Mr Andries Sebothoma.

I also need to thank all my dear relatives and friends for continuing to have trust and believe in me despite my prolonged absence during this project.

And importantly, I express my humble gratitude to the Almighty for His mercy and abundant blessings throughout my life.

ABSTRACT

Introduction: Treating and caring for trauma patients involves multiple health care professionals, multiple medical specialties or more generally, a greater part of the hospital resource base. High trauma incidences imply constant perturbation of the treatment response matrix. Whilst its acknowledged that trauma is an end-product of a myriad of complex interactions, very little if any, scientific inferences to quantify the impact this has on immediate hospital operations or on state initiatives to mitigate against trauma incidence is known.

Methods: Data was collected from Electronic Medicom information of all patients admitted to Steve Biko Academic Hospital (SBAH) in the period under review by a selected team led by the Senior Medical Superintendent responsible for surgical disciplines. Relevant information pertaining to trauma cases was then extracted and analyzed in accordance with the objectives of this study research purpose.

Results: Steve Biko Academic hospital admits more than twice than the planned trauma-bed capacity. The majority of discharges are inside of 5 days with the second day registering the most. Orthopaedic and Neurosurgery trauma patients spent more days in the hospital than other trauma patients. Older females tend to stay in care significantly longer compared to men. Also, cases of trauma involving younger people are on the rise and as a part of trauma preventative strategies; interventions targeting the younger generations be stepped up. It is also proposed that a trauma bed management framework be developed in which bed occupancy is electronically monitored and allocated by discipline.

TABLE OF CONTENTS **Page**

CHAPTER1

INTRODUCTION 1

STATEMENT OF PROBLEM 2

JUSTIFICATION FOR THE STUDY 4

RESEARCH QUESTION 5

AIM AND OBJECTIVES 5

CHAPTER 2

LITERATURE REVIEW 7

EPIDEMIOLOGY OF TRAUMA 7

SERVICES AT STEVE BIKO ACADEMIC HOSPITAL 9

THE IMPACT OF THESE TRAUMA ADMISSIONS 9

CHAPTER 3

METHODOLOGY 11

STUDY DESIGN 11

STUDY POPULATION 11

SAMPLING 12

MEASUREMENT AND DATA SOURCES 12

DATA MANAGEMENT AND ANALYSIS 13

ETHICAL CONSIDERATIONS 14

CHAPTER 4 RESULTS

EXPLORATORY RESULTS 15

DIAGNOSTIC PROFILES 26

KRUSKAL WALLIS TESTS 28

ASSOCIATIONS 32

CHAPTER 5 DISCUSSION

INTRODUCTION.....35

STUDY OBJECTIVES 35

LIMITATIONS 38

CHAPTER 6 CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS TO THE OBJECTIVES OF THE STUDY 40

RECOMMENDATIONS 41

FUTURE RESEARCH 42

SUMMARY AND CONCLUSIONS 42

REFERENCES 43

APPENDIX 46

GLOSSARY OF TERMS viii

LIST OF ABBREVIATIONS vii

LIST OF ABBREVIATIONS

ALOS	Average Length of Stay
BOR	Bed Occupancy Rate
CI	Confidence Interval
LOS	Length Of Stay
PDE	Patient Day Equivalent
RHT	Refusing Hospital treatment

CHAPTER 1 INTRODUCTION

1.1 BACKGROUND

Trauma can be defined as a bodily and/or mental injury caused by an external agent, as well as the subsequent emotional response. As far back as 2000, it was estimated about 70 000 people are killed annually due to trauma related incidents, with a further 3,5 million seeking healthcare as a result of trauma in South Africa (Reden, 1999). In 2011, it was estimated that trauma was the second commonest cause of death, and that for every trauma death there are countless trauma victims accounting for up to 40% of hospital emergencies annually (Wallis, 2011) mainly due to violence, motor vehicle accidents, gun shootings, assaults, as well as many other forms of domestic and industrial accidents. By 2013, injury-related mortality rates in South Africa were six times, and road traffic injuries double, the global rate (Clarke, 2013).

Given that trauma care encompasses emergency medical care (pre-hospital and hospital Emergency Unit based), inter- and intra-hospital transfer, definitive surgical and ICU care and rehabilitation services, it is clear that trauma cases therefore require multiple health care professionals and medical specialties. The result is that this all impacts negatively on the medical care of non-emergency patients in hospitals (Olukoga A, 2004) in a number of ways:

- the clinical management of non-emergency non-trauma patients gets postponed because of the increased competing emergency trauma cases;
- emergency trauma patients consume a lot of the resources allocated for other types of patients (resources in the form of

medical specialists, expert nurses, laboratory tests, medicine, theatre time, blood).

The Steve Biko Academic Hospital (SBAH) is one of four tertiary (Central) hospitals in Gauteng province, and one of ten in South Africa, that provide tertiary services for severely injured patients. Research conducted by the National Labour and Economic Development Institute (NALEDI, year) showed that public hospitals in South Africa are highly stressed due to excessive workloads; and so a trend of increased incidence of severe trauma in the country is exerting a lot of pressure on these tertiary hospitals with ever-increasing patient load (Matsopulos,et al, 2006). The extent of this problem in the Steve Biko Academic Hospital has never been determined, but there is a general feeling amongst clinicians and hospital managers that SBAH is surely but certainly becoming a "trauma hospital"!! The problem seems to be getting worse in recent years.

1.2 STATEMENT OF PROBLEM

At SBAH, most of the surgical patients are emergency patients brought to the hospital after sustaining trauma-related injuries. Since 2005, District Health Information System (DHIS) indicators show that the bed-occupancy rates of the surgical and orthopaedics wards at SBAH, as well as Intensive Care Units (ICUs), constantly averages upwards of 95% (SBAH records). The demand on ICU beds has been high. The bed-occupancy rates of our Intensive Care Units (ICU) and surgical wards are very often over 100%, with ICU patients having to be cared for in the Emergency Unit or in one of the operating theatre recovery rooms for days while awaiting an ICU bed.

The cost of attending to and managing these patients is prohibitive because multi-trauma patients cost more per day than other patients (Olukoga A, 2004). Though the fiscal burden of treating these injuries is still to be determined, however, these costs include specialist costs, costs of private post-basic (specialized) trained agency nursing personnel, laboratory costs, cost of medication (especially expensive antibiotics used against resistant micro-organisms) and cost of blood and blood products. This has a negative effect on the hospital's alignment of expenditure to budget, and also takes resources away from other services which are included in our service package thereby creating severe financial restraints on the entire healthcare system.

Also, trauma patients often overflow into wards of non-surgical clinical areas; this added to the fact that some of these patients have to spend over twenty four hours in the Emergency Unit while awaiting bed space in the wards. Availability of beds for non-surgical patients subsequently becomes a problem, with large numbers of elective admissions of non-surgical patients having to be postponed. Senior clinicians of the non-surgical clinical disciplines are very unhappy, distressed and frustrated by the high number of overflows ("outliers") from the surgical wards. This frustrates their patient management plans and teaching schedule for under- and post-graduate students. The problem statement therefore is that the impact of trauma admissions at SBAH and the subsequent influence on patient profiles (demographics and diagnosis) on allied hospital healthcare services is unclear, including the trend thereof. By reviewing electronic patient records over a three-year period from April 2005 until March 2008, it is hoped insight into these issues will be gained.

1.3 JUSTIFICATION FOR THE STUDY

The National Department of Health developed service packages for each of the different levels of hospitals in the country through the National Health Act 61 of 2003 South Africa, 2003), which guides the range of health services to be provided at the relevant public health establishment. SBAH has to comply with the mandate of providing services in all the clinical disciplines as expected of a tertiary Central hospital. The conundrum facing clinicians and managers in the hospital presently is that cases of trauma seem to be consuming more and more bed space, time, and other resources, to the detriment of other services and procedures the hospital has to provide.

The hospital receives an increasing number of complaints from non-emergency patients (and their relatives) whose booked admissions and booked clinical procedures are regularly postponed because of intervening trauma cases. In fact, the burden of trauma continues even after hospitalization as health care services such as home care, physiotherapy, occupational and speech therapy, skilled nursing, acute rehabilitation for instance, will be required after hospital discharge. The impact of trauma admissions on other hospital healthcare services has never been ascertained, and therefore the need for studies such as this one, which seeks to assess the extent of this problem is important to enable the smooth running of the services. It is anticipated that the research results will enhance the field's understanding of trauma based on good theoretical foundations as well as the delivery of in-hospital trauma care. Integrating theory and data will assist in developing trauma responsive treatment options. Lastly, the study will add to the body of knowledge and provide evidence to policy makers.

1.4 RESEARCH QUESTION

South Africa has a high proportion of deaths from injuries and injuries have been identified as one part of a quadruple health burden (van Hoving et al, 2015). Empirical data regarding reactions of the hospital healthcare delivery configurations to the impact of trauma admissions would be very useful to address the question of how best hospitals can better understand and contain trauma admissions. The study seeks to answer the question: What are the determinants and admission trends of trauma patients to Steve Biko Academic Hospital? The need to further understand the determinants and admission trends of trauma patients, will enable a better understanding and evaluation of interventions to manage the load of trauma patients (as compared to non-trauma patients) presenting at Steve Biko Academic Hospital.

Few studies have examined the impact of trauma admissions on hospital health services (delivery of services to trauma populations) in South Africa. Empirical data regarding reactions of the hospital healthcare delivery configurations to the impact of trauma admissions would be very useful to address the question of how best hospitals can better understand and contain trauma admissions.

1.5 AIM AND OBJECTIVES

1.5.1 AIM

To determine the admission trends of trauma patients to Steve Biko Academic Hospital during the three-year period from 1st April 2005 to 31st March 2009.

1.5.2 OBJECTIVES

1. To determine socio-demographic profiles and diagnosis of patients (as risk factors to trauma vulnerability) admitted to Steve Biko Academic Hospital from 1st April 2005 to 31st March 2009.
2. To determine the proportion of patients admitted due to trauma as compared to non-trauma patients, as well as the length of stay of each patient in the hospital;
3. To assess the impact of these trauma admissions on the non-trauma cases in terms of access to care; viz. occupation of hospital beds designated for non-trauma patients by trauma patients.
4. To propose intervention strategies to facilitate the creation of efficient trauma systems / treatment options to manage the load of trauma patients relative subsequent to the patterns observed.

As a secondary objective, the research will attempt to infer if the distribution of admissions is age and/or gender specific i.e. if there are any differences across different age groups or between men and women and how resource needs and services would be distributed if there are differences. Therefore in summary, the research seeks to provide a concise yet flexible interpretation of the impact of trauma and how SBAH can understand and reconfigure its intervention strategy and other processes involved.

CHAPTER 2 LITERATURE REVIEW

In this chapter, relevant reports into the referral system, factors influencing resource utilization and admission trends in hospital wards are discussed.

2.1 EPIDEMIOLOGY OF TRAUMA

Review of literature reveals that trauma has been recognized as being on the increase world-wide in the last twenty five years or so. A number of clinicians and researchers (including South Africans) have published a myriad of articles, all pointing out that the increasing load of trauma (intentionally and non-intentionally) was becoming a real problem in health care. Brolini (1991) and Hosman (1994) wrote about the fact that cases of trauma were reaching epidemic proportions, even in the early nineties. Alcohol and substance abuse, bad driving, and lax fire-arms control are mentioned as some of the epidemiological factors contributing to this epidemic (Olukoga, 2004; van der Spuy, 1999).

SOUTH AFRICAN SCENARIO:

Researchers have previously studied the case load of trauma in South Africa (Matsopoulos et al, 2006; and Muckart, 1991); and others have even attempted to demonstrate the cost of the trauma load in the form of resources it consumes at the disadvantage on non-trauma cases (Robicsek et al , 1993; and Oluga, 2004).

Saadia (Saadia R, 1999) has attempted to detail the hospital responses needed in attempting to meet the increasing trauma load.

Few of the other articles reviewed so far identify the effect this mounting trauma load has on the care of non-trauma patients, and what needs to be done about this. The proposed research study will attempt to quantify the trauma load in a typical tertiary institution in South Africa (the SBAH), and identify some of the negative effects it has on non-trauma cases.

GAUTENG SCENARIO:

Gauteng's health delivery platform consists of a total of 377 clinics and community centres (CHCs), 10 District Hospitals, 10 Regional Hospitals, 3 Tertiary Hospitals, 4 National Central Hospitals (i.e. Dr George Mukhari, Steve Biko, Chris Hani Baragwanath and Charlotte Maxeke Johannesburg Academic Hospital). Together, these provide health services to 9, 626,600 uninsured people who make up 75.8% of the 12.7 residents of Gauteng. In addition, there are 146 licensed private facilities, including 85 private hospitals, 22 sub-acute facilities and 40 unattached operating theatres. Recent studies have confirmed that even the majority of those covered by medical schemes make use of public health facilities particularly for inpatient care in central hospitals. It is currently not unusual to find hospitals having mixed functions (e.g. mainly regional and many primary and tertiary functions).

The Steve Biko Academic Hospital (SBAH) is a 832 bed tertiary referral healthcare institution, which provides a highly specialised range of services. Steve Biko Hospital (Formerly the Pretoria Academic Hospital and before 1994 called H F Verwoerd Hospital) of Pretoria, South Africa, is a purely tertiary training healthcare institution and is the

main teaching hospital of the University of Pretoria along with Kalafong Hospital in Atteridgeville to the west of the city centre.

2.2 SERVICES AT STEVE BIKO ACADEMIC HOSPITAL

SBAH has state-of-the-art medical equipment including an MRI Scanner, two 64-Slice CT Scanners, computed tomography (PET-CT) scanner, totally digital radiology, Picture Archiving Communication System (PACS) and is the only teaching hospital in South Africa that accommodates the hospital and University Clinical Department's offices in one building. This cohesiveness has galvanised communication between the sections and created very productive working relationships. Operating theatre patients are not dependant on lift transport and this is because Operating Theatres, ICU's, X-rays and associated wards are on same floor. The hospital has 53 ICU beds, 21 High Care beds, 61 Observation places, 108 Beds in the Oncology Complex, 21 Operating theatres (19 active), 19 Lifts and about 80 Consulting rooms.

2.3 THE IMPACT OF THESE TRAUMA ADMISSIONS

Generally, a higher number of serious trauma cases in relation to available resources tends to 'push out' planned elective operations (Engelbrecht et al, 2015) and exerts a drag on planned daily operations and in particular, places a strict limit on the number of very expensive surgical operations that can be done. Another net effect is a longer than usual surgery waiting list.

Several programs such as the Student Programmes for Practical Experience and Internships at ***HospiVision*** Steve Biko Academic Hospital exist to manage and mitigate against trauma. ***HospiVision*** Steve Biko offers internships for Trauma and Pastoral Counsellors who want to become HPCSA registered counsellors, in conjunction with Unisa and other universities offering the BPsych programme.

CHAPTER 3 METHODOLOGY

3.1 STUDY DESIGN

For this research study, descriptive cross-sectional study design using patients' records review was used to describe and quantify the burden of trauma. The study was conducted at SBAH from 1st April 2005 until 31st March 2009; SBAH is a national central hospital situated in the urban heart of the City of Tshwane.

3.2 STUDY POPULATION

The study population were all sampled trauma admissions between 1st April 2005 until 31st March 2009; though focus was on adult in-patients admitted to SBAH, the results will include paediatric trauma as these were captured as well. Included are patients admitted to surgical and non-surgical wards. This period was chosen because it was during this time that a general impression took root that the proportion of trauma to none trauma cases in the hospital was increasing. Patients' demographic information and their diagnoses were available on the improved electronic Health Information System (Medicom system), which was first implemented in the hospital in 2003.

Incomplete information from the electronic records were supplemented by retrieving hard copy records of patients' files and scanning them for the missing information, however this was not possible for the 2007 period which proved irreparable and so data for that period was omitted from the analyses.

3.3 SAMPLING

Because all patients' demographic detail, their diagnoses, and hospitalization details are available electronically, all complete records of patients who were admitted during the three-year study period were retrieved and analyzed. Systematic sampling was used, by selecting the first twenty five patient files in the each of the two financial years 2005-2006 and 2008-2009, starting on 1st April in each year. Selection of patients file was systematic in that the 25th patient file was selected until we had four hundred files in each of the outer years of the study period being April 2005 to March 2006 as well as April 2008 to March 2009.

3.4 MEASUREMENT AND DATA SOURCES

Following data that were collected: ages, gender, hospital numbers, ward numbers (and clinical discipline type of the wards, e.g. medical ward, surgical ward, neurosurgery ward), and the diagnosis of every patient that was admitted to all wards in SBAH from 1st April 2005 until 31st March 2009.

A data collection form was developed to capture information, and were filled by a selected team consisting of the Senior Medical Superintendent responsible for surgical disciplines, the hospital's Health Information Officer, two nurse volunteers, and myself as the researcher. In particular, the diagnosis indicated whether the patient's condition was trauma-related or not. The form also captured information about whether the patient was admitted in a regular ward for the condition the patient had, or whether the patient was an "out-lie" or not (that was a patient who is "squatting" in another ward because the ward he/she should be admitted in is full).

A **pilot study** was conducted by collecting data for the two-months period from and analyzing it in accordance with the objectives of this study. On the basis of the pilot study, it became apparent that the period April 2007 to March 2008 had too many gaps that would potentially alter the inferences due to too many missing data elements. Data amputation was a possibility, however the series and ultimately longitudinal evolution was insufficient to yield a plausible trend for 2007.

3.5 DATA MANAGEMENT AND ANALYSIS

Electronic Medicom records of all patients admitted to SBAH were down-loaded from the system, and used to populate the data collection form. The data were then be sorted into a number of categories, including: whether trauma was the cause of the patient's condition or not, or whether the patient was an elective admission case; and also whether the patient was lying in the appropriate ward or whether the patient was an outlier.

The available records were sorted in chronological order on an Excel spreadsheet in order to observe trends over the three year period. The Epi-Info programme was used to analyze the data further. Admission trends over the years would be compared using X^2 (chi square) analysis; means would be compared using the "t" test; and multi-trends analysis examined to try to understand the reasons for the trends.

3.6 ETHICAL CONSIDERATIONS

There was no need to interview the patients themselves, as the information needed were already available in the hospital's electronic Health Information System (HIS). Also, the required diagnosis information from the hospital records were more reliable than whatever information the patient can provide. There was therefore be no need to obtain informed patient's consent, but approval to access patients' information were sought from Gauteng Department of Health's Research Monitoring Directorate to conduct the study.

This was a records review, and there is therefore no need for informed consent from subjects. No patient names were captured as this is deemed not necessary. Only patients' hospital numbers, which were codified, were captured on the forms so as to ensure that the data collected were of real patients. All information were kept confidential, and through coding, anonymous. The coded data and links to hospital numbers were kept by the researcher in a safe locker.

Approval for this study was sought and granted by the Research Ethics Committee of the University of Witwatersrand (Annexure A), and also from Gauteng Department of Health's Research Monitoring Directorate (Annexure B).

CHAPTER 4 RESULTS

4.1 EXPLORATORY RESULTS

In this chapter the results of the study is outlined. The chapter attempts to provide answers to the specific objectives of the study.

Table 1: Length Of Stay by year.

	Length Of Stay (LOS = Number of Inpatient days)													
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**...**	**13+**
2005	45	44	22	23	16	7	10	4	4	3	3	4	....	
2006	6	17	26	8	9	1	3	1	2	2	0	0	....	
2008	42	58	40	20	16	8	7	3	6	14	5	6	....	
2009	2	8	2	2	2	1	0	1	0	1	0	0	....	
LOS = Inpatient Days	95	127	90	53	43	17	20	9	12	20	8	10	.....	2513
%	**3.1**	**4.2**	**3.0**	**1.8**	**1.4**	**0.6**	**0.7**	**0.3**	**0.4**	**0.7**	**0.3**	**0.3**	**....**	**83.3%**

Length of Stay (LOS) is the number of inpatient days i.e. number of days spent in hospital by all patients who were in care. One Day is a day when one patient occupies a bed at midnight as determined by the hospital midnight census. The above study had a sum total of 3017 and the last two columns shows of that number, 3.1% of the inpatient days were after one day or stayed for only 1 day before discharged, 4.2% (127) were after 2 days. Table 1 shows that in the period under study, the majority of discharges were on the second day and that the percentages exceeding 5 inpatient days would remain below 1% day-by-day. This sort of scientific evidence is necessary for benchmarking purposes i.e. it may be necessary to examine each and every patient who exceeds 5 days to ascertain if continued stay could be unavoidable.

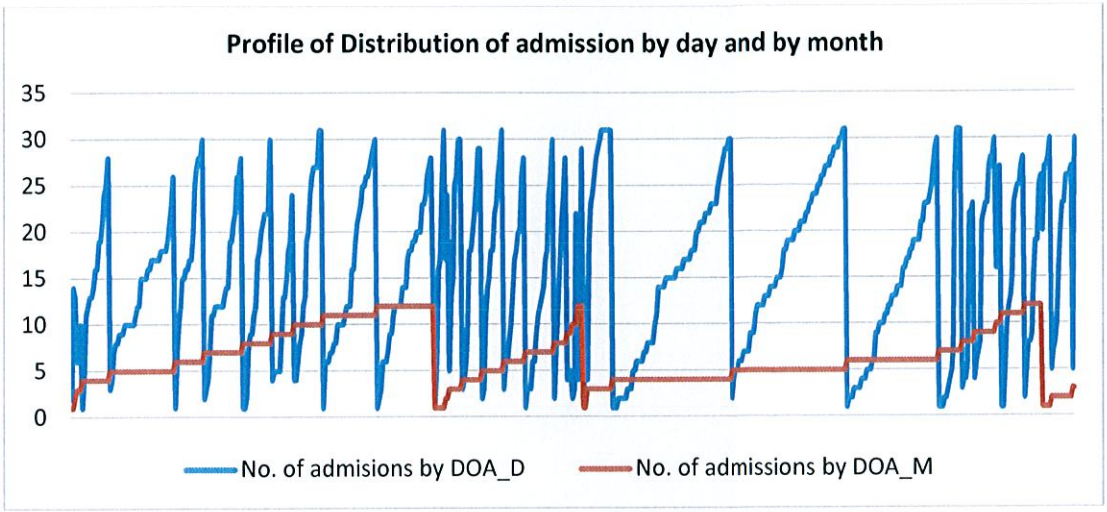


Figure 1: Distribution of time of admission of patients

Figure 1 above is an indication of the intake of trauma patients by (DOA_D) and by month (DOA_M). The brown line shows months (1 up to 12) and is clearly divided into three (2005/2006; 2006/2007 and finally 2008/2009). The blue line represents the day of admission per given month (1 up to 31). It is clear that the intensity (and by implication pressure) was greatest in the 2006/2007 period and least in 2008/9 but began to build up soon thereafter.

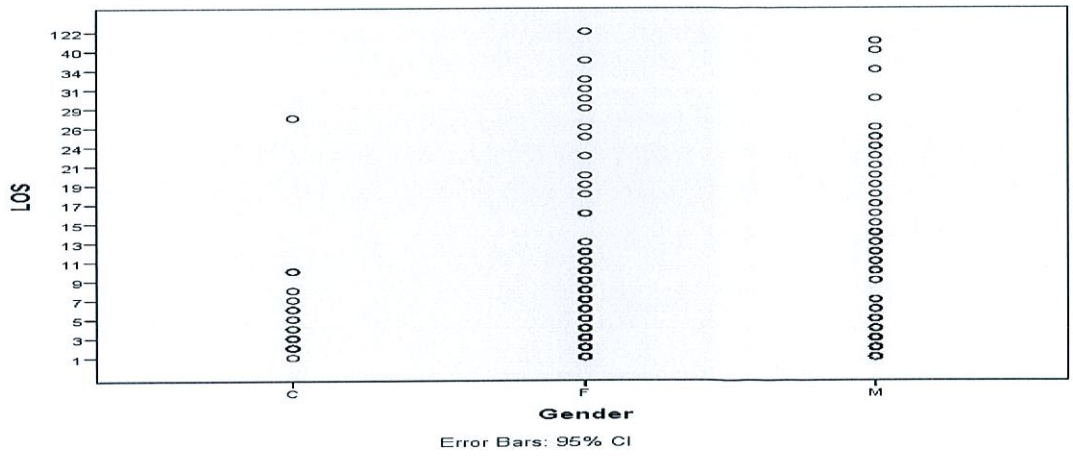


Figure 2: Distribution of Length Of Stay by Gender

There is intensity and pressure from males (first 11 days) and for females (first 7 days). Longest female stay was 122 days vs. 40 for longest male.

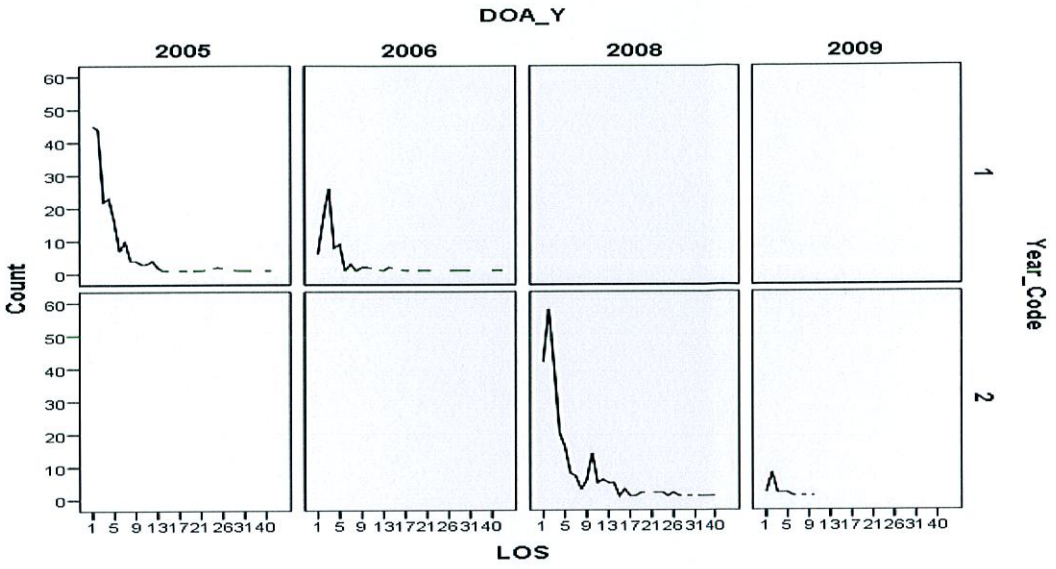


Figure 3: Profile of Length Of Stay by Year of admission

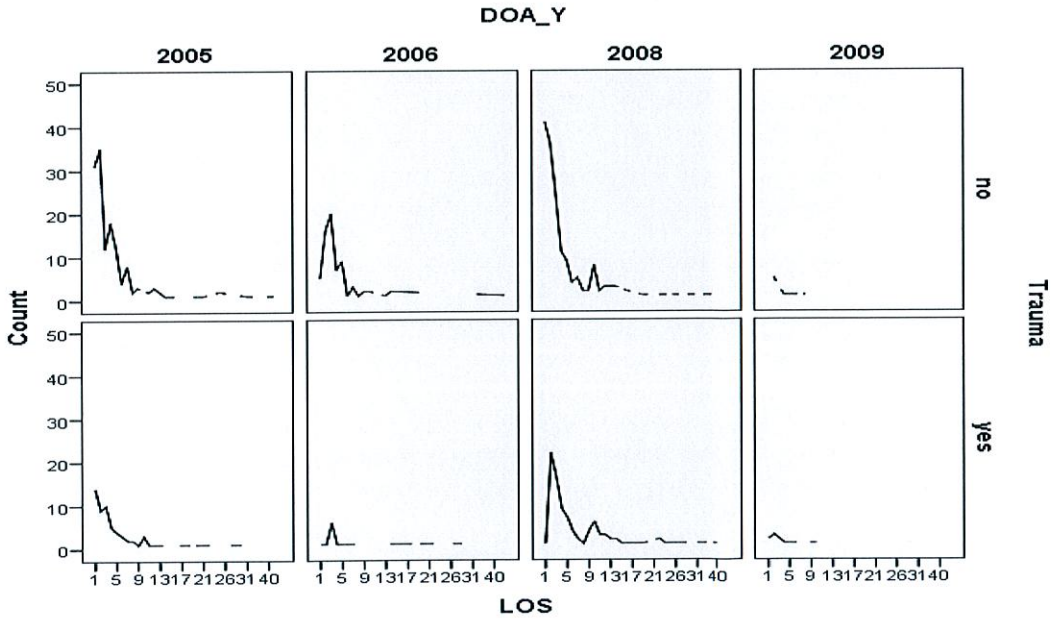


Figure 4: Profile of Length Of Stay by Type of bed

Figure 3 shows that most discharges occurred within 9 days as the rate drops steeply thereafter. What is also clearly evident from Figure 4 is that throughout the period under review, there was heavy utilization of non-trauma beds by trauma patients (trauma = no).

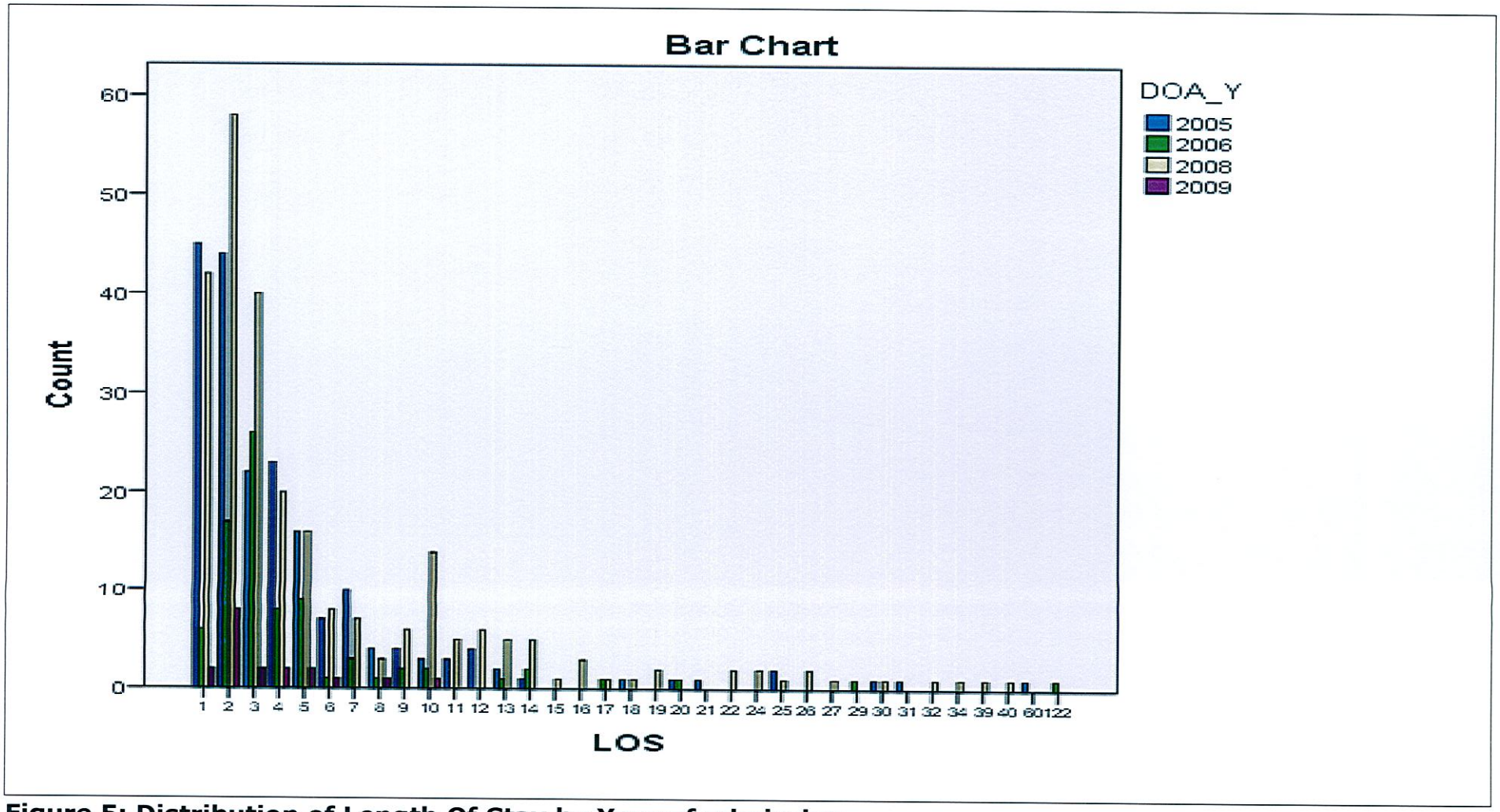


Figure 5: Distribution of Length Of Stay by Year of admission

The earlier observation that most of the discharges occur within the first week and stabilizes after at most 11-14 days is further confirmed irrespective of the year in Figure 5. It is also evident that most discharges irrespective of year of admission, the second or first day is the more frequent and this possibly points to the priority and efficiency accorded trauma treatment at SBAH.

Patients admitted due to trauma stayed for varying number of days, but on average these patients spent fractionally less time in hospital than Internal Medicine patients. Orthopaedic and Neurosurgery trauma patients spent more days in the hospital than other trauma patients, probably because their injuries usually require more drastic or repeat surgery.

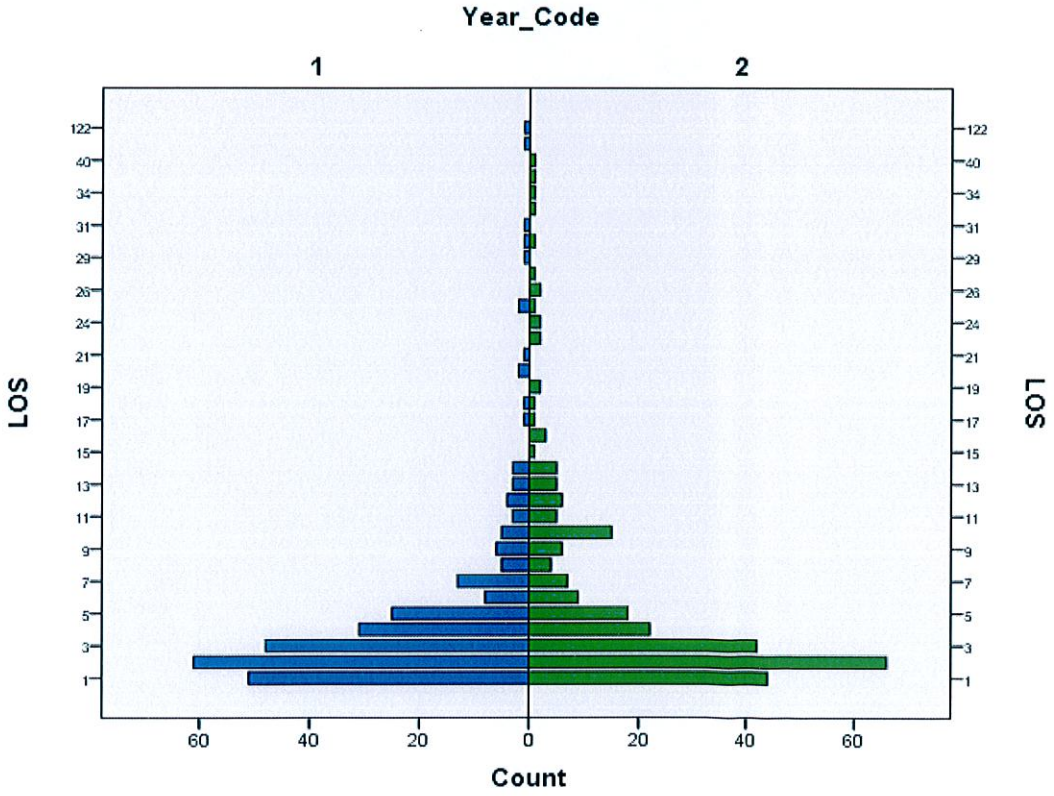


Figure 6: Profile of Length Of Stay by Year code

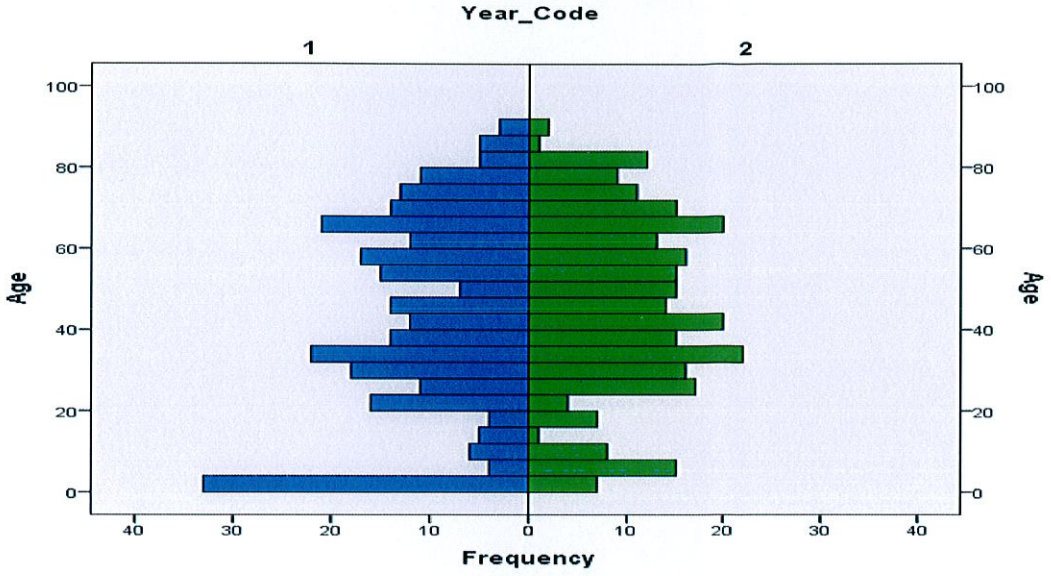


Figure 7: Profile of Age by Year code

Figures 6 and 7 show that (i) Year 2 had more cases and severity for a given discharge day than year 1 with the exception of day 2 (ii) that discharges dwindle drastically after about 2 weeks in each instance (iii) Year code 1 had more children than year code 2 and (iv) in terms of the aged (60+), the profiles are more or less alike. Comparison of age groups is necessary to account for confounding in recovery periods as measured by LOS.

Table 2: Percentage trauma cases admitted by year

	Frequency	Percent
2005	200	35.9
2006	82	14.7
2008	256	46.0
2009	19	3.4
Total	**557**	**100.0**

Results show that a total of 557 patients were admitted and all in all 200 of them in 2005 representing close to 36% with about 15% in the following year, 46% in 2008 and approximately 3% in 2009. Given that the period of study was divided into two (from January 2005 to December 2006) and from January 2008 to March 2009), analyses was premised in terms of those years as depicting in Table 3 below.

Table 3: Percentage trauma cases admitted by year

	Frequency	Percent
Year 1	282	50.6
Year 2	275	49.4
Total	**557**	**100.0**

Bearing in mind that the data reported as Year 1 is from 1st April 2005 till 31st March 2006, and that Year 2 is from 1st April 2007 till 31st March 2009, Table 3 reveals that the number of trauma cases at the beginning of the research period (50.6%) and at the end of the research period (49.4%) remained virtually the same. This implies that, despite government agencies' efforts to decrease the number amount of traffic accidents and injuries due to interpersonal violence, these efforts have been in vain particularly in the SBAH catchment area.

The distribution of admissions by gender shows about half were male and the rest female. In 2005, the ratio of male to female was almost the same, but in 2006 there were more females admitted than males and this was reversed in 2008 with significantly more male admissions.

Figure 8: Cases by Year

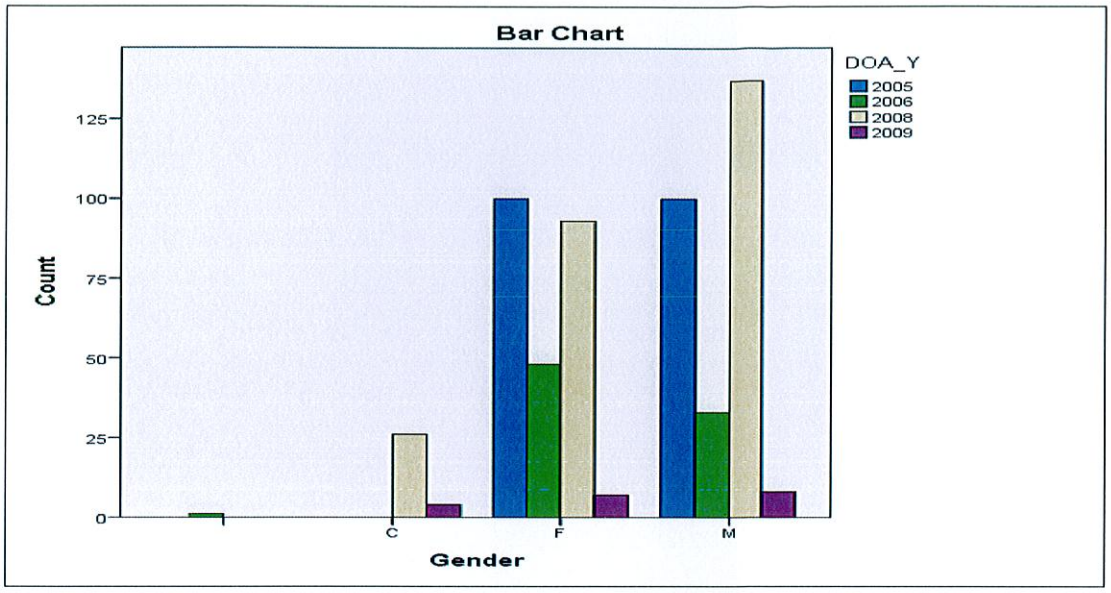


Table 4: Cases by Gender

	Frequency	Percent
undefined	1	.2
Children	30	5.4
Female	248	44.5
Male	278	49.9
Total	**557**	**100.0**

This data reveals that, on average, the effect of trauma is even across the gender groups. This might dispel previous perceptions that trauma affects males more than females because of the nature of male=dominated riskier jobs in the past. It might also mean that females are increasingly engaging in work and activities that were previously associated with males mainly. However, though admissions are independent of gender, a shift in proportions was observed with more males than females admitted in year 1 and vice-versa in year 2.

Gender by Year_Code					
			Year_Code		Total
			1	2	
Gender		Count	1_a	0_a	1
		% within Gender	100.0%	0.0%	100.0%
		% within Year_Code	0.4%	0.0%	0.2%
		% of Total	0.2%	0.0%	0.2%
	Children (gender not captured)	Count	0_a	30_b	30
		% within Gender	0.0%	100.0%	100.0%
		% within Year_Code	0.0%	10.9%	5.4%
		% of Total	0.0%	5.4%	5.4%
	Female	Count	148_a	100_b	248
		% within Gender	59.7%	40.3%	100.0%
		% within Year_Code	52.5%	36.4%	44.5%
		% of Total	26.6%	18.0%	44.5%
	Male	Count	133_a	145_a	278
		% within Gender	47.8%	52.2%	100.0%
		% within Year_Code	47.2%	52.7%	49.9%
		% of Total	23.9%	26.0%	49.9%
Total		Count	282	275	557
		% within Gender	50.6%	49.4%	100.0%
		% within Year_Code	100.0%	100.0%	100.0%
		% of Total	50.6%	49.4%	100.0%

Each subscript letter denotes a subset of Year_Code categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	40.727[a]	3	.000
Likelihood Ratio	52.755	3	.000
N of Valid Cases	557		

a. 2 cells (25.0%) have expected count less than 5. The minimum expected count is .49.

The above associated is significant with a p-value less than 0.005 and the null hypothesis (that admissions are independent of gender) is rejected; the conclusion being that a shift in proportions was observed with more males than females admitted in year 1 and vice-versa in year 2.

Table 7: Trauma cases by Trauma bed availability

Trauma Bed	Frequency	Percent	Cumulative Percent
missing	1	.2	.2
no	380	68.2	68.4
yes	176	31.6	100.0
Total	**557**	**100.0**	

The non-trauma category includes all cases sampled for study for that period other than those admitted for trauma. Trauma = no represents the occupation of a non-trauma bed by a trauma patient and this is of particular interest as it represents not only overflow but a good proxy of the extent of resource utilization and diversion from other disciplines towards Trauma. Of the total 557 admissions, more than 68% of those had to be accommodated on non-trauma beds (i.e. 380 were on non-trauma beds). This possibly suggests excess workload or drag brought up as a result of too much trauma cases as given that only 176 bedding is set aside for trauma, the total of 557 = (557-176)/176 * 100 = **216%** more than available trauma capacity. This would mean that the hospital is seeing more than twice the number of trauma cases than available or planned for capacity. This will have a ripple effect on both resources, specialists times and availability as well as shifting of planned theatre procedures as most trauma emergencies are not planned and scheduled for prior.

The data comparing trauma patients admitted into trauma wards and trauma patients admitted into non-trauma wards (outliers) reveals that a large number of trauma patients get admitted into hospital beds allocated for non-trauma patients. The main implication of this is that non-trauma patients are disadvantaged in the form of having less resources (hospital beds and nursing care) in favour of trauma patients. It may also mean that resources allocated for non-trauma patients are inadequate.

		Frequency	Percent
Ward		1	.2
	Cardiothoracic	32	5.8
	ENT	47	8.4
	Female Urology	8	1.4
	Gastroenterology	29	5.2
	General Surgery	40	7.2
	High Care	2	.4
	ICU	5	.9
	Male Urology	23	4.1
	Maxillo Surgery	7	1.4
	Neurosurgery	28	5.0
	Oncology	17	3.1
	Ophthalmology	30	5.4
	Orthopaedics	93	16.7
	Paeds Surgery	46	8.3
	Plastic Surgery	27	4.8
	Surgery Male	17	3.1
	Surgica ICU	1	.2
	Surgical	54	9.7
	Trauma	7	1.3
	Urology	37	6.6
	Vascular Surgery	6	1.1
	Total	557	100.0

Figure 9: Percentage ward type by trauma bed availability

Most severe injuries are classified as poly-trauma, meaning that the patients tend to suffer Orthopaedic, General Surgery, and even Neurosurgical injuries. The wards of these clinical disciplines are therefore the most over-crowded. Over-crowding from these wards very often over-flows into the Ear Nose & Throat ward and the Urology ward. Inferences show that trauma admissions are 2.16 times more than available capacity are evident by the distribution and density of the trauma = no group (i.e. trauma case occupying a non-trauma bed).

4.2 DIAGNOSTIC PROFILE

Distribution by clinical condition indicates that the more common diagnosis being are Gastric ulcer with 12 cases followed by Prostate CA on 7 cases of the 557 cases admissions. The distribution of all sample patients admitted by diagnoses is widespread and covers many trauma and non-trauma conditions. The information gleaned from this also shows that trauma cases form a significant percentage of the total number of cases. This fact is also confirmed by the data in Table 8 below. Table 8 which shows the ward code for condition for which the patient was admitted to e.g. was it a surgical, medical obstetric & gynaecologic or paediatric? The top three were General surgery (20.6%), Orthopaedics (16.9%) and Urology (12.2%).

Table 8: Percentage trauma cases by ward code

	Frequency	Percent	Cumulative Percent
Missing ward name	1	.2	.2
Cardiothoracic	32	5.7	5.9
ENT	47	8.4	14.4
Gastroenterology	29	5.2	19.6
General Surgery	115	20.6	40.2
Maxillo Facial	7	1.3	41.5
Neurosurgery	28	5.0	46.5
Oncology	17	3.1	49.6
Ophthalmology	30	5.4	54.9
Orthopadics	94	16.9	71.8
Paediatrics Surgery	46	8.3	80.1
Plastic Surgery	27	4.8	84.9
Trauma	10	1.8	86.7
Urology	68	12.2	98.9
Vascular Surgery	6	1.1	100.0
Total	**557**	**100.0**	

This information is critical in informing (i) excess overflow which is often evident when the usual pattern is distorted (ii) the effect of disease profile or burden assuming correct allocation of trauma beds i.e. if trauma bed = no was to be collapsed; the resulting picture would reflect dynamism in profiles and inform whether or not the trauma bed allocations require to be revisited. Analysis of the data reveals that number of hospital beds allocated for trauma patients has to be increased because of the burden caused on non-trauma beds. Some balance may also be achieved to some extent in the short term by re-allocating some of the non-trauma beds to trauma patients to meet the demand.

Table 9: Diagnostic profile by year code

Ward Code	Year_Code		Total
	1	2	
Missing data	1	0	1
Cardiothoracic	17	15	32
ENT	33	14	47
Gastroenterology	0	29	29
General Surgery	75	40	115
Maxillo Facial	2	5	7
Neurosurgery	15	13	28
Oncology	0	17	17
Ophthalmology	8	22	30
Orthopadics	39	55	94
Paediatrics Surgery	24	22	46
Plastic Surgery	22	5	27
Trauma	9	1	10
Urology	37	31	68
Vascular Surgery	0	6	6
Total	**282**	**275**	**557**

The above table identifies the diagnostics by year code and it is apparent that the total numbers of patients admitted in the hospital wards over the three year period of study have not increased significantly. This is probably caused by the fact that the total number of hospital beds remained static, and any over-flow of patients could not be accommodated in the hospital. The neighbouring Tshwane District Hospital and also Mamelodi Hospital were increasingly used to accommodate more patients as they commissioned more new bed numbers. However, it must be noted that the frequency listed above resonates and compliments the information already presented except that in this instance, the total diagnostics is divided between the two years of the study (year code 1 and year code 2). The significant find above is that the big diagnostics decreased from year one to year two with the exception of orthopaedics which actually increased.

4.3 KRUSKAL WALLIS TESTS

Kruskal Wallis, the non – parametric equivalence of ANOVA (which is a statistical procedure useful in comparing means of several groups of observations) was used to compare two independent variables as well the domains (the study research as earlier on indicated is 'mixed' using both qualitative and quantitative data elements).

The "median test rank" method was used to test the null hypothesis for the difference in means between various groups i.e. the null hypotheses says there are no differences and the decision rule is to reject the null if the p-value is less than the level of significance alpha set at 0.05.

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Age is the same across categories of Trauma.	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.
2	The distribution of LOS is the same across categories of Trauma.	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Figure 10: Kruskal Wallis (Age /Length Of Stay vs Trauma)

The p-value above is very small (less than 0.05). It can be concluded that the effect of Age and the Length of Stay differs between trauma and non- trauma cases.

Table 10: Kruskal Wallis (Age /Length Of Stay vs Trauma) Statistics

Group Statistics

	Trauma	N	Mean	Std. Deviation	P-values
Age	yes	176	38.94	20.913	0.000
	no	380	45.95	24.457	
LOS	yes	175	6.49	6.901	0.000
	no	378	4.98	8.372	

There difference in both Age and LOS between trauma and non- trauma is such that the trauma = no group have a higher average number of years i.e. are on average, 7 years older than the trauma = yes group. Trauma patients are on average than non-trauma patients, possibly indicative that younger people tend to be more involved in activities that may predispose them to trauma.

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The medians of Age are the same across categories of DOA_Y.	Independent-Samples Median Test	.436	Retain the null hypothesis.
2	The distribution of Age is the same across categories of DOA_Y.	Independent-Samples Kruskal-Wallis Test	.211	Retain the null hypothesis.
3	The medians of LOS are the same across categories of DOA_Y.	Independent-Samples Median Test	.792	Retain the null hypothesis.
4	The distribution of LOS is the same across categories of DOA_Y.	Independent-Samples Kruskal-Wallis Test	.145	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Figure 11: Kruskal Wallis (Age /Length Of Stay vs year of admission)

There is no statistical effect of either Age or Length of Stay effect emanating from the year of admission as all the p-values are (0.436; 0.211; 0.792 and 0.145) are greater than 0.05. This is important for the research study in that the observed trends are therefore free of seasonal fluctuations and that any gradual increments or trends, could in fact be in response to changes only in the disease burden / profile. The statistics below show no real plausible difference.

Table 11: Kruskal Wallis (Age /Length Of Stay vs year of admission) Statistics

	Year_Code	N	Mean	Std. Deviation	P-Values
Age	1	282	42.25	24.834	0.211
	2	275	45.21	22.182	
LOS	1	278	5.14	9.124	0.145
	2	275	5.77	6.584	

The above results and those in the figure below, correlate with the fact that if there is no statistical effect of either Age or LOS emanating from the year of admission, then there will be no effect from the year code as the year code merely groups the year of admissions into two.

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The medians of Age are the same across categories of Gender.	Independent-Samples Median Test	.000	Reject the null hypothesis.
2	The distribution of Age is the same across categories of Gender.	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.
3	The medians of LOS are the same across categories of Gender.	Independent-Samples Median Test	.030	Reject the null hypothesis.
4	The distribution of LOS is the same across categories of Gender.	Independent-Samples Kruskal-Wallis Test	.079	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Figure 13 Kruskal Wallis (Age /Length Of Stay vs gender)

Table 12: Kruskal Wallis (Age /Length Of Stay vs gender) Statistics

	Gender	N	Mean	Std. Deviation	P-Values
Age	M	278	44.17	21.969	0.000
	F	248	47.65	22.621	
LOS	M	276	5.24	6.794	0.079
	F	246	5.78	9.372	

The above results show that there is a significant effect of gender on Age. The Female group is statistically older than the Male group and that the median Females LOS is higher compared to the Males. This could, if triangulated against demographic data, be consequential to the fact the females tend to live longer or tend to show a higher life expectancy than men.

4.4. ASSOCIATIONS

There is association between year of admission and Length of Stay after adjustment of age of patient. In all cases, Anova results show no statistical significance of year admission or year code on either LOS or Age as no p-value is less 0.05 the level of significance, hence H_0: difference in factor levels = 0 cannot be rejected.

In order to measure measure the effect (if any) of an association between two factors / variables that are categorical. The Pearson Chi-square p-value is computed and if less than the level of significance (i.e. 0.05), it can be concluded that there is dependency of association.

Table 13: Cross tabulation of Ward code by Gender

	Gender				
Ward code	missing	C	F	M	Total
missing	0	0	1	0	1
Cardiothoracic	0	1	17	14	32
ENT	1	3	**16**	**27**	47
Gastroenterology	0	0	13	16	29
General Surgery	0	0	**76**	**39**	115
Maxillo Facial	0	1	3	3	7
Neurosurgery	0	0	**9**	**19**	28
Oncology	0	0	10	7	17
Ophthalmology	0	3	13	14	30
Orthopadics	0	0	46	48	94
Paediatrics Surgery	0	**22**	10	14	46
Plastic Surgery	0	0	**20**	**7**	27
Trauma	0	0	5	5	10
Urology	0	0	**8**	**60**	68
Vascular Surgery	0	0	1	5	6
Total	1	30	248	278	557

Chi-Square Tests						
				Monte Carlo Sig. (2-sided)		
					99% Confidence Interval	
	Value	df	Asymp. Sig. (2-sided)	Sig.	Lower Bound	Upper Bound
Pearson Chi-Square	270.809[a]	42	.000	.001[b]	.000	.002
Likelihood Ratio	193.099	42	.000	.000[b]	.000	.000
Fisher's Exact Test	197.162			.000[b]	.000	.000
N of Valid Cases	557					
a. 36 cells (60.0%) have expected count less than 5. The minimum expected count is .00.						
b. Based on 10000 sampled tables with starting seed 92208573.						

Table 13 confirms a high statistically significant association between gender and ward code (p-value = 0.001). Females tend to dominate in General Surgery & Plastic Surgery wards, Children in Paediatric whilst Males in ENT, Neurosurgery & Urology wards.

Chi-square test allows for testing of the significance in the relationship, i.e. "it tests the goodness of fit" (Zikmund, 2003: 511). From the above sections, determinants so far identified include Gender, diagnosis / ward code as well as the unavailability of trauma beds. It is critical that cross tabulations involving those two are performed as well as to establish associations to them and in the above table 14, it is clear that trauma bed (yes= for bed designated for trauma and no = bed not designated and as such, a result of overflow) confounds associations. There is a need to investigate bed management within various disciplines as only orthopedics beds are fully exhausted before overflowing into non-trauma beds.

Table 14-18: Cross tabulation of Ward code by Gender by Trauma

Trauma bed		Gender			
		Children	Female	Male	Total
	missing		1		1
no	Cardiothoracic	1	14	8	23
	ENT	**3**	**13**	**23**	**39**
	Gastroenterology	0	13	16	29
	General Surgery	**0**	**69**	**29**	**98**
	Maxillo Facial	0	0	1	1
	Neurosurgery	0	4	6	10
	Oncology	0	10	7	17
	Ophthalmology	2	10	9	21
	Orthopadics	0	6	4	10
	Paediatrics Surgery	**17**	**9**	**13**	**39**
	Plastic Surgery	**0**	**17**	**4**	**21**
	Trauma	0	2	1	3
	Urology	**0**	**8**	**55**	**63**
	Vascular Surgery	0	1	5	6
	Total	23	176	181	380
yes	Cardiothoracic	0	3	6	9
	ENT	0	3	4	8
	General Surgery	0	7	10	17
	Maxillo Facial	1	3	2	6
	Neurosurgery	0	5	13	18
	Ophthalmology	1	3	5	9
	Orthopadics	**0**	**40**	**44**	**84**
	Paediatrics Surgery	5	1	1	7
	Plastic Surgery	0	3	3	6
	Trauma	0	3	4	7
	Urology	0	0	5	5
	Total	7	71	97	176
	Grand Total	30	248	278	557

The p-value in the above instance = 0.000 and differences are ascertained between gender and ward.

CHAPTER 5 DISCUSSION

5.1 INTRODUCTION

The main purpose of the research study is to determine the admission trends of trauma patients to Steve Biko Academic Hospital during the three-year period from 1st April 2005 to 31st March 2009. Accurate inferences are essential for proper planning and management of incidences of severe trauma not only at SBAH but the country in general which are exerting a lot of pressure on the public healthcare delivery platforms with tertiary hospitals bearing an ever-increasing patient load as a result. Hospital managers are able to know what is lacking, critical and how best control measures can be provided with urgency.

5.2 STUDY OBJECTIVES

Trauma injuries are a part of the quadruple Burden of Disease and given that trauma care encompasses a greater consume of resources as the cost of attending to and managing these patients is also intensive; the research sought to:

- Improve understanding of the trauma patient profiles (demographics and diagnosis) for the period of study.
- Determine the trend of diagnosis, LOS of trauma patients
- Assess the impact of these trauma admissions on the non-trauma cases in terms of access to care.

- Develop intervention strategies to facilitate the creation of efficient trauma systems / treatment options to manage the load of trauma patients relative subsequent to the patterns observed.

Study results have shown that in the period covered, 557 trauma incidences were admitted, close to 36% in 2005/6 and about 15% in 2006/7 49% in 2008/9.

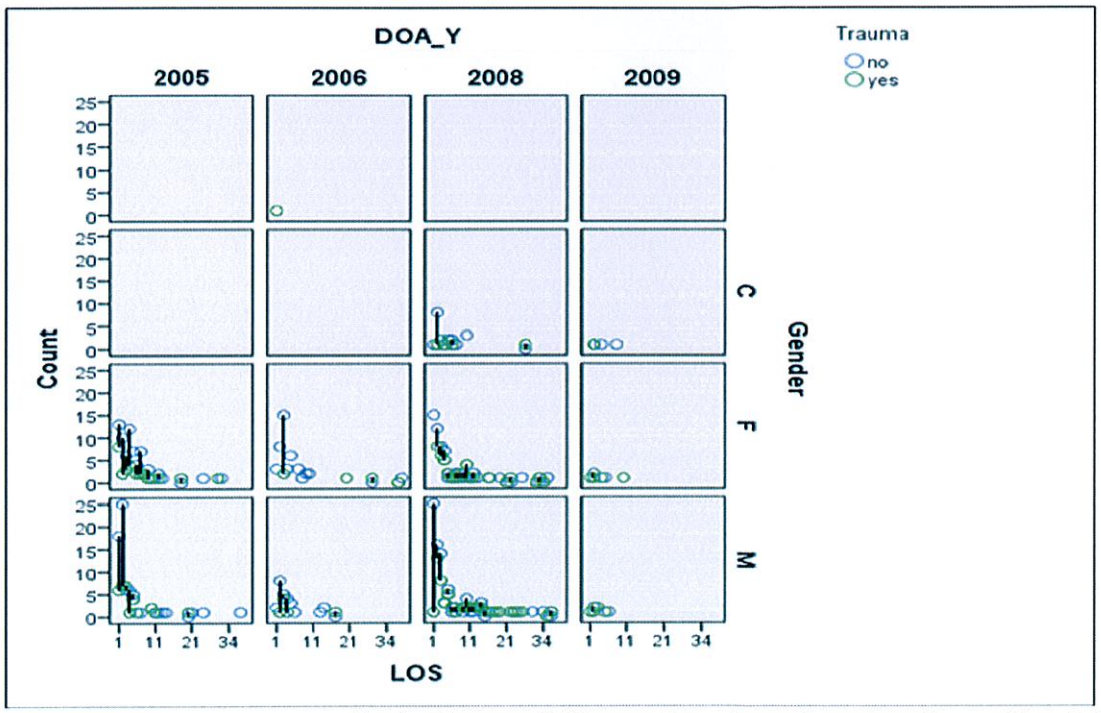


Figure 14: Cross tabulation of Year by Gender by Length Of Stay

About half the total trauma admissions were male with a small percentage being children (5.4%) and the rest female. In 2005, the ratio of male to female was almost the same, however there were no children admitted in that year. In 2006 there were more females admitted than males and this was reversed in 2008 with significantly more male admissions. No associations involving any year were established by the LOS in being gender depended as shown in figure

14. However, it is clear that the number of males discharged in the first 11 days is much higher than for females irrespective of the year and inevitably, and LOS was determined to be significantly higher for Females than for Males.

The fact that the Female group is statistically older than the Male group and as statistically determined that Gender and Age are associated, this could very well imply that Gender is a confounder to the association between LOS and Age or alternatively, Age is a confounder in the relationship between LOS and Gender. If one relates the findings there was established an association between Gender and ward code showed that Females tend to dominate in General Surgery & Plastic Surgery wards, Children in Pediatric whilst Males in ENT, Neurosurgery & Urology wards with LOS significantly different across the gender groups; it therefore implies that in fact LOS and Gender are indeed the ones confounded by Age. This is logical as trauma procedures could differ by gender (as presented by ward code) and for those in the same ward code (and / or gender), Age plays a prominent role in determining LOS. This is what the cofounding is alluding to.

The results in figure 14 show variability of LOS across the Gender groups, it is once again evident that Females have the largest inter-quartile range (IRQ) followed by the children and the Males have the least. This is further evidence of the above fact that Females tend to stay longer in trauma care (as Males discharge much sooner). Also, Males are more consistent in their LOS than Females as evidenced by fewer outliers but the Children are much more consistent overall, this is correct when viewed in the context of diagnosis, the spectrum of diagnoses is least for children and much wider for Females. A fact confirmed by the distribution of overflows (trauma = no) by Gender.

In terms of ward capacity, trauma admissions were greatest in General surgery (20.6%), Orthopedics (16.9%) and Urology (12.2%). Another crucial finding is that more than 68% of trauma admissions had to be accommodated in non-trauma beds and most of these overflows were relocated or housed in General surgery, Orthopedics, Urology and ENT.

SBAH is stretched as the number of trauma patients seen was 2.16 times the number of available trauma beds; yet despite all this, the majority of discharges were within the first two days, few exceeding 5 days and even much fewer exceeding 11-14 days. Whilst this shows the efficiency and fighting spirit at SBAH to attend to cases timeously, the impact and strain of the workload put on staff and the effect on resources (though not directly measured) should never be ignored.

5.3 LIMITATIONS

Methodologically, Chi-square test allows for testing of the significance in the relationship, i.e. "it tests the goodness of fit" (Zikmund, 2003: 511) but these are confined to cell observations of at least 5. Other limitations to this study included:

- The non-response was not accounted for and as such, the research findings not adjusted for this. A greater part of this emanated from data collection forms being inadequately completed and therefore potentially obscuring the true validity of the study findings.
- The diagnoses gleaned from the electronic hospital information system might not always indicate whether the patient's admission was due to a traumatic incident or not, for e.g. fracture neck of femur in an old person.

In mitigation and to reduce effects of the above limitations, incomplete records were taken into account with the fields missing so indicated. The advantage being that the absence of some partial information does not preclude the value of that information present being a part of the study. An alternative could be, were the records are deemed sufficient enough, to use "*data imputation*" techniques to account for non-responses and data fields '*missing not completely at random*' (MNCAR). The number of subjects in this instance was clearly too small for that technique as the method is premised on multiple similar or almost similar record profiles.

CHAPTER 6 CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS TO THE OBJECTIVES OF THE STUDY

The main aim of the study was to determine the admission trends of trauma patients to Steve Biko Academic Hospital during the three-year period from 1st April 2005 to 31st March 2009. Conclusions related to specific objectives are:

- The demographic and diagnoses of the trauma patient profiles for the period of study have been adequately synthesized.
- The trend of Diagnosis, LOS of trauma patients and factors influencing patterns and confounders have been presented.
- The impact of trauma admissions on the hospital operations have been identified and indirectly quantified in terms of access to care and resource settings.
- The intervention strategies to facilitate the creation of efficient trauma systems / treatment options to manage the load of trauma patients relative subsequent to the patterns is subsequently presented in the next section.

A review of some of the recommendations mitigating against findings determined in the preceding chapter include:

- The number of hospital beds allocated for trauma patients has to be increased because of the burden caused on non-trauma beds.
- Bedding capacity to be predominantly increased for females, in particular in relation to General Surgery & Plastic Surgery wards as children are more predominant in Paediatric whilst Males are predominant in ENT, Neurosurgery & Urology wards.

- Some balance may also be achieved to some extent in the short term by re-allocating some of the non-trauma beds to trauma patients to meet the demand.
- Trauma preventative strategies be developed targeting the younger generations as possibly younger people tend to be more involved in activities that may predispose them to trauma in the surrounding catchment area.
- There is a need to craft a bed management framework within various disciplines as only orthopedics beds are fully exhausted before overflowing into non-trauma beds. Efforts must be made to electronically monitor Bed occupancy in that regard.

6.2 RECOMMENDATIONS

The significant find above is that the big diagnostics decreased from year one to year two with the exception of orthopedics which actually increased. It may be necessary to examine each and every patient who exceeds 5 days to ascertain if continued stay could be unavoidable as well as trauma causality case by case. There exist a need to establish the cause why there is a high number of non-trauma beds (trauma = no) utilized when the trauma beds (as per level of ward code) show no evidence of having been filled up with the exception of orthopedics. It is necessary to establish the trauma bed allocations by discipline and monitor adherence to the allocation. The findings of this research study therefore, support the observations of (Wallis, 2011) that "**the time is long overdue for trauma to be made a national government priority**" and specific efforts and policy parameters ought to be initiated in that regard.

6.3 FUTURE RESEARCH

It is recommended that ICD10 coding as a data management strategy, ought to be the basis of diagnosis as it was noted earlier on that the electronic hospital information system might not always indicate whether the patient's admission was due to a traumatic incident or not. Furthermore, such an approach will ensure seamless diagnosis and secondly, a criteria that determines bed allocation for trauma vs. non trauma would to be more elaborately clear and even more important, should be benchmarked against prevailing trauma incidences in SA tertiary hospitals. The effect of other disease burdens aside from trauma should also be investigated, especially given very high LOS such as 122 in one case. More work is required to develop accurate, unifying clinical guidelines that optimizes the utilization of resources such as personnel and beds in a resource-limited public healthcare environment with a view to improving trauma LOS outcomes.

6.4 SUMMARY AND CONCLUSIONS

The study report has provided a good framework for understanding trauma and this should be extremely useful to SBAH's trauma management to help with the development of an integrated trauma system e.g. if a separate trauma section of the hospital is to be created with its own resources allocation so that non-trauma services are protected and disruption to other hospital operations arrested, then the study also provided rudimentary evidence of the resource base that would be required for such a section. The report is also useful to other institutions of similar size and nature to SBAH and for possible utilization in policy options. Trauma data are rich yet still underused.

REFERENCES

Birolini D. 1991. Trauma: a forgotten epidemic, or Brazil in times of trauma? AMB. Rev Assoc. Med Bras, 1991 37(2): 53-54.

Bowley DM, Dickson EJ, Tai N, Goosen J, Boffard KD. 2005. A theme issue by, for, and about Africa: South Africa is still blighted by trauma. British Medical Journal, 331(7519); page 780.

Brysiewicz P. 2001. Trauma in South Africa. International Journal of Trauma Nursing, 7(4): 129-132.

Forjuoh SN, Zwi A, Mock CN. 1998. Injury control on Africa: getting governments to do more. Tropical Medicine Int. Health; 3(5): 349-356.

Goosen J, Bowley DM, Degiannis E, Plani F. 2003. Trauma Care Systems in South Africa. Injury, 34(9): 704-708.

Hosman J. 1994. Trauma, a malignant epidemic in South Africa. Nederlandse Tijdshcrift Geneeskunde, 138(46): 2321-2323.

Engelbrecht, A., du Toit, F. G., & Geyser, M. M. (2015). A cross-sectional profile and outcome assessment of adult patients triaged away from Steve Biko Academic Hospital emergency unit. South African Family Practice, (ahead-of-print), 1-6.

Knottenbelt JD. 1989. Trauma, a scourge of modern society. South African Medical Journal, 1989 75(1): 1-2.

Lutge EE, Muirhead D. 2005. The epidemiology and cost of trauma to the orthopaedic department at a secondary-level hospital. South

African Journal of Surgery, 43(3): 74-77.

Mai-phan TA, Patel B, Walsh M, Abraham AT, Kocher HM. 2008. Emergency Room surgical workload in an inner city UK teaching hospital. World Journal of Emergency Surgery, 3-19.

Matsopoulos RG, Prinsloo M, Butchart A, Peden MM, Lombard CJ. 2006. Estimating the South African trauma caseload. International Journal of Injuries Control, 13(1): 49-51.

Muckart DJ. 1991. Trauma: the malignant epidemic. South African Medical Journal, 79(2): 93-95.

PCORI Scientific Program Area. April 2013: Compare the effectiveness of care delivery (e.g., local hospital care, trauma center care) on improving outcomes in patients living in rural communities who experience trauma.

Olukoga A. 2004. Cost analysis of road traffic crashes in South Africa. Inj. Control Saf Promot, 11(1): 59-62.

Robicsek F, Ribbeck B, Walker LG, Thompson MH, Hollenberg JI, Baker JW. 1993. The cost of violence: The economy of healthcare delivery for non-accidental trauma in an urban south-eastern community. New Canada Medical Journal, 54(11): 578-582.

Saadia R. 1999. Organization of hospital responses for the trauma epidemic. British Medical Bulletin, 55(4): 767-784.

van der Spuy JW. 2000. Trauma, alcohol and other substances. SA Medical Journal, 90(3): 244-246.

van der Spuy J, de Wet B. Trauma today and tomorrow. SA Medical Journal, 1991 Jan 19: 79(2): 61-62.

van Hoving, D. J., Barnetson, B. K., & Wallis, L. A. (2015). Emergency care research priorities in South Africa. SAMJ: South African Medical Journal, 105(3), 202-208.

APPENDIX A: ETHICS CLEARANCE CERTIFICATE

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG
Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Dr Molefe E Kenoshi

CLEARANCE CERTIFICATE	**M090348**
PROJECT	The Admission Trends of Trauma Patients in a South African Tertiary Hospital Over a Three Year Period from April 2005 to March 2008
INVESTIGATORS	Dr Molefe E Kenoshi.
DEPARTMENT	School of Public Health
DATE CONSIDERED	09.03.27
DECISION OF THE COMMITTEE*	Approved unconditionally

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

DATE 09.03.31 **CHAIRPERSON** .....
(Professor PE Cleaton-Jones)

*Guidelines for written 'informed consent' attached where applicable
cc: Supervisor : Prof Shan Naidoo

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES...