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PRE-HOSPITAL TRAUMA CARE: TRAINING AND PREPAREDNESS OF, AND PRACTICE BY, MEDICAL GENERAL PRACTITIONERS IN LIMPOPO PROVINCE

Obby Risiva

A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Family Medicine

Johannesburg January 2009

DECLARATION

I, Obby Risiva, declare that this research report is my own work. It is being submitted for the degree of Master of Family Medicine in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other university.

The study has received ethical approval from the University of the Witwatersrand Committee for research on Human Subjects (Medical). Approval protocol number M050230.

……

Dr Obby Risiva

DEDICATION

To Nyiko-the pillar that brings strength to the palace. To Ntsako-the pride of my heart. To Vunene- the joy of my soul. To Akani-the comfort of my life. Most of all to Rebo- the channel of blessings.

ABSTRACT

Trauma is a pandemic that has a significant negative impact on the lives of its victims and national economies. This descriptive study was conducted on 103 private medical general practitioners in Limpopo Province. Ethical approval for the study was obtained from the University of the Witwatersrand Committee for research on Human Subjects (Medical). Approval protocol number M050230.

The aim of the study was to determine the state of pre-hospital trauma care: training and preparedness of and practice by private medical general practitioners (GPs) in Limpopo Province. Data was collected by means of an anonymous, confidential, self-administered questionnaire.

The objectives were to determine demographic features of the respondents; determine the status of emergency pre-hospital trauma training, preparedness and practice amongst the respondents; and to determine their incentives and disincentives to trauma medicine training, preparedness and practice in Limpopo province.

The response rate was 36%. Fifty five per cent (55%) of the respondents had received trauma training since they commenced work as GPs. The proportion of GPs who said that they received trauma training while working in hospitals casualty departments was 52%. The number of respondents who completed ATLS was 24 (23%). Five (21%) of those who had completed ATLS updated their qualifications during years 2001 to 2005. Of the GPs surveyed 46% were not aware of ATLS course offered by the College of Emergency Care at Polokwane City.

The majority of the respondents graduated as medical practitioners from the university of Pretoria (38%) and MEDUNSA (31%). But undergoing trauma management training was not associated with the medical schools from which

respondents graduated as medical practitioners (p=0.767; Fisher's exact=0.827; Pearson chi2 = 4.9075). The medical schools from which respondents graduated as medical practitioners was also not related to the amount of private medical practice that comprised emergency care (p= 0.372).

Undergoing trauma training was not associated with the age of a GP (p value= 0.120; Fisher exact=0.127). Sex was not found to be associated with trauma training (p=0.895; Fisher exact=1.000). Sex also had no link to the proportion of medical practice comprising emergency care (p-value=0.153; Fisher 's exact=0.214; Pearson Chi2). Even though location of GP's practice was reported to be both an incentive and disincentive to trauma management training it was found not to be associated with trauma management training (p=0.393; Fisher exact=0.426; Pearson chi2 =1.5687)

There was no association between location of GP's practice and preparedness for trauma management. The exception to the finding was in terms of availability of chest drains where the p-value was 0.001. It was found that 31% of respondents who indicated that they had chest drains were based in rural areas while about 6% were practicing in urban areas. Availability of morphine and other analgesics (p-value=0.025, Fisher's exact=0.038, Pearson Chi2 (1)=5.0165) were associated with preparedness for trauma.

There was no association between type of GP practice and trauma management training (Pearson Chi2 (2) =2.1242. p- value = 0.346. Fisher's exact = 0.429). Almost 95% of those who stated that they spent at least 50% of their time in private general medical practice were full-time. Being in full-time private general medical practice did not necessarily translate into a higher proportion of the practice that comprised trauma care. It was found that 64% of the respondents who were in full-time private general medical practice had an emergency trauma care burden of less than 10% compared to 36% that had a proportion of 10% and more. Amongst part-time practitioners the percentage of those whose burden of trauma care was less than 10% was equal to that of those with 10% and more.

The findings implied lack of an association between time spent in private general medical practice and proportion of the practice that constitutes trauma care (p=0.621).

The commonest method of updating trauma management skills was through personal study (37% of respondents) followed by attendance of trauma meetings (24% of respondents). Trauma trained GPs tended to have a higher proportion of their practices that comprised emergency trauma care (p-value = 0.030; Fisher's exact =0.050) than those who had not. The frequently used sources of trauma management information were personal experience (58%) of the respondents followed by continuing medical education (50% of respondents). Almost 50.8% of the respondents reported that they were fairly skilled to manage in a pre-hospital setting various types of injuries. Minor soft tissue injuries were the type of trauma that 68% of the respondents said that they could manage excellently.

Incentives factors to both trauma training and practice were high trauma prevalence (33.3% of respondents-training: and 20.7% of respondents-practice); performance improvement (20% of respondents-training: 12.1% of respondents respectively-practice); adequate and managed trauma care facilities (17% of respondents-training: 10.4% of respondents-practice); trauma care support (6.7% of respondents-training: 6.9% of respondents-practice); the need to improve trauma knowledge and skills (17% of respondents-training: 17.2% of respondents-practice) and; strategic GP practice location (7% of respondents-training: 6.9% of respondents-practice).

Major disincentives to both trauma training and practice were lack of time for trauma care (28.9% respondents-training: 14.9% respondents practice); unsupportive staff (10% respondents-training: 14.9% respondents-practice); perceived high cost of trauma care and poor rewards (15.6% respondents-training: 11.7% respondents-practice); substandard and inaccessible trauma care facilities (15.6% respondents-training: 24.5% respondents-practice); under-utilized trauma knowledge and skills (6.7% respondents-training: 4.3% respondents-practice);

restrictive healthcare regulations and policies (2.2% respondents-training: 2% respondents-practice); and low number of trauma patients seen (11.1% respondents-training: 3.2% respondents-practice).

In terms of preparedness for trauma the respondents were ill-prepared for trauma as evidenced by insufficient trauma equipment and drugs. Whereas almost all the respondents (frequency 102 or 99%) had stethoscopes only 7% had cricothyrotomy set. Only 18% of them had needle with one-way valve and chest drains. The trauma drug that appeared to have been the most widely stocked was adrenaline with a frequency of 96 or 93%. It was followed by aspirin with a frequency of 95 or 92%. Ketamine and zidovudine were drugs that were least stocked by the respondents. Their frequencies were 27 or 26%) and 33 or 32% respectively. The other equipment that was infrequently available at GPs' rooms was goggles (frequency 46%) suggesting poor adherence to safety measures.

There were low levels of preparedness to manage trauma patients independently with 43% reporting that they could independently adhere to universal safety measures. Whereas 52% of the respondents stated that they had received training in CPR 54.5% stated that they were equipped and prepared to open and protect the airway; 43% could independently provide adequate breathing while 45% of them could restore and maintain sufficient circulation, indicating a need to improve levels of CPR training.

It was recommended that more general practitioners in Limpopo province should be trained and involved in trauma care. It was further recommended that awareness should be raised about the ATLS offered at the College of Emergency Care in Polokwane City. Further research is needed to explore how trauma trained GPs could be better equipped, prepared and supported in the management of trauma. There was also a need to address the disincentive factors to trauma training, preparedness and practice while strengthening the incentives. Given the critical shortage of advanced emergency practitioners (such as paramedics) in Limpopo province, there was perhaps a need to consider how GPs, with their

advanced medical qualifications and strategic positioning within communities, could be better deployed in pre-hospital trauma care.

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To my family, for being there for me.

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INTRODUCTION

Trauma is a Greek word meaning wound or injury. It has been defined as any physiological shock, wound or distress that is likely to have long-lasting effects.[1] The Advanced Learner's Dictionary of Current English defined it as: 'diseased condition of the body produced by a wound or injury.'[2]

Du Plessis called it a surgical disease that should be treated by surgeons.[3] Hospital Association of South Africa (HASA) called it: 'the largest, deadliest and costliest surgical problem in South Africa'.[4] Goosen labelled it 'the hidden epidemic' in South Africa because it is very prevalent.[5] Boffard described it as the 'neglected epidemic' and 'malignant epidemic'.[6] The local and systemic response that injury causes has been called the 'real disease of trauma.'

Trauma is commonly seen as 'accidents' when in fact it is a public health disease. It was said that because it happened yesterday, is happening today and will happen tomorrow, it is predictable.[7] It is part of the quadruple of diseases (HIV/AIDS, degenerative diseases, diseases of poverty and trauma).[8] Wound healing is aimed at restoring structural integrity caused by the injury.[9]

The far-reaching effects of trauma mean that it cannot be defined in pathophysiological terms only. Its broader definition includes the psycho-social and economic impact that it has. There have been calls for education and advocacy to raise public awareness of the need to view trauma as both a public safety issue and health problem that is amenable to prevention and treatment rather than an accident or a random incident.

Doctors working in many parts of South Africa tend to face huge patient loads with minimal support.[10] Trauma not only pose additional burden but may contribute to

the stress that they often have to cope with according to Batemen[11] and Verkuijl[12]. Their response to and management of trauma is not only critical to patient survival but is likely to have a significant impact on the overall quality of healthcare delivery.[13]

The role of General practitioners in trauma care is important especially in areas where there is shortage of trauma care services and Emergency physicians (EPs). GPs form part of the 25% of private health care facilities rendering treatment to injured patients.[12] Their role in trauma care can be regarded as multidisciplinary, resuscitation, stabilization, and appropriate referral of the patient. They are also expected to determine if the patient's needs will likely exceed a facility's capabilities, arrange for patient's transfer and assure that optimum care is provided each step of the way. In rural and underdeveloped areas many of them render care in casualty units in hospitals without the benefit of having received specific training in trauma.[14] Campbell *et al* said that in areas where local hospitals are inaccessible GPs will need to have better emergency training and equipment availability as patients are more likely to present directly to their surgeries.[15] They are also expected to render trauma care expeditiously and professionally. But some GPs tended to avoid regularly handling certain specified minor trauma that often present to hospital.[16] The hazards that are encountered at a pre-hospital trauma scene often add to the challenges that GPs have to deal with when caring for the injured.

While there is a need for doctors to be more involved in the care of injured patients applications to at least one major trauma fellowship are reported to be declining.[17] Various disincentives factors to trauma training and practice have been cited including perceived poor remuneration and limited career opportunities.[18]

It was reported that 70% of the population of United States of America lives in an urban environment while 70% of trauma deaths occur in a rural locale and that the relative risk of a rural victim dying in a motor vehicle crash is 15:1 compared with a victim in an urban crash.[19] Limpopo province in South Africa is largely rural area and it recorded the second highest unemployment rate in the country.[20] Intentional

and unintentional injuries contributed 11.25% of deaths of males and females in the period 1997 and 2001 in the province.[20] Given the link between rural environment, poverty and trauma it becomes necessary to conduct a study looking into trauma management in the province. Such a study is also important because one of the South African Department of Health's strategic priorities for the national health system, 2004-2009, is the strengthening of trauma care services.

Furthermore given the epidemic proportions of trauma; the shortage of licensed and well equipped trauma practitioners; responsibility upon GPs to care for the injured; the challenges of a pre-hospital trauma setting; and disincentives to trauma training and practice it is worthwhile for such research to explore GPs' training and preparedness for and management of trauma in a pre-hospital environment in Limpopo province. The author knows of no other similar study ever carried out in Limpopo province.

From a personal point of view the author decided to embark upon the research following the untimely death of his medical partner in a horrific car accident in 2003 in Limpopo Province. The study hopes to contribute to the growing body of knowledge on trauma, its challenges and management.

1 DEFINITIONS

Emergency = the need to act fast, to provide immediate care.

General Practitioner= family practitioners in private practice.

Injury prevention=efforts to forestall or prevent events that might result in trauma.

Preparedness for trauma= entails developing plans and protocols for addressing events that can disable us. It involves investing time training and practicing with elaborate equipment and protective gear. The main goal of trauma preparedness is the stabilization of injury and preservation of life.

Quality improvement=a method of evaluating and improving processes of patient care which emphasizes a multidisciplinary approach to problem solving, and focuses not on individuals but systems of patient care which might be the cause of variations.

Quality management=a broad term which encompasses both quality assurance and quality improvement, describing a program of evaluating the quality of care using a variety of methodologies and techniques.

Rural=those areas not designated as metropolitan statistical areas (MSA).

Rural trauma region=an area in which the population served is fewer than 2500, has a population density of fewer than 50 persons per square mile, has only basic life support pre-hospital care, has pre-hospital transport times that exceed 30 minutes on average and is lacking in sub-speciality coverage for specific injuries.[19]

The 'golden hour'=is the first sixty minutes after the occurrence of multi-system trauma and during which definitive care should be administered in order to avoid either loss of life or disablement.

Trauma= the medical term for a "personal injury or wound".

Trauma care system=an organized approach to treating patients with acute injuries; it provides dedicated (available 24 hours a day) personnel, facilities, and equipment for effective and coordinated trauma care in an appropriate geographical region.

Trauma center= a specialized hospital facility distinguished by the immediate availability of specialized surgeons, physician specialists, anaesthesiologists, nurses, and resuscitation and life support equipment on a 24 hour basis to care for severely injured patients or those at risk for severe injury.

Training= a process which is used to enhance the knowledge and skills of employees. Its aim is to improve behaviour and performance of health-workers so that the organization can achieve its objectives.

Triage= the process of sorting or prioritizing injured patients on the basis of the actual or perceived degree of injury and assigning them to the most effective and efficient regional care resources, in order to insure optimal care and the best chance of survival.

Urban area=area consisting of central city and its environs with a combined population of more than 50000 and a population density of 1000 or more per square mile.[19]

Wound=A wound is a pathological state in which tissue becomes separated or destroyed.

ABBREVIATIONS

ACLS= Advanced Cardiac Life Support; **AEA=** Ambulance Emergency Assistant; **APLS=** Advanced Paediatric Life Support; **ATLS=** Advanced Trauma Life Support; **BAA=** Basic Ambulance Assistant; **BASICS=**British Association for Immediate Care; **BTLS=**Basic Trauma Life Support; **CCA=** Critical Care Assistant; **CD=** Compact Disc; **CME=** Continuous medical education; **CPD=** Continuous professional development; **DSTC=** Definitive Surgical Trauma Course**; DVD=** Digital Video Display; **EMS=** Emergency Medical Services; **EMST=** Early Management of Severe Trauma Course; **EP=** Emergency Physician; **ESS=** Essential Surgical Skills**; ETQA=** Education Training Quality Assuror; **GP =** General Practitioner; **HE=** Higher Education; **HPC(SA)=**Health Professions Council of South Africa; **HPS=** Human patient simulators; **ILS=** Intermediate Life Support; **IT=** Information technology; **KNUST=** Kwame Nkrumah University of Science and Technology; **MSA=** Metropolitan Statistical Areas; **NQF=** National Qualification Forum; **NTMC=** National Trauma Management Course**; OBE=** Outcome based education; **PBECP=** Professional Body for Emergency Care Personnel; **PHTLS=**Pre-hospital Trauma Life Support; **PTC=** Primary Trauma Care; **SGB=** Standard Governing Body; **TNCC=** Trauma Nursing Core Course; **TTT=**Trauma Team Training; **VCR=** Video Cassette Recorder; **WHO=** World Health Organization;

2 AIMS AND OBJECTIVES OF RESEARCH STUDY

2.1 AIM OF STUDY

The aim of the study was to determine pre-hospital trauma care: training and preparedness of and practice by medical general practitioners in Limpopo Province.

2.2 OBJECTIVES

The objectives of the study were to:

a. determine demographic features of the medical general practitioners in Limpopo Province such as age, sex, location of medical practice and whether they are in full-time private medical practice;

b. determine the status of emergency pre-hospital trauma training (measuring variables such as method of trauma training, qualifications, and currency of trauma certifications); preparedness (considering variables such as emergency trauma equipment and level of readiness to respond effectively to an emergency); and practice amongst medical general practitioners in the province (by establishing inter alia, the proportion of their medical practice which constitutes trauma, the kind of trauma they deal with on a regular basis and how they update their trauma management knowledge and skills);

c. to determine incentives and disincentives identified by the medical general practitioners to trauma medicine training, preparedness and practice in Limpopo Province.

3 LITERATURE REVIEW

3.1 PREVALENCE OF TRAUMA

South Africa faces an epidemic of trauma accounting for between 12 to 15% of all deaths in the country.[21] The country has been described as 'the trauma capital of the world.' [22] It was reported that almost 1,5 million patients with trauma present at secondary and tertiary public hospitals in South Africa every year.[13] It was further said that in an average emergency unit, almost 12% of the patient population comprises trauma patients, while in the United Kingdom the figure is almost 8%.[22] The epidemic is made of patients whose injuries threaten their lives; some patients who need admitting to hospital but, are in no danger of death; patients with serious injuries but who can be treated as outpatients; and those with only minor injuries.[23]

It was estimated that 16% of all deaths of people between the ages of 15 and 40 years in the country are by trauma.[4] It was further reported that one third of all patients treated at emergency units in South Africa were diagnosed with trauma.[8] According to EuropAssistance in South Africa trauma is second only to circulatory disease as a cause of death.[4]

The trauma caseload per province is shown in the table 1. The table revealed that injury rates for traffic, violence or other injuries showed significant inter-provincial variation, and violence accounted for more than half of the yearly trauma caseload.[13]

Table 1: Trauma caseload per province.

PROVINCES	No. hospitals supplying caseload information	No. trauma cases from questionnaire responses	Mean no. trauma cases per facility	Median no. trauma cases per facility	Headcount data not available	Total no. trauma cases based on mean	Total no. trauma cases based on median
Gauteng Province	18	198406	11023	7522	9	297613	266104
Free State	21	79626	3792	1821	7	106170	92373
Eastern Cape	33	150706	4567	2000	26	269447	202705
Northern Cape	15	50414	1621	1621	3	59933	55277
Western Cape	30	236032	6297	6297	1	243900	242329
KwaZulu-Natal	39	200144	2000	2000	18	294950	236144
Northern Province	22	52112	949	949	22	104230	72990
North-West	14	36954	1301	1301	17	81817	59071
Mpumalanga	18	41759	2248	2248	6	55679	55247
ALL PROVINCES	**210**	**1028896**	**25964**	**25964**	**108**	**1513739**	**1282240**

Traffic-related deaths and injuries constitute a significant component of the trauma caseload. Road deaths are a global epidemic on a scale of malaria and tuberculosis.[24] Mock, Joshipura and Goosen put the figure of people killed or injured on the roads throughout the world per annum at 20 million.[25] The Commission for Global Road Safety estimated the number of people killed in motor vehicle accidents at 1,2 million and 50 million injured every year worldwide.

More than 9000 people are killed on the roads of South Africa yearly[6] and more than 33000 people are seriously injured in traffic accidents. In 2005 it was reported that the number of deaths on South African roads over the December festive seasons was over 1400, a figure which is very high by international standards.[7]

Car accidents also remain the leading cause of trauma in children and account for 26-40% of all trauma–related childhood deaths in Africa. In South Africa more than

one-third (39,5%) of infant transport-related deaths and more than half (56,4%) of child-related deaths were the result of pedestrian injuries.[26] Among children, the 5-9 year age category was the most at risk for passenger injuries of all the non-natural deaths occurring in South Africa at least 10% are persons under the age of 18 years. It was also reported that most of the deaths due to trauma were of young people.

Rural death rates associated with road accidents have been found to be double those in the urban areas in most parts of the world. The burden of death and disability from trauma was also found to be more notable in low-and middle-income countries and an estimated 90% of the total burden of injury occurred in such countries.[27] The Commission for Global Road Safety said that more than 85% of the casualties were in low-and middle-income countries, with road deaths second only to AIDS as a global killer of young men.[27] Given the major negative economic impact that trauma is likely to have on the low-and middle income countries (estimated at $65-100bn) the Commission called upon the Group of Eight to back a $300million, 10-year action plan to address the issue.

According to Directorate of Traffic Safety Data 39% of those people killed in transport accidents between 1985 and 1998 were pedestrians.[25] The figure of pedestrians killed in transport accidents had decreased from over 47% in 1987.

Figure 1 below shows that substance abuse is implicated in over 80% of trauma patients.[28]

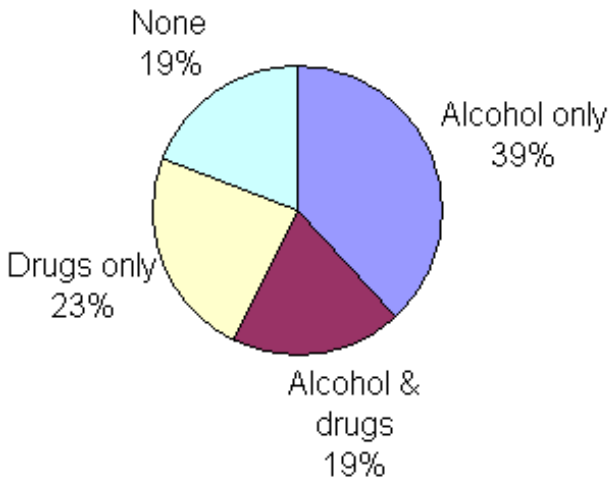

Figure 1: **Substances abused by injured patients**

According to the 1996 national figures on trauma 23,3% of all male deaths and 10,2% of all female deaths were attributed to external violence, and external violence was the causative factor for the 35,4% of male and 15,7% of female life years that were lost. Given the high prevalence of trauma in South Africa the National Department of Health and Welfare has, as one of its strategic priorities, the strengthening of Emergency Medical System.[29]

Internationally traumatic injuries were found to be responsible for 16% of the global burden of disease and that approximately on a daily basis, approximately 16000 people die from injuries throughout the world.[30] It was estimated that 37 million Americans experience trauma every year.[1] while almost 20 million people are killed or injured on the roads throughout the world.[25] In 1995, in the United States of America, 148,000 people were reported to have died as a result of trauma.[7] In that country trauma patients were claimed to take up almost 19 million hospital days per year.[4] Moreover in 1996 in that country, trauma caused by inter alia, road traffic collisions, homicide, violence, and unintentional injuries, combined, were reported to have accounted for more 'Disability Adjusted Life Years' (DALY) for men than did ischaemic heart disease.

The Global Burden of Disease study reported that injuries accounted for 10% of overall deaths in 1990, and predicted that by the year 2020 there would be a decrease in death from infectious diseases and peri-natal disorders and increases in deaths from motor vehicle accidents, violence and war.[31]

3.2 DRIVERS OF THE TRAUMA PANDEMIC

The brunt of the trauma-related burden of disease was borne mainly by the poor and disadvantaged. In sub-Saharan Africa the major drivers of trauma were identified as wars, interpersonal violence and transport-related accidents. According to the Global Burden of Disease study the injury-related burden of disease will continue to rise between 1990 and 2020 unless there is drastic intervention to reduce it.[13] In South Africa car accidents, homicide and suicide are main contributors to the trauma-related burden of disease. According to the second annual report (October 2001) of the National Institute of Mortality Surveillance Systems (NMSS) homicide accounted for 45% of non-natural mortality of all cases reviewed, accidents 35% and suicide 9%. The figures for 2001 were not much different from those of 1999 where it was reported that almost half of all deaths due to injury were as a result of homicide (47,1%).[32] (See figure 2 below).

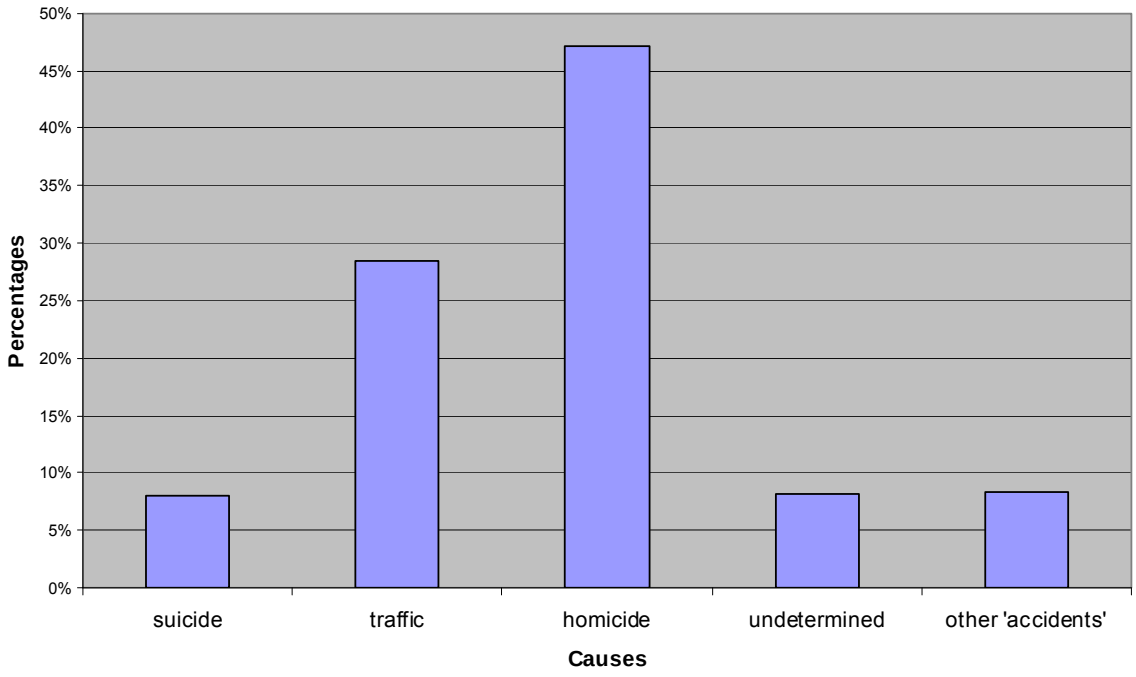

Figure 2: Causes of non-natural death in South Africa (preliminary NMSS data, first quarter 1999).

The Medical Research Council (MRC 1994) reported similar findings as NMSS showing the causes of pre-hospital traumatic deaths as inter-personal violence 53%, road traffic accident 25%, other 13% and suicide 9%.[4] The rate has decreased from almost 70 per 100,000 population and stabilized at about 60 per 100000, ten times higher than the USA. Unintentional injury is dominated by traffic accidents.

Rising gun-ownership levels were closely related to homicide rates, while alcohol and speed accounted for the high rate of motor vehicle accidents. The majority of patients who presented after interpersonal violence also tested positive for alcohol. Stein *et al*. found a high correlation between clinical history of alcohol use, blood alcohol measurement.[33] A recommendation was therefore made that patients presenting with interpersonal violence should be screened for alcohol and other substances history.

Goosen *et al.* identified urbanisation, substance abuse, violence against women, demilitarisation and globalisation as other drivers of trauma in South Africa. HIV/AIDS and shortage of healthcare workers were found to be other indirect drivers of trauma in South Africa.[8]

Inadequate treatment of trauma due to shortage of healthcare workers has a higher likelihood to result in the development of complications or secondary trauma. For instance in Gauteng province the shortage of healthcare workers in public hospitals and clinics was such that there were 1600 fewer health workers while they were expected to treat an extra 600000 patients in 2005.[34] The losses in healthcare workers were attributed to among others, emigration, as well as the huge migration of people to Gauteng and the effects of HIV/AIDS. It was reported that the province lost 34% of its doctors and 10% of its nurses. Trauma further increases the patient load on the remaining health-workers.

The World Health Organization (WHO) reported an inverse relationship between the number of healthcare workers in a country and the mortality rate there.[35] It was further reported that South Africa had 0,7 doctors per 1000 people over the decade to 2004 as opposed to 2,1 in Brazil and Egypt. Developed nations such as Germany and the United States had 3,6 and 5,5 respectively.

Professor Boffard wrote that for every one death there are 85 serious injuries and 315 minor injuries.[6] He said that each year one out of fifteen South Africans is injured, one-third of them in road accidents. He further stated that 80% of trauma patients are males between the ages of 20 and 32, and Blacks constitute 70% of all cases, Coloureds 16%, Whites 12% and Asians 2%. The pattern of trauma along racial lines could be attributed to Apartheid policies that disenfranchised the majority of the population in the country resulting in the creation of conditions for violence.

Resources to humans have also been blamed as hazards that produce injuries. The resources include people, guns and knives, motorcars, household chemicals and high buildings.[36] Knives, household chemicals and guns were said to have

become instruments of aggression instead of just tools for domestic use. Motorcars continue to claim lives instead of being a mode of transportation. High buildings and household chemicals become means of committing suicide.

Forces that continue to undermine efforts to prevent and control the trauma pandemic in the near future include economic recession, unacceptable unemployment rate and breakdown in law and order.[37] Factors affecting trauma service delivery and that also serve as indirect drivers of trauma in South Africa were said to include vast distances and time delays, overload of tertiary facilities, inaccessibility to basic trauma care, poor funding, legislative restructuring, failure to implement effective trauma preventative strategies, mal-distributed emergency response systems, choice of destination (bypass of smaller trauma units in favour of major ones, resulting in overload of the major ones), inequitable pre-hospital care hospital care (the pattern of trauma in South Africa has changed with a preponderance of major trauma due to gunshot wounds), limited career paths in emergency medicine, inter-hospital transfers (unavailability of beds for trauma patients in tertiary hospitals, rehabilitation (shortage of rehabilitation facilities in public hospitals and a preponderance in the private sector), HIV and trauma (the trauma population as a whole constitutes high group for HIV positivity for trauma resuscitations with a prevalence rate of 37% at the Johannesburg Trauma Unit. Given the many and complex drivers of trauma it is no surprise that trauma has reached pandemic proportions. It appears that it is when the drivers of trauma are controlled that hope of a reduction in trauma levels can be raised.

3.3 PRE-HOSPITAL TRAUMA CARE: THE SETTING

Pre-hospital trauma care constitutes one of the essential components of trauma management system. It is important because in developing countries such as South Africa, most trauma-related deaths occur in the pre-hospital environment. [38] The British Association for Immediate Care (BASICS) and the Faculty of Pre-Hospital Care of the Royal College of Surgeons of Edinburgh further highlighted the importance of pre-hospital trauma care by formalizing training of doctors in it.[39]

Previous epidemiological studies of injuries at all severity levels in urban areas and rural settings indicated that more than half of all injuries present at treatment sites other than state hospitals.[13]

Issues that a doctor needs to consider in a pre-hospital trauma setting include the following:

3.3.1 Pre-hospital Trauma Response Team

The pre-hospital trauma response team has a major role to play in formally preparing for trauma, resuscitating, stabilizing, and arranging for safe transfer of the injured patient to a definitive trauma center. The responders have also been shown to improve the process and outcome of trauma care**.**[40] The responders are expected to perform fast and skilfully, utilizing the necessary supporting equipment and techniques.[41] They have a huge responsibility and legal duty to respond effectively to life-threatening emergencies.

A pre-hospital trauma team comprises mainly of out-of-hospital EMS (emergency medical services) agencies. A doctor responding to a trauma call-out is likely to encounter EMS as they are often amongst the first pre-hospital trauma responders. Emergency Medical Services (EMS) forms an important link in the trauma management system and are an integral part of the pre-hospital trauma response team. They are a key player in first-aid and patient stabilization and transport to definitive trauma care.[4] Sometimes the police and fire brigade are also involved in the pre-hospital trauma scene. There could also be other healthcare professionals and laypersons who are trained in basic or advanced life support. The Emergency Department physician guides the pre-hospital response, leading the hospital and co-ordinating surgical intervention and transfer if necessary.[42] Where it is safe and appropriate (such as in bomb blasts involving large numbers of people) the assistance of bystanders could also be enlisted.[43]

Peden and Butchart said that many of the injured people in Africa are also those with the least access to formal emergency medical services.[36] Consequently, pre-hospital trauma care is often rendered by those community members closest to the scene of the injury. These individuals, known as *first responders,* are thus a crucial link in the injury prevention chain and care.

According to Alaska Department of health and social services each person involved in the pre-hospital care of trauma patient should know who is in charge of the trauma patient at the scene; what trauma care procedures are authorized for each level of certification and which are appropriate for each one's particular service; what options exist for the transport of the trauma patient (air, ground, water); the emergency medical service's policies and procedures for communicating with emergency department personnel during the care of the trauma patient; and the emergency medical service's policies and procedures for adequately documenting trauma care.[44] The cohesion of the trauma response team is thus critical to the effective provision of pre-hospital trauma care. Through collaboration roles and responsibilities of members of the response team can be defined and procedures to be followed in the acute care of the patient outlined.

3.3.2 Pre-hospital Transport Arrangements

It is known that early access to a trauma scene and quick transportation of the injured to definitive care center is an important component of trauma care and is crucial in reducing morbidity and mortality. Simon *et al* said that before being on-call for emergencies one should ensure that one has a reliable vehicle with a full tank of petrol and one should have a good street map of the area.[45] One of the responsibilities of a doctor responding to an injured patient is to arrange transportation of the patient to a trauma care center. He can encounter some challenges with pre-hospital transport arrangements.

It was noted that the Emergency Medical Services (EMS) in South Africa is lacking access in vast rural areas and the inability of established urban services to cope with the demands placed on them. In urban areas there is often hospital overcrowding and ambulance diversion, and reports of inappropriate triage to regional centers It was added that in many instances there were delays in the arrival of ambulances and in some cases people have died as a result of the unavailability of resources. In rural areas the problem is made worse by the long distances between centers of care and places of injury. Inaccessibility is also caused by the general paucity of adequately trained health personnel. Transportation is also to the closest hospital, which is often inadequate in respect of definitive care. It was said that in view of the fact that the large sparsely populated areas of South Africa serve as transit routes for people returning home to their families, the problem of added mortality and morbidity in accidents occurring in remote areas is a pertinent one.

Emergency transport vehicles should be in strategic locations rather than facility bound and should be used appropriately to facilitate timely access and response, especially in areas that are least accessible. It was recommended that in rural areas access to pre-hospital trauma care could be greatly enhanced through the development of more efficient deployment of limited transport resources.[7]

3.3.3 Hazards and Safety Considerations

Pre-hospital trauma scene can be chaotic, dangerous and overwhelming particularly in situations with mass casualties.[43] Therefore first priority is to ensure the safety of the rescuers and then to change the scene to make it a safe working environment. The scene should be surveyed to assess environmental conditions and mechanism of injury. Afterwards body substance isolation precautions such as putting latex gloves, should be taken. Other precautions include wearing of goggles and developing systems for the safe disposal of sharps and biological materials.

Universal barrier precautions are very important given that first response to trauma and resuscitation can lead to risk of exposure to blood and body fluids and therefore blood borne pathogens such as HIV, Hepatitis B and C. The sero-prevalence of HIV amongst trauma patients in one study was found to be 37%.[46] The study recommended specific health worker education to improve compliance with universal barrier precautions.

The trauma area can also pose a risk for litigation. Key issues that lead to potential risk or litigation that have been identified include: delays in assessment, diagnosis, treatment, diagnostic tests, surgical intervention and/ or appropriate specialist involvement; missed injuries; lack of communication among treatment staff; lack of documentation of care provided; lack of supervision of physicians in training; not recognizing associated medical problems; medication errors and not treating patient's pain. Safety of the trauma caregiver thus takes priority over the emergency care of the injured.

3.3.4 Communication systems

Having accessible information and instruction in the field provides caretakers with critical information needed to render immediate treatment of trauma victims.[43] Accessibility to strategic, timely and up to date information has the ability to save lives as it enables critical and correct decisions and actions to be taken rapidly. First responders to a trauma scene should be able to communicate such information even if it is in layman's terms. The information should also be recorded in appropriate media for use at a later stage for research and in post care review that aims to improve performance.

Enhanced communications among all members of the trauma care team during the pre-hospital phase are said to speed deployment of resources, produce more appropriate triaging, and result in better patient outcomes.[7] Greater use of wireless technology should enable team members to speak to other hospitals and providers in the field and to give direction and assistance wherever the care is being provided.

In South Africa the EMS provider agencies can usually be reached through fixed-point and wireless telephones using numbers such as 10177, 10111 or 082911.[47]

Another means of communication can be observed during triage of patients. During triage patients tend to be categorized into categories represented by colours with *red*-resuscitation; *orange*-potentially life/limb threatening priority*; yellow-significant* pathology*; green*-minor injuries/illness*; blue*-dead.[48] Benefits of a triage system are reported to include reduced waiting times, better management of clinical risk, more efficient use of resources and reduced mortality and morbidity. It results in more objective clinical assessment of injured patients.

Torches can be used to flag down passing vehicles to an accident scene especially at night. The placement of danger road signs at the accident site is another way of communicating to passer-by. Waving of hands by the roadside could also alert other people to the accident scene.

3.3.5 Pre-hospital Triage

Pre-hospital triage is a component of the trauma care management system. It means that the more severely injured patients would be taken to the nearest suitable hospital and not necessarily the geographically nearest hospital in order to insure optimal care and the best chance of survival.[30] It also implies that triage criteria should have a higher predictive value, specificity and sensitivity in order to facilitate direction of patients to the most appropriate care setting. Its aim is to provide more objective clinical assessment of injured patients.

Triage of patients is mostly essential in mass casualty situations. In such a situation the triage will depend on existing facilities and available support services. It is recommended that in mass casualties those who are moderately injured should take precedence over those who are severely injured as they have a higher chance of survival in a health system with very limited resources.[43] Bateman

reported that if it is properly carried out triage can reduce mortality by as much as 50%.[49] It can also reduce waiting times, and result in better management of clinical risk and more efficient use of resources[4].

Drawbacks with triage in South Africa were that there was no nationally recognized triage system and that many of the internationally developed systems were unsuitable for the country.[50] In urban areas the increasing problem of hospital overcrowding has led to ambulance diversion throughout the country, with cases of inappropriate triage to regional trauma centers reported.[7] Another problem with triage is that it can result in those who are less injured having to wait longer to be attended to.

3.4 THE PRIVATE MEDICAL GENERAL PRACTITIONER (GP) AND TRAUMA CARE

3.4.1 Introduction

A private medical general practitioner (GP) may sometimes find himself called upon to attend to an injured patient in a pre-hospital setting. It thus become necessary to explore his role in such a situation.

In South Africa a general practitioner (GP) has been defined as a family doctor who did not do postgraduate residency (registrarship) in Family Medicine and who is in private medical practice.[51] Family doctors are generalists dealing with a wide range of problems that are presented to them. They treat acute and chronic illnesses, provide preventive care and health education for all ages and both sexes. Some also treat patients in hospital and do minor surgery and/or obstetrics.[52] They are said to be at the forefront of health care service providing primary health care.

Some of them do part-time clinical sessions at local hospitals and health-care centers while others are almost completely in private practice. Others also serve as medical advisors to local industries or as district medical officers in the public sector. Some of them operate medical dispensaries for which they have to obtain a licence from the National Department of Health while others stock emergency drugs only and do not require a dispensing license. They tend to have different billing methods. Some charge medical aid rates while others are contracted out. Tariff fees for cash paying patients are often different from those patients who are on medical aids.

Buch and Rispel found that the major strengths of GPs are the need to keep their patients satisfied in order to retain their patronage, continuity and individualization of care, strong relationships that they forge with families and the ability to offer fairly comprehensive curative care.[53] They raised concerns about over-servicing in fee-for-service payment system, the restriction of access to those patients who can afford it, the limited range of preventive care, the inadequate community participation, and failure to implement health-care cost-containment.

Legislation on dispensing of medicines and the possible introduction of certificate of need policy by government is viewed as a threat to the freedom of the GPs. The perceived deteriorating trading environment has prompted some of them to specialise in other fields; quit medical practice; or to operate non-medical businesses to augment income.

Mankazana *et al* criticized the contemporary GP for 'medicallizing' people's illnesses, paying lip-service to notions of prevention and health promotion, and for the reductionist approach to healthcare intervention.[54] Luyt lamented their lack of surgical skills, failing to make correct diagnoses and failing to practice evidence-based treatment, and poor communication.[55]

3.4.2 Medical General Practitioners' involvement and role in trauma care

Local general practitioner attendance at the 'accident' scene was found to be effective in saving lives and reducing morbidity.[56] In rural low-income areas there was a need for them to be competent in a variety of surgical procedures. In many places GPs remain a source of medical personnel which until recently seemed overlooked in disaster planning.[56] They were found to be ubiquitous and therefore local to the disaster site with local knowledge of resources and obstacles. It was therefore felt that they should be more involved in disaster planning. They were also generally 'on-call' all the time and were more likely to be first responders to a trauma scene especially in rural areas.

In Africa where there is a health workforce crisis with a gap of more than a million,[57] general practitioners continue to play a critical role in trauma care. It was found that generalists with little or no formal trauma training predominate rural areas.[19] Most of them are expected to treat a significant proportion of minor trauma cases but also the occasional complex major trauma case for which they have not been trained. It was further stated that in rural low-income areas, there is often a need for GPs to perform a variety of surgical procedures. In such environments it would be useful to comprehensively address the appropriate elements of operative care that should be worked into basic medical school curriculum and house-officer training. This would assure that all graduates going to work in rural hospitals would have the skills needed to perform the procedures safely.

The World Health Organization, International Society of Surgery, and International Association for the Surgery of Trauma have detailed skills and equipment that a general practitioner (GP) should have in order to manage trauma effectively.[30] They stated that amongst others, it is essential for the GP to be able to assess for airway compromise and adequacy of ventilation; know how to open the airway and offer assisted ventilation using for example, bag-valve-mask. It is desirable for the GP to know how to insert an endotracheal tube and where indicated, perform

cricothyroidotomy. He should be capable of inserting an underwater chest drain in an emergency. It is also essential for the GP to have suction device and carry a basic trauma pack. He should also be skilled in the administration of oxygen through for example, mouth-to-mouth ventilation. The GP should be competent in assessment and management of shock, and control of haemorrhage through application of manual pressure, pressure dressing, and fluid administration. He should have basic equipment such as baumanometer and clock to monitor shock.

He should be able to assess neurological status, and determine level of consciousness through use of scoring systems such as Glasgow Coma Scale. He should recognize presence or risk of spinal injury. He should recognize platysmal penetration in neck injuries; clinically assess an injured abdomen and perform diagnostic peritoneal lavage; recognize neurovascular compromise and disability-prone injuries of extremities; and assess depth and extent of burn wound. He should be competent in the administration of pain-control drugs used in trauma such as ketamine, lignocaine and morphine.

Every doctor is expected to have a working knowledge of what to do in an trauma emergency.[58] After securing safety at the accident scene a pre-hospital doctor should be involved in triage, patient assessment and management as required, assistance with extrication and patient evacuation.[59] The doctor can also liaise with the receiving hospital, and in the handling of relatives, colleagues and bystanders. It was advised that while a doctor might be tempted to assume control of a patient in a pre-hospital trauma situation despite the fact that he possesses little experience caring for such a patient, he should realize that the majority of paramedics are well-trained and that they work under the medical direction of a licensed emergency physicians or trauma practitioners.[19] Further caution was made that should a doctor begin to direct care for the patient, he should remain with the patient until care is formally handed over to an accepting doctor. Failure to do so might constitute abandonment or negligence.

In the USA it is unusual for doctors to directly participate on fulltime basis in the provision of care to the injured patient in the field.[19] It was found that because of EMT training in the USA, there was little to be gained by employing doctors on EMS units. The paramedics (Emergency Medical Technicians) were found to be more equipped to render pre-hospital trauma care. However those paramedics are required to practice trauma care under the supervision of an emergency care physician who must possess amongst others experience in the pre-hospital provision of emergency care to injured patients.[19] On the other hand in Europe and Central and South America it was common for doctors to function as primary members of the EMS team.

In developed countries the establishment of an emergency medical system (EMS) manned by an air and ground emergency physician (EMS) has posed a threat to the role of GPs in trauma care. In a study by Vaardal *et al* the proportion of alerts to GPs using a certain toll-free number was significantly lower, the proportion of alerts to GPs significantly higher, and the proportion of GPs on scene significantly higher in rural than urban areas.[60] In another study by Hansen *et al* there was a minor reduction in the total number of trauma treatments at the hospital Accident and Emergency Department after the reduction in the number of general practitioners on call in the county of Ringkobing.[61]

Doctors have been urged to commit themselves not only to providing optimum care but to becoming equally involved in epidemiological and sociological aspects of trauma prevention.[62] They were also encouraged to become trauma prevention lobbyists and to get involved in trauma prevention groups such as Medics against Crime and Cape Doctor against Violence and Rape given the high rate of trauma. Stein *et al* said that the individual medical practitioner can do the following about the pandemic of violence in South Africa: at a macro-level be involved in media efforts to change social attitudes, access to guns, improve parenting and conflict resolution; be involved in research on violence; screen for violence victimization and perpetration in patients and communities; and offer appropriate treatment.[41] It was reported that more than 50% of the minor trauma problems for which patients

sought treatment at a district hospital could have been treated by general practitioners.[16]

Silbert called on doctors to be involved in the prevention and management of trauma arguing that prevention of death, management of injuries and the costs incurred both in the private and public sectors impact directly on the medical profession.[63] He also urged the profession to lobby the ministry of transport to implement more effective measures to reduce the carnage on the roads. The medical profession was also reminded that caring for the injured starts with the doctor's role in prevention of the trauma and ends with rehabilitation, after which the patient can play a meaningful role in society.[6]

Marais encouraged those involved in trauma training to include in their training programmes injury prevention education which is facilitated by the supply of data on injury by the Crime, Violence and Injury Lead Programme run by the Medical Research Council and The Child Accident Prevention Foundation of South Africa.[64]

In Great Britain BASICS (British Association for Immediate Care) is a registered charity that was established in 1977 acting as the national co-ordinating body for both schemes and individuals providing immediate care to the injured. The association was formed after it was realized that there was a growing demand for better and immediate care for trauma patients. BASICS doctors are general practitioners specialising in pre-hospital care and they provide voluntary major incident support to the existing emergency services that could be in the form of Medical Incident Officers (MIO), Forward Medical Officers, Primary Triage Officers and mobile medical teams.[65] The role of the Medical Incident Officers include: planning and incident control; clinical decision making; multi-agency-liaison; hospital-based specialty liaison and chemical decontamination. BASICS doctors play multi-factorial roles such as:

organisational- taking the clinical lead in a pre-hospital trauma scene and supporting ambulance crew; clinical-rendering advanced skills such as surgical

airway and amputation; educational-informal instruction for emergency service personnel at the trauma scene, instruction on many courses such as ATLS and ALS and undergraduate training in pre-hospital care and life support, examiners for medical college, involvement in the development and provision of immediate care, and other resuscitation courses; research and development-offering guidelines on various aspects of pre-hospital treatment. In South Africa organizations similar to BASICS doctors are still in formative stages.

A hospital-based doctor not trained in pre-hospital trauma care or who lacks trauma skills is potentially dangerous to an injured patient out in the field. It was found that such a doctor is more likely to spend more time on scene than EMS crews. He is detrimental to trauma patient care because he might not be good in decision-making and action than paramedics. On the other hand an appropriately trained doctor working with an experienced paramedic can increase patient survival.

Trauma care poses a significant challenge to the doctor regardless of his or her training and background. The doctor may suffer the same overwhelming feelings of loss and hopelessness as everyone else and may also be a victim of the disaster.[66] Those feelings and victimisation may hinder his or her ability to respond effectively to a disaster.

The determinants of a doctor's pre-hospital response capability in a trauma emergency were pointed out by Greaves and Porter and include the following teamwork, co-operation and collaboration with emergency services units; understanding of ambulance personnel capabilities, protocols and equipment; capacity and skills in command and control, communications, driving and navigation skills; training in advanced life support; provision, marking, equipping and driving of a response vehicle; having personal protection clothing and equipment; doctor identification documentation and marking; having appropriate medical and other equipment such as airway, ventilatory support, circulatory

support, monitoring devices and drugs; and the ability to approach a pre-hospital scene quickly but safely.[67]

3.5 MACRO-ENVIRONMENTAL ASSESSMENT OF LIMPOPO PROVINCE.

In seeking to understand the role of private general practitioners (GPs) in pre-hospital trauma care in Limpopo Province, and incentives and disincentives that impact on their trauma practice it is perhaps necessary to explore the environment in which they operate. The macro-environmental assessment provides insight into the socio-economic and political drivers of trauma. It enables identification of the challenges that the GPs are likely to encounter in the management of trauma. It can also allow for strengths and weaknesses of the trauma management system in the province to be determined and in turn help healthcare authorities and other role-players in formulating intervention strategies to bring down the levels of trauma. The assessment can also allow for exploitation of opportunities in trauma care while containing associated threats.

3.5.1 Socio-Economic forces

Economic data for Limpopo province (formerly Northern Province) is summarized in the table 2 below.[68] Limpopo province had 18% of the provincial poverty share, making it the third most poverty stricken province in South Africa.[69] Major driver of the economy in the province is agriculture and retail. Mining is also emerging as a driver of the provincial economy. Economic underdevelopment has been shown to contribute to trauma load in a number of ways.[7]

Table 2: Economic Data- Northern Province (now Limpopo Province).

Area (square km)	119606
Population (000)	5120,6
Population growth (%) (1985-1933	3,95
Density (persons per square km)	42,8
Functional urbanization (%)	12,1
Literacy rate (%) (1991)	61,1
Labour force ('000), (1991)	812
Participation rate	35,9
Labour absorption capacity	40,3
Unemployment rate	24,8
Male absenteeism rate	-28,1
Dependency ration	4,8
Growth (1980-1988)	5,99
Contribution to GDP (%)	3,1
Personal income per capita (R)	725
Life expectancy (1999)	62,7
Human Development index	0,40

3.6 TRAINING IN TRAUMA MANAGEMENT

3.6.1 Introduction

Training has been defined as a process that is used to enhance the knowledge and skills of employees. The Oxford Dictionary defined it as teaching a particular skill or type of behaviour through regular practice and instruction.[57] Gibbs *et al* defined training as skill acquisition requiring practice for mastery.[70] Its aim is to

improve behaviour and performance of workers so that organizational objectives can be achieved. It was Geyer who said that the key to resolving the perpetual challenges in human resources is to educate and train sufficient numbers of the right cadres of health professionals and to have a national agenda for the development of human resources for health based on a shared vision and a commitment to the mission of providing adequately for the country.[71]

Benefits of continuous training of healthcare professionals include the following: improving the knowledge and skills of employees in an ever changing medical environment; improved profitability and better patient service; improved staff morale; creating a more professional image for the workers; increased productivity and quality of work; helping workers adjust to change; creating a positive climate for growth and communication; increased job satisfaction; better decision-making and conflict resolution; motivation and a higher sense of responsibility.

According to WHO greater attention is needed worldwide to define and optimize the training of doctors in trauma care and higher-level skills for operative care require specific training.[30] As far as trauma in rural setting is concerned The Road Accident Fund (RAF) Medical Management Team said that the education of emergency department primary care providers in basic principles of stabilization and initial treatment may be the most cost-effective method of reducing preventable deaths.[4]

3.6.2 Trauma Training in South Africa: Historical background

Trauma has been part of human experience since time immemorial. Various historical records narrate how mankind attempted to deal with it, the challenges encountered and successes achieved. The roots of pre-hospital trauma care can be traced back to military physicians.[72] Formal and modern training in pre-hospital trauma care was introduced almost four decades ago by the Chicago Committee on Trauma and the Chicago Fire Academy. The National Emergency Medical

Services Education and Practice Blueprint developed by the National Highway Traffic Safety Administration (NHTSA) in 1993 divided the major areas of pre-hospital instruction and/ or performance into 16 “core elements.” For each core element there are progressively increasing knowledge and skill objectives, representing a continuum of education and practice. It identified four levels of pre-hospital EMS providers as: first-responders; Emergency Medical Technician-Basic (EMT-B); Emergency Medical Technician-Intermediate (EMT-I); and Emergency Medical Technician-Paramedic (EMT-P).[19]

In South Africa until the late 60s and early 70s of the 20th century, medical trauma care did not receive much attention in most communities or healthcare providers. It was after publication in 1966 of the landmark report of the National Academy of Sciences (NAS) and the National Research Council (NRC): *Accidental death and Disability: The Neglected Disease of Modern Society* that trauma care became the focus of widespread and continuing attention.[26] The publication of the report on accidental death and disability in 1966 also had a major influence on the ultimate establishment of Emergency Medicine as a specialty.

The need to formalise trauma training came about after it was realised that injury is precipitous and does not discriminate; the doctor who first attends to the injured patient has the greatest opportunity to impact outcomes; and that trauma is very costly in both monetary terms and human suffering. In that first critical hour after severe injury it is vital that the doctor act speedily, with knowledge and skill to provide appropriate Advanced Life Support to the patient. Trauma training was also seen as an essential requirement given the extent and nature of trauma in South Africa[64]. It was observed that the majority of medical practitioners are not adequately trained in trauma management.[16]

Up until around 1999 there was no minimum training requirement set for the doctors working in emergency units in spite of the ATLS (Advanced Trauma Life Support) course that has been offered by the Trauma Society of South Africa since 1992. There was also no official recognition for trauma surgeons in South Africa

although Trauma Society of South Africa tried to get that aspect changed by introducing a two-year registrable trauma course. The training of trauma surgeons in South Africa was found to be insufficient, fragmented, random and lacking a proper training program.[3] There was also a need to improve the triage system and categorization of hospital casualties and trauma units so that patients are correctly prioritized and transferred.

Following the realization of the seriousness of the trauma pandemic and identification of challenges in trauma care and weaknesses in trauma management system the South African National Department of Health appointed Trauma Working Group in 2003 to formulate a national plan for trauma care.[73] The Group came up with the following broad conclusions: the hidden epidemic of trauma was expected to continue until 2011, where after it could be expected to decline; irrespective of the financial scenarios, there would be a need for University-based Tertiary Trauma Care Centres in each province, backed by supra-regional Tertiary Care Centres in areas not in close proximity to University Hospitals; Tertiary Trauma Care Centres would have to be ring-fenced by National Government; technological developments were expected to have an impact mainly on the care of severely injured in intensive care units; major improvements in outcomes could be brought about by implementing known principles of inclusive trauma care systems such as bypass, strengthening and deepening EMS, and verification of trauma centers; access to Tertiary Trauma Care would have to be proscribed by triage protocols, and rapid decanting of less severe injuries; the disciplines of Trauma Surgery and Emergency Medicine should be created to drive these processes; conditions of service for all healthcare professionals, and entry of foreign graduates would have to be improved and expanded significantly in order to retain skills; there was a need for strong and representative professional bodies to assist in driving the process.

In 2003 a private healthcare organization sponsored R2, 5 million towards medical training in emergency healthcare at the Health Sciences Faculty at the University of the Witwatersrand. The sponsorship was prompted by among others, the

realization that trauma has reached epidemic proportions in South Africa; the need to bring trauma care to world standard; and the realization that care in Casualty Units in hospitals is administered through the efforts of medical practitioners who have not had the benefit of specific training in trauma.[74] Through better training it hoped to decrease trauma mortality and morbidity rates.

3.6.3 Pre-hospital Trauma Training: the status quo

Pre-hospital immediate care is increasingly being recognized as a specialist area of medicine. Faculties of pre-hospital care have been established such as the one at the Royal College of Surgeons of Edinburgh.[65] It was estimated that South Africa will require in the order of 200 emergency physicians to fulfil both service and teaching needs in critical care.[22] It was observed that in general, medical students are under-exposed to all aspects of emergency medicine including trauma.[6] It was further noted that South Africa does not have enough trauma centers, and the majority of care falls on the shoulders of medical practitioners whose interest lies somewhere.

To that end there have been attempts to standardize trauma training and practice throughout the country through the use of national training protocols.

The World Health Organization, departments of health, academic institutions, Resuscitation Council of South Africa and Trauma Society of South Africa are amongst the leading players in the development of uniform training protocols in the country. In order to comply with the South African Qualifications Authority Act of 1995 all training, courses and educational offerings needed to be re-curriculated into outcome-based education (OBE) format and aligned to the NQF.[75]

The WHO identified three tiers of pre-hospital trauma care system: first responder care, basic pre-hospital trauma care and advanced pre-hospital trauma care.[76] With first responder care interested community members are taught basic first aid techniques. They are taught to recognize an emergency, call for help and provide

treatment until formally trained healthcare personnel arrive to give extra care. Basic pre-hospital trauma care is provided by those who have been trained in the principles of basic life support (BLS). Those who have completed Basic Trauma Life Support (BTLS) course have extensive formal training in pre-hospital care, scene management, rescue, stabilization and the transport of the injured.[77] Advanced pre-hospital trauma care (ALS) involves more sophisticated and invasive form of pre-hospital care. Advanced Trauma Life Support (ATLS) is tailored for medical staff that who may not have immediate access to sophisticated emergency facilities and those working in emergency or surgical departments who have to treat victims of major trauma.[78] ATLS puts more emphasis on the first hour of initial assessment and primary management of the wounded patient. Definitive Surgical Trauma Care (DSTC) is intended for doctors who are actively involved in the surgery of trauma and who may not have immediate access to sophisticated facilities and those working in emergency or surgical departments.

In the United Kingdom BASICS doctors are registered with the General Medical Council and many of them have postgraduate qualifications such as Fellow of the Royal College of Anaesthetists (FRCA), Member of the Royal College of Physicians or Surgeons (MRCP or MRCS), or Member of the Royal College of General Practitioners (MRCGP). They have been taught generic skills in life support and resuscitation. They also undergo specialist training to learn about the pre-hospital environment, its dangers, delivery of healthcare in non-clinical areas and how the other emergency services work.[65]

Pre-hospital trauma courses on offer include Pre-hospital Trauma Life Support (PHTLS) developed by the National Association of Emergency Medical Technicians in cooperation with the Committee on Trauma of the American College of Surgeons (ACSCOT).[19] It is based upon the tenets of the ATLS course developed by ACSCOT but it has been modified to meet the needs of patients in the pre-hospital setting. The course puts more emphasis on the principles of trauma management, rather than individual protocols. Its approach includes scene assessment before evaluating the injured patient, and identifying life-threatening conditions and initiating treatment. It puts more emphasis on the need for rapid

assessment of the critical trauma patient; treatment of shock and hypoxaemia; and rapid transportation to a suitable hospital.[79]

Pre-hospital trauma care generally fits into one of two distinct categories, namely basic life support (BLS) and advanced life-support (ALS). Basic life support is the level of care that provides non-invasive emergency care. It entails ensuring basic airway management, supplemental oxygen, and breathing; CPR; control external haemorrhage; splinting; and spinal immobilization. Given that they are the first steps to be taken in the initial assessment of any critically injured patient it is expected that every emergency care-giver should be able to render cardio-pulmonary resuscitation (CPR). ALS entails the use of invasive procedures: sophisticated airway management, cardiac monitoring and defibrillation; insertion of intravenous lines and administration of medications. Following resuscitation of the patient the severity of injury should be assessed. Appendix1 lists other trauma related courses available in South Africa. Various methods for trauma scoring are used to assess the extent of the injury.

In a study by Notzer *et al* it was found that a more comprehensive assessment of competence in trauma management could be arrived at through a combination of knowledge (written examination) and performance (peer assessment or self-assessment) measures.[80]

They added that the written examination format should be expanded and developed to include more clinical vignettes requiring treatment decisions, making this instrument a more clinically oriented measure of physician competence in trauma care.

To manage the extent and nature of trauma in South Africa effectively, training is required at several levels, and for health care professionals in different situations. Methods used for trauma training include the following: working in trauma care facilities; short courses, diplomas and degree courses, trauma management guidelines, refresher training sessions, telemedicine, IT-based trauma training and, using simple algorithms and charts.

In many parts of South Africa telemedicine is still in the developmental stage. For health professionals in remote areas telemedicine could be used for both training and clinical support in trauma management. It was found that for minor injuries it is safe and clinically effective, providing care that is equivalent to specialist on-site assessment and the current practice of treatment by a general practitioner.[81] But there was no evidence that telemedicine provides superior care, and there are a number of process issues that may impede successful implementation of this new technique.

Information Technology (IT)-based trauma training such as MMTV (television program) is increasingly being used for continuous medical education (CME). Internet has made it possible for candidates to conduct trauma research and engage in distance learning more effectively. Candidates can also subscribe for compact-disc (CD), video-camera recording (VCR), audio and digital video display (DVD)-based trauma training. Information-technology (IT) is also used for refresher courses, and as support study material. Information Technology (IT)-based trauma training has been criticised for lacking the class-room or face-to-face experience. It is envisaged that in future together with telemedicine, it will receive more application given the growing trend towards distance learning.

Different institutions across the world have come up with trauma treatment guidelines in order to assist healthcare professionals in different situations manage trauma better. Examples are Guidelines for Essential Trauma Care. 2004, developed jointly by The World Health Organization and the International Society of Surgery.[30] Alaska Department of Health and Social Services' Pre-hospital Trauma Guidelines.[44] and Guidelines for Essential Trauma Care in South Africa developed by Trauma Society of South Africa.

Simple algorithms are useful for quick training and referencing in an emergency. They are often written in simple language with graphic illustrations and can therefore be used by both health care professionals and laypeople. They are

usually written on charts or small cards and can therefore be placed in strategic public places or carried around in pocket size.

In order to improve retention after trauma training, techniques that are being taught should be evaluated on a regular basis. Pre- and post-course tests, core content lectures, case presentations, discussions, development of life-saving skills, performance of technical procedures and final performance proficiency evaluation are some of the techniques used to deliver trauma training. Refresher training can be in the form of workshops, seminars, skills laboratory sessions and in-service clinical rotations at accredited facilities. Practice using such equipment as mannequins and more simple algorithms (rules) should also be promoted. Competency in trauma management should not only be assessed in terms of successful acquisition of a skill but should be accompanied by adoption of appropriate principles and values relevant to the profession.

3.7 PREPAREDNESS FOR AND PRACTICE OF TRAUMA CARE

3.7.1 Preparedness for trauma

Ragavan and Kloeck defined preparedness for trauma emergencies as having proper medication and equipment in an easily accessible area; to be knowledgeable and skilled in immediate life support techniques, and having additional support and back-up as and when required.[82] Appendix 2 provides example equipment scale for BASICS practitioners. In Appendix 3 is shown a matrix of essential knowledge, skills, equipment and supplies for pre-hospital trauma care providers developed by WHO.[76]

Surgical emergencies can arise anywhere and at any time. Being prepared to respond to them in a speedy and appropriate manner can make the difference

between life and death. Healthcare professionals should therefore be well prepared to resuscitate and treat the injuries. Unfortunately many doctors are ill-prepared and de-motivated to deal with pre-hospital trauma and emergencies particularly those outside a practice centre or emergency clinic.[83] In one study GPs considered involvement in disasters as inevitable and they felt uncomfortable with their competence to respond, and they indicated a need for training, liaison and planning.[66] In another study led by Professor Marietjie de Villiers reported that young doctors working in rural hospitals felt they were ill-prepared for the amount of trauma and violence their work would involve in the rural service.[10] Part of the reason for the sentiment was lack of supervision and support.

Trauma care can be challenging even to experienced practitioners, therefore there is a need for continuous retraining to prevent skill attrition. It was documented that even in western countries an organized approach to emergency and trauma care remains a major challenge. For instance the results of the Health Resources and Services Administration Report in 2002 revealed that many Americans do not have access to well-trained pre-hospital emergency personnel and that between 10 and 15 % of the US population did not have access to basic emergency medical and communication services.[84] The acquisition of the skill of trauma care should be accompanied by relevant education that provides an understanding of people and their illness behaviour.

The ability to practice trauma surgery begins with proper training and preparation. It was Ragavan and Kloeck who said that the golden rule of resuscitation is preparedness.[82] That meant that the doctor needs to be in a state of readiness at all times if he or she is to respond effectively to trauma call-out. Simon *et al* gave a practical example of how the individual doctor can prepare him or herself for emergencies saying: ‘ensure you have a reliable car with a full tank of petrol. Have a good street map of the area. Carry a large, strong torch in the car; carry a pager (ideally a mobile telephone); check the drug box is fully stocked and all items are in date; check all equipment carried is operational and you have spare batteries;

carry a list of emergency telephone numbers; know which chemists have extended opening hours and carry the chemist rota'.[45]

Little is known about the costs associated with the continual 'level of readiness' needed to provide healthcare services to trauma patients in the United States of America. The lack of knowledge about those costs is partly due to the fact that the costs of trauma care are borne by a number of organizations within the trauma system including public institutions, pre-hospital heath-care providers, acute care providers, and rehabilitation service providers.[7]

There are challenges that may hinder preparedness for trauma. Perhaps getting prepared for trauma begins with a willingness to get involved in its management and having a consciousness that trauma is indiscriminate and can present any time. Lack of emergency equipment is another challenge to being prepared for emergencies. It is known that the cost of some of the equipment can be prohibitive. In cases that involve mass casualties despite thorough and well thought out protocols, hospitals and emergency services can become rapidly overwhelmed.

Perhaps the major stumbling block to preparedness for trauma is a mindset that continues to view trauma as an accident rather than a surgical disease for which every doctor should receive training and be equipped. The 'trauma-accident'

mindset causes doctors to treat trauma on an ad hoc basis instead of being focused and dedicated to it. It also discourages investment and lifelong learning in trauma care. There is also a tendency to think that installing modern and expensive trauma technology in healthcare facilities will result in improved patient care. But having sophisticated trauma technology without an empathetic attitude towards patients and a winning mindset that takes a proactive approach to trauma is most likely to result in wastage of resources. MacFarlane noted however that despite the lack of preparedness many doctors have made efforts to improve response to pre-hospital emergencies particularly trauma by undergoing training.[39]

3.7.2 Trauma practice

Trauma practice deals with the actual management of trauma. It describes the principles of trauma surgery; primary and secondary surveys; triage of injured patients; resuscitative procedures and evacuation. It also looks into the behavioural issues pertaining to trauma care. Simon, Everitt and Stevenson went on to make suggestions of what to do when on call to an emergency saying: 'in all cases, record the time of any calls, full name, date if birth or age, telephone number, address of the patient and current location. Give the patient or person making the call a clear idea of exactly what you will do (such as calling an ambulance, when will you be visiting and what you expect them to do. If only advice is given then make full notes to be filed in patient's notes). If visiting take, directions from the person making the request for a visit. Keep a full record of the consultation with the patient, any actions taken and drugs administered/ including expiry date, manufacturer and batch number). Do not go alone to suspected violent patients-the police will accompany you. Ensure someone knows where you are and when to expect you back at all times'.[45]

Fulde added other practical steps about what to do at a road accident that are equally applicable to other trauma situations.[85] He said: 'park your car at a safe distance and lock it to prevent theft. Identify yourself. Co-operate with EMS and other people at the accident scene. Secure safety of the accident scene by warning oncoming traffic. Check for danger to yourself and to the injured person. Take history. Have disposable gloves, Guidel airways, mouth-to-mask resuscitator in your glove box. Conduct Primary survey: Secure airway (A). Check for breathing (B). Assess circulation (C) and restore it as indicated. Avoid danger (D). Exposure (E)-fully undress patients. Resuscitate the patient. Urinary catheters, intragastric tubes and analgesia are dictated by the clinical picture. Secondary survey: this is a detailed examination of every bit of the patient. In a major trauma, diagnostic tests are usually performed routinely. Furnish patient report you have. Follow up on the patient by calling the hospital where the patient was admitted'.

Davies identified two major philosophies of pre-hospital trauma, namely “scoop and run” and “stay and play”.[86] With “scoop and run” patients are removed from the scene and rushed to hospital with minimal intervention. This is common where ambulance service providers are non-physicians. It is debatable whether pre-hospital ‘scoop and run’ approach to trauma care reduces patient mortality and morbidity. It was argued that given that ‘scoop and run’ is based on ‘time to definitive care’ if one can render some of that definitive care in a pre-hospital setting then one has improved one’s response time, not lengthened it, even though the on-scene time may have increased. On the other hand there is a tendency for EMS to “swoop and scoop” because the time to definitive treatment is a major determinant of outcome.

With the other view, “stay and play” or ‘stay and stabilize’, the doctor and hospital facilities are brought to the patient at the scene of injury and it is a fundamental feature of many European models of pre-hospital care. Controversy surrounded pre-hospital Advanced life support for trauma patients. Many studies reported the undesirable effects of prolonged attempts at field stabilization on seriously injured trauma patients while others showed that paramedics could employ advanced life support measures in an expeditious manner.[19]

It was reported that in rural areas where there is low patient volume systems it is difficult to maintain trauma proficiency. Consequently, because of time, expenses, and infrequent need for advanced skills it is unusual to find Advanced Life Support providers in a rural service area.[19] There is a need for continuous education and retraining in order to maintain up to date trauma skills.

Most of the essential trauma management skills can be found in almost all textbooks on trauma surgery, resuscitation and emergency medicine. In principle if the steps are adhered to they should reduce patient morbidity and mortality and yield better patient outcomes. But the reality is that resuscitation and trauma care is still full of challenges. In one study it was said that while there is universal consensus that sufficient oxygenation in a patient with major injuries is of critical

importance in avoiding further damage to vital organs and body systems there is ongoing debate surrounding the role of endotracheal intubation in pre-hospital advanced trauma life support. Endotracheal intubation in severely but not fatally injured patients in a pre-hospital setting is more difficult and risky requiring additional skills and experience, and use of anaesthetics and/or muscle relaxants.[87]

GPs considered involvement in disasters as inevitable and they felt uncomfortable with their competence to respond. They indicated a need for training, liaison and planning.[66] In another study Graduates of Colorado family practice residencies were surveyed concerning their emergency medicine practice, their comfort working in emergency departments, and their perceived preparation for practicing emergency medicine.[88] Seventy per cent (70%) reported discomfort with managing trauma.

Another challenge with the practice of trauma is related to the habits acquired during trauma care training. Brooks said that vocational training is skilfully and conscientiously delivered, but habits are firmly established by the time postgraduate education starts.[89] He observed that the trouble is that doctors emerge after their training at medical school unable to use an understanding of people and their behaviour in clinical problem solving and managing the consultation. Brooks wondered whether the root cause of this behaviour is not the fact that the term medical education is a misnomer?

Simpson pointed out that much of the bad work done by doctors is due to lack of care, insensitivity, failure of communication or human understanding, and other similar factors than is ever due to lack of knowledge.[90] Thai and Mock discovered that even though capabilities for trauma care are limited in most developing countries they can be improved by low-cost, sustainable measures, improved training and increased attention to detail in planning.[91]

3.8 INCENTIVES AND DISINCENTIVES FACTORS TO TRAUMA CARE

An exploration of incentives and disincentives factors to trauma training, preparedness and practice provides an understanding of the attitude and behaviour of doctors towards the disease and its management. It sheds light on how they perceive the discipline of trauma as a career opportunity. By considering what motivates and discourages them in their care of injured patients their response capability can be assessed and a human resource strategy to deal with the epidemic formulated. A number of issues that could serve as incentives and disincentives factors to trauma training, preparedness and practice have been suggested.

In the past most doctors lacked the passion and commitment to the discipline of trauma even though the disease is widespread. According to Theron effective trauma training was hindered by the lack of appreciation and commitment regarding the significance of efficient trauma and emergency care.[92] An obstacle to effective trauma prevention that has been identified is that within South Africa primary prevention initiatives (i.e. those addressing the root causes of violence in order to dry up the supply of new victims and perpetrators) continue to find significantly lower levels of financial and policy support than police and security-oriented strategies aimed at protection through more efficient policing, swifter criminal justice processing and target hardening.[36] It was found that less than 3% of the health budget is allocated to trauma management and emergency medical services.

In his critique of the trauma training system and its impact on trauma practice Bass said that the South African education system wants doctors to practise universally good trauma care, but they are guided up to a point and then they are left to their own devices.[37] He added that educators 'enjoy teaching trauma care to young doctors, because it allows the teacher to present a wonderful balance of theory, 'hands-on' and colourful anecdote'. He pointed out how medical students and postgraduate surgical trainees in general, perhaps because they are mercifully

sheltered from the problems associated with trauma care, thrill to the challenges and immediacy of acute trauma care. Yet when they get into the field they become ambivalent. Reasons behind the ambivalence include the observation that acute trauma care carries little of the romantic appeal associated with mainstream general surgery. Trauma patients are said to be generally indigent, often aggressive and seldom effusive in their gratitude. Of necessity the hours spent in casualty or trauma units are long and antisocial, and financial rewards for trauma care, even in the private sector, are limited. He criticized the negative attitude that undermines the science of trauma as a surgical subspecialty.

In rural areas doctors face challenges of inaccessible trauma care system; trauma manpower shortages; underdeveloped communication systems; poor transport infrastructure and perceived limited career opportunities.[19] Other circumstances reported to be making rural trauma care challenging are: lack of trauma-team and trained surgeon; adverse weather preventing transport; local residents resistant to trauma-related legislation (such as wearing of safety helmet); insufficient patient numbers to support trauma doctor; poor field-to-hospital communication; disorganized response to major trauma events; fears of being overworked and underpaid, and unable to obtain backup and guidance. Social and cultural deprivations may also take its toll on a spouse. Because trauma events are unpredictable and infrequent rural doctors may develop a fear of or aversion to care of the injured.

Factors that influence the decision of whether or not to attempt minor trauma and surgical procedures include lack of time, clinical experience, job satisfaction, the presence of ancillary staff, and remuneration.[16]

Local doctors attending to injured patients sometimes complain of unpleasant encounters with EMS, emergency room personnel at the receiving hospital, and surgical staff on the trauma service.[19] They may be unfamiliar with and wary of communications equipment, and accordingly, reluctant to talk with field personnel to provide medical guidance. They also complained of not receiving feedback after

referring the patients. They have also been criticised for over triage on one hand or for holding onto a patient too long on the other.

Psychosocial distress has also been found to be a disincentive factor to trauma care. Emergency rescue workers such as fire-fighters, police and emergency medical personnel have to cope with multiple stressors related to trauma. They have to live with the danger of death or physical injury and the possibility of losing colleagues. They also tend to suffer from 'anticipation stress.'[1] 'Anticipation stress' is related to waiting time. Extended waiting time before being called out to an emergency situation tends to result in major stress that manifests in higher levels of fatigue once the work begins. Common symptoms of secondary trauma on caregivers include anger, irritability, withdrawal, prolonged sadness, headaches, lethargy, intrusive thoughts about work and lack of motivation and energy.[93]

Healthcare givers who attend to patients' fear, pain, suffering and reports of trauma may feel similar pain, fear and suffering through a process of counter-transference or vicarious traumatisation. They may develop symptoms of post-traumatic stress disorder (PTSD), re-experiencing, avoiding and symptoms of hyper-arousal. Internal factors (allostatic load), resilience and personal trauma experiences may influence the varied responses to working with trauma.[94] According to Nelson**,** for persons dealing with trauma the most important aspect of coping with the intensity of the work is to acknowledge that it will affect you.[95]

Lifestyle issues, perceived undervalue by society and limited scope of practice were identified by trauma surgeons as some of disincentives to entering the subspecialty field of trauma.[96] As an incentive Thomas, Luis and Gregory called for broader training to allow more procedures in trauma, emergency surgery, critical care, and elective surgery. Their preferred model of practice was large, hospital-based, diversified group practice with a predictable lifestyle and guaranteed salary commensurate with effort.

Theron observed that doctors could be stimulated and educated by continued in-service training programmes.[92] while Marais noted that for trauma training to attract more participants it needed to be relevant, interesting and of an international standard.[64]

Continuing competence in among others, trauma, is said to be a lifelong process and is motivated by a number of factors, including curiosity, self-identified gaps in knowledge, and the desire to provide the very best care to one's patients.[97] It was observed that in contrast to South Africa, interest in trauma in countries in the Northern hemisphere was high, but there were limited opportunities for clinical experience because of the relatively low levels of trauma.[37]

Incentives to trauma practice are used to recruit, retain, motivate and promote trauma practitioners. The World Health Organisation's Global Health Report made some recommendations to reduce the declining numbers of health workers and to improve their incentives. They include more direct investment in the training and support of health workers; increasing health budgets to educate and pay for salaries; creating better working conditions; and getting commitment from donor countries to assist crisis countries to improve their workforce.[98] It was found that more health workers are associated with better access to health services and therefore health workers should be valued.

Strategies to recruit and retain trauma practitioners included recruiting professionals who are patient-centred and are team-oriented; new categories of service providers should be used to address the need for additional resources; appropriate reimbursement for all types of service providers so as to encourage participation in trauma care; strengthening trauma specialization by addressing the burden of liability; making available and accessible, continuing medical education opportunities; use volunteers to supplement career resources and enlist them to promote injury prevention and to deliver trauma care. Incentives for rural trauma care service providers could include 'rural modifier' to the medical funders such as medical aid schemes.[7]

4 STUDY METHODOLOGY

4.1 Study design

The design of the study was descriptive. The aim of the study was pre-hospital trauma care: training and preparedness of and practice by private medical general practitioners (GPs) in Limpopo Province. Within the entire study different research methods and statistical analyses were applied. Quantitative data was collected and it included independent variables such as age, gender, educational level, year of graduation as medical doctor, and medical school where medical degree was obtained.

Content analysis method was used to analyse results of the questionnaires and to determine frequencies and percentages. Content analysis method was used to process qualitative data where communication was involved. Association and not causality were assumed. The computer software program *Epi-Info 6* was used to code and analyse the data from self-administered questionnaires.

4.2 Site of Study

The study was conducted in Limpopo Province amongst general medical practitioners in the private sector.

4.3 Study population

The study population was made up of all the doctors in private general medical practice in Limpopo Province. The exact population size of private general medical practitioners in the province is uncertain. But according to the database obtained

from Public Relations Officer based at Limpopo Mediclinic in Polokwane City in Limpopo the province had about 400 private general medical practitioners in 2004. Other estimates put it around 460.

4.4 Sampling

Before the questionnaires were mailed to the private general medical practitioners their addresses were checked telephonically to ascertain their correctness and to optimise sample size. 63 doctors could not be reached even though their names were on the database. 6 questionnaires could not be sent because the doctors were deceased. 33 of the respondents telephoned indicated that they were no longer practicing in Limpopo Province at the time of the research. After editing the database a population size of 298 was used for the research. All the 298 GPs were sampled.

4.4.1 Inclusion criteria

a). all private general medical practitioners that stated that they spent at least 50% of their time in private general medical practice.

b). the private general medical practitioners had to be based in Limpopo Province.

c). the private general medical practitioners had to be in active private general medical practice at the time of the survey.

d). the private general medical practitioners could be male or female located in either urban or rural areas within Limpopo province.

e). a willing participant.

4.4.2 Exclusion criteria

a). non-consent.

b). lack of time to complete questionnaire.

c). private general medical practitioners that said that they did not spend at least 50% of their time in private general medical practice.

d). private general medical practitioners that were not based in Limpopo province.

e). general medical practitioners that were not in private general medical practice.

4.5 MEASURING INSTRUMENT

Collection of data was through an anonymous, confidential, self-administered questionnaire. See appendix 4**.** The questionnaires were mailed to the private general medical practitioners (GPs). The questionnaires included an introductory page explaining to the respondents the researcher's status, the aim and purpose of the survey, and what input the participants make to enable the investigation to be carried out (appendix 5). Respondents voluntarily participated in the study. The questionnaire contained demographic information about the general practitioners. The information included age range, sex, university from which junior medical degree was obtained, year of qualification as medical doctor, additional qualifications obtained, number of years in medical practice, and location of medical practice.

The questionnaires also allowed for profiling in terms of emergency medicine preparedness for and practice of trauma. The following considerations were taken into account during the profiling: training and skills level in emergency medicine, personal confidence to manage trauma, liaison with other emergency medical services (EMS) that exist in the area of activity, familiarisation with emergency

services, command and control skills, communications, personal protection, identification, commonly encountered trauma emergencies and medical equipment used. Medical equipment that was checked included airway, ventilatory support, circulatory support, monitoring devices, drugs, equipment trays, fixation devices, and support staff and other equipment.

In some sections open-ended questions were asked to generate discussion on respondents' opinions. The questions sought to establish incentives and disincentives to trauma training, preparedness and practice. The questionnaire consisted of 27 questions and estimated time to complete it was 15 minutes.

4.6 DATA COLLECTION

A covering letter introducing the purpose of the study and requesting the respondent to complete the questionnaire was sent out to the doctors via post. Each questionnaire was mailed out with a self-addressed return envelope and a postcard. The stamped postcard had the researcher's reply address and the respondent's. A note was included stating that the postcard and questionnaire should be sent back separately. The postcard was meant to indicate who had hopefully returned their questionnaire even though the questionnaire was anonymous. The questionnaire was to be sent back in the stamped reply envelope separately from the postcard so as to ensure anonymity. Respondents who did not return their questionnaires were followed up telephonically using the returned postcards. Repeat questionnaires were mailed to non-responders.

4.7 THE PILOT STUDY

A pilot study was necessary to test and clarify key questions introduced in the questionnaire and to check practicality of the survey. The pilot study also served to

test the analysis method. Unclear questions were modified and additional ones added where necessary. The pilot study was conducted amongst 10 private general medical practitioners (GPS). The study led to a few minor changes being made in the structuring and wording of the questionnaire. In order to minimise bias the 10 GPs sampled were excluded from the main study leaving 288 respondents to be surveyed.

4.8 SOURCES OF BIAS

Those doctors lacking in emergency surgical and or medical skills might not have completed the questionnaire though that could not be ascertained. Answers to open-ended questions might be subject to different interpretations making content analysis difficult and biased. With regard to incentives and disincentives to trauma training, preparedness for and practice respondents may have answered what they know is correct and not what they actually do or think.

4.9 ETHICAL CONSIDERATIONS

Clearance for the protocol was obtained from the University of the Witwatersrad's Postgraduate Committee and the Committee for research on Human Subjects. Clearance number M050230. See appendix 6. Participation in the survey was voluntary and anonymous. The data and information received was treated with confidentiality.

4.10 PROBLEMS

Expected problems were lack of co-operation and support from the sampled doctors and delays in returning the questionnaires. Other challenges were failure to complete and to return the questionnaires. Failure to complete and to return the questionnaires would retard research progress and reduce sample size.

Questionnaires that are partially completed would also compromise quality of data. Respondents who did not return the self-administered questionnaires separate from the postcards could invalidate anonymity of the questionnaires. By clearly explaining the purpose of the study, obtaining their informed consent and voluntary participation it was hoped that any concerns they might have had would be minimised.

4.11 LIMITATIONS OF THE RESEARCH REPORT

The results of the study could not be generalized to all private general medical practitioners given that the study was confined to private general medical practitioners that said that they spent at least 50% of their time in private general medical practice in Limpopo province. The number of respondents was also low and the research was confined to one province.

5 DATA PRESENTATION

5.1 RESPONSE RATE

The following responses were received after the 288 questionnaires were mailed to the GPs in Limpopo province:

Of the 288 GPs 103 respondents (36%) mailed their questionnaires back indicating that they were 50% of the time in private general medical practice. Nine respondents (3%) stated that they were not 50% of the time in private general medical practice and returned the rest of their questionnaires uncompleted. Medical practitioners who did not spend at least 50% of their time in private general medical practice were excluded from the study. Two respondents (0.7%) sent reply letters apologizing for not completing the questionnaires because they had retired from medical practice. Twenty-four respondents (8.3%) returned blank questionnaires in the enclosed reply envelope without stating reasons for not completing them. Fifty six uncompleted questionnaires (19.4%) were sent back with *'Return to Sender'* or *'RTS'* note on the forward envelopes. Ninety four questionnaires (33%) were not returned despite follow-up re-mailing and telephone reminders. These results meant that out of the 288 questionnaires sent out 185 (64%) were excluded in data analysis leaving a response rate of 36%. Even though the quantity of the questionnaires sent back (response rate) meant that the results of the study could not be generalized to all GPs in Limpopo Province the quality of the feedback received was deemed to be sufficient for analysis. It is also unlikely that a higher response rate would have yielded results and themes significantly different from the ones already received. The feedback received gave an indication of the GPs' opinions and experiences regarding pre-hospital trauma care: training and preparedness for and practice in Limpopo Province.

5.2 DEMOGRAPHIC DATA

Table 3 shows that forty one per cent (41%) of the 103 GPs who indicated that they spent 50% of their time in private general medical practice were above 45 years old. The majority of the GPs were male (85%). Slightly more GP practices reported that they were located in urban areas than in rural ones in the province. Out of the 103 subjects 101 indicated where their practices were located. In urban areas they comprised 52.5% compared to 47.5% in rural areas (Table 4).

Table 3: Age of GPs

AGE	FREQ.	%.	CUM.
26-35 yrs	27	26.2	26.2
36-45yrs	34	33.0	59.2
>45yrs	42	40.8	100.00
TOTAL	**103**	**100**	

Table 4: Location of GP practices

LOCATION	FREQ.	%.	CUM.
Urban	53	52.5	52.5
Rural	48	47.5	100.00
TOTAL	**101**	**100**	

Most of the private general medical practices were solo (60%) followed by partnerships (33%) (table 5). The other types of practices included close corporations and incorporations.

Table 5: Type of GP practice

PRACTICE TYPE	FREQ.	%.	CUM.
Solo	62	60.2	60.2
Partner	34	33.0	93.2
Other	7	6.8	100.00
Total	**103**	**100.00**	

Out of the 103 respondents 102 of them indicated whether they were in full-time or part-time private general medical practice. Almost all (95%) those who stated that they spent at least 50% of their time in private general medical practice were full-time (table 6).

Table 6: Time spent in GP practice

TIME	FREQ.	%.	CUM.
Full-time	97	95.1	95.1
Part-time	5	4.9	100.00
TOTAL	**102**	**100.00**	

Of the 103 respondents who said that they spent at least 50% of their time in private general medical practice 38% of them graduated from the university of Pretoria followed by MEDUNSA at 31%. About 4% of the respondents obtained their junior medical degree from outside South Africa. Those who obtained their degrees from outside South Africa did not specify whether the names they gave for places where they obtained their medical degrees were names of medical schools or countries. Examples were those who said “USA” or “Pakistan”. The universities from which the respondents graduated as medical practitioners are shown in table 7.

Table 7: Universities from which respondents graduated

UNIVERSITY	FREQ.	%.	CUM.
Medunsa	32	31.1	31.1
University of Pretoria	39	37.9	69.0
University of Free State	10	9.7	78.7
University of Kwa-Zulu Natal	7	6.8	85.5
University of Witwatersrand	8	7.8	93.3
University of Cape Town	3	2.9	96.2
University of Kingshasa	1	1.0	97.2
United States of America	2	1.9	99.1
Pakistan	1	1.0	100.00
TOTAL	**103**	**100.0**	

The year of qualification as medical practitioner ranged widely from 1961 to 2005 (44 years). Approximately 43% of the respondents graduated as doctors in the last 15 years of the study followed by 33% in the preceding 15 years. About 21% of the participants graduated in the period 1961 and 1976. The mode was 7 graduates in 1989. The duration of private general medical practice ranged from 1 to 43 years. Sixty three per cent (63%) of the respondents had been in practice for not more than 15 years prior the time the study was conducted. The mean was 15.17 years and standard deviation, 10.9. Variance was 117.8 and skewness, 0.8. Four per cent (4%) of the respondents had been in the sector for over 40 years.

5.3 TRAUMA TRAINING

Of the 103 who answered the question of whether they received trauma training since they commenced work as GPs, 55% said yes, while 45% said no (table 8).

Table 8: Proportion of respondents that received trauma management training

TRAINING	FREQ.	%.	CUM.
Yes	57	55.3	55.3
No	46	44.7	100.0
TOTAL	**103**	**100.0**	

5.3.1 Method of trauma management training

Of the 103 respondents 53 (51.5%) received trauma training while working in casualty departments at hospitals (stated as 'worked in casualty job at hospital' in the questionnaire), with some as far back as in 1964 and as recently as in 2004 as indicated in table 9.

Table 9: Method of trauma management training

	Method of training	Yes Freq.	Yes %.	No Freq.	No %.	Range of years
a.	Worked in casualty job at hospital (meaning worked in the casualty department at hospital)	53	51.5	50	48.5	1964-2004
b.	Enrolled for a trauma management course (meaning registered for and studied for trauma course)	31	30.1	72	69.9	1989-2006
c.	Was involved with emergency medical services (meaning collaborated and worked with EMS)	15	14.6	88	85.4	1995-2005
d.	Underwent internet-based training	1	1.0	102	99.0	2000
e.	Registered for compact disc (CD) based training	-	-	-	-	-
f.	Other	6	5.8	97	94.2	1994-2004

Of the 53 who said that they worked in casualty departments 33 (62.3%) indicated the year in which they did the job. 78.8% (26 out of 33) worked in hospital casualty departments more than 5 years ago while about 3% (1out of 33) worked in the departments in the last 2 years of the survey as indicated in table 10. Table 10 further shows that 31 respondents received their training by enrolling for a trauma management course. That meant that they registered for and studied for a trauma management program. Of those 31 respondents sixty seven per cent

(66.7%) enrolled for the courses more than 3 years ago as indicated in table 11. 25 (78%) of them enrolled for the courses between the years 1989 and 2006 as shown in table 10 above.

Table 10: Proportion of respondents that worked in Casualty Department at Hospital

	FREQ.	%.	CUM.
Longer 5 years	26	78.8	78.8
3-5 years	6	18.2	97.0
2 years or less	1	3.0	100.00
Total	**33**	**100.00**	

Table 11: Proportion of respondents that enrolled for trauma management courses

	FREQ.	%.	CUM.
Longer 5 years	7	29.2	29.2
3-5 years	9	37.5	66.7
2 years or less	8	33.3	100.0
Total	**24**	**100.0**	

Table 11 also indicated that 29% (7 out of 24) had their training longer than 5 years ago while 33% had theirs less than 2 years ago.

Those who said that they received their trauma training through collaboration and working with EMS were 15 (14.6%) as shown in table 9.above. Of the 15 subjects 6 (40%) respondents worked with EMS between the years 1995 and 2005. One respondent said that he was “involved with SADF (South African Defence Force)

EMS commandos" meaning that he received trauma management training while serving in the EMS attached to the military. The majority of them (83.3%) worked with EMS more than 2 years ago before the survey was conducted (table 12 below).

Technology-based trauma training method was the least popular with only 1 respondent stating that he underwent internet-based training more than 2 years ago (in the year 2000) while another registered for compact-disc (CD) based training without stating the year in which he did.

Table 12: Proportion of respondents involved with EMS (that is, collaborated and worked with EMS)

	FREQ.	%.	CUM.
Longer 5 years	3	50.0	50.0
3-5 years	2	33.3.	83.3
2 years or less	1	16.7	100.00
Total	**6**	**100.00**	

Six subjects (5.8%) employed other methods for trauma-related training that included attending an Advanced Life Support Skills Workshop offered by a private hospital group, studying for an Acupuncture Diploma, and completion of a module in emergency care while attending an anaesthetic refresher course (table 9 above). Of those 6 subjects four (67%) engaged in other training methods more than 2 years ago in the period 1999 to 2004.

5.3.2 CPR Training

The number of those who underwent training in cardio-pulmonary resuscitation (CPR) was almost equal to those who did not with 51(52%) saying they did while 49 (49%) said that they did not (table 13).

Table 13: Proportion of respondents that underwent CPR training

	FREQ	%.	CUM.
Yes	51	51.5	51.5
No	48	48.5	100.0
TOTAL	**99**	**100.0**	

Of the 51 who stated that they underwent training in CPR 46 (45%) of them indicated the year of last certification. That was during the periods 1991 to 2006. Of the 46 subjects that received certification in CPR 30 (65%) received the training more than two years prior the research. Furthermore 73.9% of the 46 respondents were certified in the last 5 years and 35% within the last 2 years as shown in the table 14 below.

Table 14: Certification in CPR

	FREQ.	%.	CUM.
Longer 5 years	12	26.1	26.1
3-5 years	18	39.1	65.2
2 years or less	16	34.8	100.0
Total	**46**	**100.0**	

5.3.3 Trauma management certification and updates

The number of respondents who completed ATLS was 24 (23%). Other critical care certificate that respondents said they received was Basic Life Support {BLS=

29 (28%)}. The respondents reportedly received first training in Basic Life Support (BLS) during the period 1991 to 2005 as shown in table 15 below. Out of the 29 who studied for BLS 86% did the course in the last 3 to 5 years of the study (see table 16). Only 6 out of the 29 (21%) respondents who underwent basic life support training updated their BLS between the years 2001 and 2006. Half of those 6 respondents updated their BLS certificates in the last 2 years as shown in table 17.

Table 15: Certification in trauma management

Course	1st training freq.	1st training %.	Years range		Update freq.	Update %.	Update years range
BLS	29	28	1991-2005		6	20.7	2001-2006
ATLS	24	23	1993-2005		5	20.8	2001-2005

Table 16: BLS Training

	FREQ.	%.	CUM.
Longer 5 years	10	34.5	34.5
3-5 years	15	51.7	86.2
2 years or less	4	13.8	100.0
Total	**29**	**100.0**	

Table 17: BLS Update Certification

	FREQ.	%.	CUM.
Longer 5 years	-	-	-
3-5 years	3	50	50
2 years or less	3	50	100
Total	**6**	**100**	

Table 18 shows that of the 24 who underwent ATLS training 71% received their training more than 2 years prior the study. Table 18 also shows that 17 (71%) of the subjects received ATLS training in the last 5 years compared to 7 (24%) during the period 1993 and 2001 (8 years) (see table 15 too) further suggesting increased efforts to train more doctors in advanced trauma life support in recent years. Only 5 (21%) of those who were trained in ATLS updated their certificates during the last 5 years (2001 to 2005) of the survey (table 15 above). That also meant that fewer GPs updated their ATLS qualification.

Table 18: ATLS Training

	FREQ.	%.	CUM.
Longer 5 years	7	29.2	29.2
3-5 years	10	41.7	70.9
2 years or less	7	29.2	100.0
Total	**24**	**100.0**	

The number of respondents who did not answer the question of how they kept themselves up to date with the latest trauma management techniques was 29 (28%). The 74 (72%) subjects who answered the question provided a total number of 115 responses indicating how they kept themselves up to date with the latest trauma management techniques. The responses were categorised and common themes combined. Their responses are summarised in the table 19.

Table 19: Updating trauma management techniques

CATEGORY	FREQUENCY	%
Personal study (=studying trauma publications informally)	42	37
Trauma meetings (=attending and participating in formal trauma meetings)	28	24
Work (=employed in trauma care facility and treating trauma patients)	26	23
Courses (=registering for and studying trauma program)	17	15
Non-specific methods	2	2
GRAND TOTAL	**115**	**100**

The commonest method of updating trauma management skills was through personal study at 37% (frequency of 42 out of 115) followed by attendance of trauma management meetings at 24% (frequency 28 out of 115) and by attending to trauma patients (23%). The subjects who attended trauma management refresher courses were 17 (15%).

5.3.4 ATLS at the College of Emergency Care in Polokwane City

Of the 103 respondents 55% of them were aware of Advanced Trauma Life Support (ATLS) course offered by the College of Emergency Care in Polokwane (Provincial capital of Limpopo province). That meant that almost half of the respondents were still unaware of the course in Polokwane. Of the GPs who had done the course before 38 (37%) indicated that they would be willing to attend trauma refresher courses offered by the College of Emergency Care in Polokwane. Only 9 (9%) said that they would not be willing to attend the refresher courses at the College and the remaining 56 (54%) did not respond to the question. Given that the majority 81% (38 out of the 47 who answered question 15) said that they would be willing to attend the refresher courses it indicated a need for ATLS refresher courses in the province. There was also a further need to raise awareness about the ATLS course in Polokwane City.

5.4 INCENTIVES AND DISINCENTIVE FACTORS TO TRAUMA TRAINING

Of 103 subjects 49 (48%) indicated incentives factors in the area where they practiced that had impacted on trauma management training. Of the 103 subjects 54 (52%) did not indicate any incentives. The 49 respondents who identified incentives factors to trauma training provided a total of 60 incentives. The incentives were categorised and common themes identified and listed together. The categories are illustrated in table 20. The categories were defined as follows:

Trauma prevalence= the number of people with trauma at a specific time; Trauma care facilities=physical infrastructure, equipment and human resources used for trauma care delivery; Trauma support=rendering help, advice, encouragement or guidance in trauma management; Trauma knowledge and skills= being educated about and clinically competent in trauma management; Performance improvement=the ability to render trauma care more efficiently and professionally and endeavouring to minimise trauma patient morbidity and mortality; GP practice location=geographic area where a GP’s premises were situated; Time for

trauma=amount of time devoted to trauma training and management; Cost-benefits considerations=demands placed on trauma care giver and rewards received; Healthcare regulations=laws and policies governing trauma and related health matters; Patient benefits=gains to the trauma patient; Doctor psycho-emotional benefits=mental and emotional gains to the doctor treating trauma patient.

Table 20: Incentives to trauma management training

	CATEGORIES	FREQUENCY	%
1.	Trauma prevalence	20	33.3
2.	Trauma care facilities	10	17
3.	Trauma care support	4	6.7
4	Trauma knowledge and skills	10	17
5.	Performance improvement	12	20
6.	GP practice location	4	6.7
	TOTAL	**49**	**100**

The major incentives to trauma management training in order of frequency were prevalence of trauma (33.3% of the respondents), performance improvement (20% of the respondents), trauma facilities (17% of the respondents), trauma knowledge and skills (17% of the respondents), trauma care support (6.7% of the respondents), and location of GP practice (6.7% of the respondents).

Of the 103 participants 61(59%) GPs stated their disincentives to trauma management training while 42 (41%) did not. The 61 respondents provided a total of 89 disincentives to trauma management training that were also categorised according to common themes. 8 categories were identified and they are illustrated in table 21below.

The major disincentives to trauma management training in order of frequency were time for trauma care (29% of respondents), trauma care facilities (15.6% of respondents), cost-benefit considerations (15.6% of respondents), trauma prevalence (11.1% of respondents), trauma care support (10.0%), GP practice location (10.0% of respondents), trauma knowledge and skills (6.7%), and healthcare regulations (2.2% of respondents).

Table 21: Disincentives to trauma management training

CATEGORIES	FREQUENCY	%
Trauma care facilities	14	15.6
Trauma prevalence	10	11.1
Trauma care support	9	10.0
Trauma knowledge and skills	6	6.7
Time for trauma care	26	28.9
Cost-benefit considerations	14	15.6
Healthcare regulations	2	2.2
GP Practice location	9	10.0
GRAND TOTAL	**90**	**100**

5.5 TRAUMA MANAGEMENT PREPAREDNESS

In the survey respondents were requested to indicate the equipment that was available at their places of practice and that was used to manage airway, breathing and circulation. They were also asked to indicate trauma drugs and any other equipment or material used during emergencies that they kept where they worked as GPs. They also had to rate their level of trauma preparedness considering the emergency equipment and drugs that they possessed at places

where they worked as GPs. They were also supposed to indicate whether they had contact numbers of emergency service providers such ambulance, fire brigade and the police.

The equipment that the respondents had where they practiced as private general medical practitioners was divided into airway and breathing equipment, drugs and others and they are summarised in tables 22, 23 and 24. The tables are based on recommendations by Kloeck and Ragavan[82], BASICS (see appendix 4 and WHO (see appendix 5) about equipment that is considered essential during trauma.

Table 22: Availability of airway and breathing equipment

	ITEM	FREQ.	%
a.	pocket face mask	82	80
b.	venturi mask	57	55
c.	Oropharyngeal airway	71	69
d.	suction e.g. manual	50	49
e.	bag-valve-mask ventilation device	68	66
f.	tracheal tubes	67	65
g.	Laryngoscope	73	71
h.	cricothyrotomy set	7	7
i.	oxygen supply	47	46
j.	Stethoscope	102	99
k.	pulse oximeter	25	24
n.	Needle with one-way valve	18	18
o.	chest drains	18	18

Emergency trauma drugs available at places where the respondents worked as GPs are listed in table 23. Adrenaline appeared to have been the most widely stocked trauma drug with a frequency of 96 respondents or 93%. It was followed

by aspirin with a frequency of 95 or 92%. The drugs that were least stocked were ketamine (frequency 27 or 26%) followed by zidovudine (frequency 33 or 32%).

The other trauma-related equipment that was available where the respondents worked as private general medical practitioners is listed in table 24 below. Emergency trauma equipment that was commonly found at places where the respondents worked as private general medical practitioners included gloves, antiseptics, scissors, gauze and bandages, and BP apparatus, each with a frequency of 101 or 98%. The other trauma-related equipment that was reported to be least available at GPs' places of practice was cervical collar (frequency 63; 61%). Goggles were also infrequently stocked (frequency 47; 46%).

Table 23: Availability of emergency drugs at GP rooms

	ITEM	FREQ.	%.
a.	Cyclokapron	74	72
b.	Phenytoin	43	42
c.	Zidovudine	33	32
d.	Normal saline and/or Ringer's Lactate bags	90	87
e.	50% Dextrose 50ml and/or glucose gel	79	77
f.	Ketamine	27	26
g.	Adrenaline 1:1000	96	93
h.	Atropine	71	69
i.	Aspirin	95	92
j.	Morphine and other analgesics	64	62

Table 24: Availability of other equipment at GP rooms

	ITEM	FREQ.	%.
a.	Gloves	101	98
b.	Masks	85	83
c.	Goggles	47	46
d.	Tourniquet	91	88
e.	pen torch	89	86
f.	Antiseptics / swaps	101	98
g.	Scissors	101	98
h.	gauze and bandages	101	98
i.	plasters, bandaids and steri-strips	89	86
j.	sterile suture packs and materials	100	97
k.	Burn dressings	86	84
l.	Eye-pads	78	76
m.	cervical collar	63	61
n.	intravenous cannulae	86	84
o.	fluid giving sets	88	85
p.	needles and syringes	99	96
q.	BP apparatus	101	98
r.	sharps disposal container	100	97

Considering the equipment and drugs that the respondents said were available at the places where they practiced as private general medical practitioners they rated their level of preparedness (using the scale below) to manage trauma patients in terms of the following:

For each of the following competencies (table 25) 43% of the respondents said that they were at level 5 of preparedness, meaning that they could manage independently: adhering to universal safety measures, assessing trauma patients accurately and rapidly, and providing adequate breathing. Few respondents felt prepared to stabilize the spinal cord (30.3%) and to monitor trauma patients after resuscitation (35.64%) independently without supervision or support. Almost half (54.5%) of the respondents reported that they were equipped and prepared to open and protect the airway independently.

For each one of the listed competencies (with the exception of opening and protecting the airway) the proportion of respondents prepared to manage trauma patients independently was less than 50%. The proportion of those who were not at all prepared (level 0) to manage patients in terms of the 8 competencies measured ranged from 1% to 5%. On average 42% of the respondents felt that they were at level 5 of preparedness for trauma even though it is uncertain whether that referred to minor or major trauma.

Table 25: Level of preparedness to manage trauma patients

		LEVEL OF PREPAREDNESS					
	ITEM	**0**	**1**	**2**	**3**	**4**	**5**
a.	Adhering to universal safety measures	1.0%	2.0%	7.1%	13.3%	33.7%	42.9%
b.	Assessing trauma patient rapidly and accurately	-	3.0%	7.0%	13.0%	34.0%	43.0%
c.	Opening and protecting the airway	2.0%	5.0%	8.0%.	12.9%	17.8%	54.5%
d.	Stabilizing the spinal cord	4.0%	9.1%	14.1%	22.2%	20.2%	30.3%
e.	Providing adequate breathing	2.0%	5.0%	10.0%	16.0%	24.0%	43.0%

f.	Restoring and maintaining sufficient circulation	5.0%	1.9%	5.9%	12.9%	29.7%	44.6%
g.	Monitoring trauma patient after resuscitation	2.9%	8.9%	14.9%	18.8%	18.8%	35.6%
h.	Re-evaluating response to resuscitation	2.0%	6.0%	14.0%	19.0%	18.0%	41.0%

Scale: **0**=not at all prepared; **1**=manage with constant supervision; **2**=manage with much support; **3**=manage with some assistance; **4**=manage with minimal supervision; **5**=manage independently.

The proportion of respondents who had contact numbers of emergency services likely to be present at a trauma scene are shown in table 26 below. Relatively few respondents were found to have contact numbers of Fire Departments (n=24; 26%). Almost all the subjects had contact numbers of ambulance services and the police.

Table 26: Availability of emergency services contact numbers to doctors

		Yes (freq.)	**Yes (%)**	**No (Freq.**	**No (%)**
a.	Ambulance	94	94	6	6
b.	Fire	67	73.6	24	26.4.
c.	Police	94	94	6	6
d.	Other	-	-	-	-

5.6 TRAUMA PRACTICE

5.6.1 Percentage of trauma practice

Participants were also requested to indicate the type of trauma cases they attended to. Of the 103 subjects 94 (91%) indicated the percentage of their medical practice that comprised trauma care. It was found that on average 8.3% of their medical practice comprised emergency trauma care. The standard deviation was 9.2 and variance 84.6.

Of the 103 respondents 93 (90.3%) indicated the percentage of their medical practices that comprised emergency care for blunt trauma, 86 (84%) for penetrating trauma and 58 (56.3%) for other forms of trauma. 'Other forms of trauma' referred to trauma that could not be classified as blunt or penetrating, such as rape.

The mean that constituted care for blunt trauma was 37.2% with a standard deviation of 28.6 and variance of 819.1. The mean for penetrating trauma was 27.7% with standard deviation of 27.2 and variance of 739.3. The mean percentage that constituted emergency care for other forms of trauma was 19.1% with standard deviation of 23.9 and variance of 569.7. The percentage of the injuries that the respondents managed that comprised blunt trauma, penetrating trauma and other forms of trauma are summarised in table 27 below. Table 27 shows that blunt trauma was the commonest form of trauma (37.2%) that the respondents said they attended to.

Table 27: Proportions of injuries managed by GPs

	Blunt	Penetrating	Other
Respondents	90.3% (n=93)	83.5% (n=86)	56.3% (n=58)
Mean	37.2	27.7	19.1
Std.dev	28.6	27.2	23.9
Variance	819.1	739.3	569.7
Skewness	0.4	0.9	1.9

5.6.2 Support to local EMS

The number of respondents who supported the local emergency medical services was almost equal to those who did not. Those who said that they supported the local EMS constituted 53%. Those who said that they did not support local EMS cited '*absence of EMS* (meaning unavailable EMS)*'*; *'bad EMS* (meaning poor quality service of EMS)*; 'pathetic ambulances-government'* (meaning suboptimal state of EMS facilities and resources) and '*ill-equipped EMS'* (meaning under-resourced EMS) as reasons for non-support. Of the 53% who said that they supported the local EMS 33.33% did not specify the support that they rendered.

5.6.3 Sources of trauma management information

The frequency of use of the following sources of information to guide trauma management is illustrated in table 28 below. The frequently used sources of trauma management information were personal experience (57.9% respondents) followed by continuing medical education (50% respondents). The respondents who occasionally referred to trauma management guidelines comprised 42.6%.

They were followed by 39.5% who relied on preferences of medical staff to guide their trauma management decisions. Trauma journals were rarely used by 35.42% of the respondents. Internet-based sources were the least utilised (58.1% respondents).

Table 28: Sources of trauma management information

		SCALE			
	SOURCE OF INFORMATION	**0**	**1**	**2**	**3**
a.	continuing medical education	4.0	12.0	34.0	50.0
b.	trauma journals	21.9	35.4	26.0	16.7
c.	trauma textbooks	16.7	27.1	37.5	18.8
d.	preferences of medical staff	17.4	31.4	39.5	11.6
e.	emergency medical training	23.4	27.7	37.2	11.7
f.	trauma management guidelines	9.6	21.3	42.6	26.6
g.	personal experience	1.0	12.1	29.3	57.6
h.	internet-based sources	58.1	19.4	19.4	3.2
i.	Other: specify	-	-	-	-

Scale: **0**=never used; **1**=rarely used; **2**=occasionally used; **3**=used frequently.

5.6.4 Trauma management skill levels

The skill level of the GPs to render pre-hospital emergency management of the following trauma incidents is represented in table 29 below (using the scale: **0**=no skill; **1**=poor; **2**=fair; **3**=excellent). The list of injuries was derived from recommendations by World Health Organization, International Society of Surgery and International Association for the Surgery of Trauma about required skill levels to manage various forms of trauma[24]. (See appendix 5).

Table 29: Skill level for pre-hospital trauma care

		SCALE			
	INJURY	**0**	**1**	**2**	**3**
a.	head injury	-	9.3	69.1	21.7
b.	eye injuries	3.1	22.7	58.8	15.5
c.	Maxillo-facial injuries	3.1	22.9	64.6	9.4
d.	penetrating injuries of the neck	1.1	30.5	56.8	11.6
e.	chest injuries	-	19.8	51.1	29.2
.f.	abdominal injuries	-	15.5	58.8	25.8
g.	Uro-genital injuries	-	22.7	58.8	18.6
h.	Spinal cord injuries	2.1	34.4	51.0	12.5
I.	extremity injuries	-	9.3	39.2	51.6
j.	soft tissue injuries	-	4.2	27.4	68.4
k.	needlestick injuries	-	8.3	33.0	58.8
l.	Rhabdomyolysis	8.7	27.2	47.8	16.3
m.	compartment syndrome	1.0	18.8	54.2	26.0
n.	nerve injuries	4.1	30.9	52.6	12.4
o.	peripheral vascular injuries	2.1	24.2	47.4	26.3
p.	pelvic fractures	1.0	18.6	54.6	25.8
q.	Burns	1.0	10.4	46.9	41.7
r.	paediatric injuries	-	17.5	60.8	21.7
s.	Human and animal bites	-	5.3	35.8	59.0
t.	Missile and blast injuries	5.2	36.5	46.9	11.5

Scale: **0**=no skill; **1**=poor; **2**=fair; **3**=excellent.

The mean skill levels for the pre-hospital management of injuries listed in table 29 are indicated in table 30 below. In order to arrive at the mean skill levels in table 30 the percentage of respondents in each column in table 29 were added together and the total in each column was then divided by the total number of types of injuries (in that column) that the respondents said that they could manage.

Table 30: Mean skill level for pre-hospital trauma care

	0=no skill	1=poor	2=fair	3=excellent
Sum of percentages of respondents per column (A)	32.6%	388.78%	1015.4%	563.3%
Number of types of injuries managed (B)	11	20	20	20
A / B	2.97%	19.4%	50.8%	28.2%

Based on table 30 it was deduced that the majority of the respondents (50.8%) felt that they were fairly skilled to manage in a pre-hospital setting, the various types of injuries listed in table 29. However it was not specified whether they referred to minor or major types of injury. About 3% of the respondents felt that they were poorly skilled. Soft tissue injuries were the type of injuries that most of the respondents (68.4%) said that they could manage with excellence.

5.6.5 Incentives and disincentives to trauma practice

Out of 103 respondents 57 (55.3%) did not indicate their incentives to trauma practice. The 46 (44.7%) subjects who answered the question yielded a total of 58 incentives. The incentives were also categorised and listed together according to common themes. The categories are represented in table 31.

Table 31: Incentives to trauma practice

CATEGORIES	FREQUENCY	% (%)
Trauma prevalence	12	20.7
Trauma care facilities	6	10.4
Trauma knowledge and skills	10	17.2
Performance improvement	7	12.1
Patient benefits	8	13.8
Trauma care support	4	6.9
Doctor psycho-emotional benefits	7	12.1
GP practice location	4	6.9
GRAND TOTAL	**58**	**100**

The leading incentive to trauma practice was the high rate of trauma (frequency 12; 20.7%) followed by the need to improve trauma knowledge and skills (17.2%).

Of 103 subjects 41 (39.8%) did not state their disincentives to trauma practice. The 62 (60%) remaining respondents provided a total of 94 disincentives that were also categorised according to common themes. Ten categories of disincentives factors were identified and they are represented in table 32 below.

Table 32: Disincentives to trauma practice

CATEGORIES	FREQUENCY	%
Trauma care support	14	14.9
Trauma care risk	9	9.6
Cost-benefit considerations	11	11.7
Regulations and policies	2	2.1
Time for trauma care	14	14.9
Trauma care facilities	23	24.5
Trauma knowledge and skills	4	4.3
Trauma prevalence	3	3.2
GP practice location	4	4.3
Performance improvement	10	10.6
GRAND TOTAL	**94**	**100**

5.6.5.1 Trauma care facilities

The major disincentive to trauma practice was a state of trauma care facilities that the respondents found unacceptable. Twenty five per cent (25%) of the respondents found it to be a disincentive to trauma while 10% said it was an incentive. Lack of equipment and facilities at local hospitals accounted for 68% of the 25% of the disincentives. The lack of intensive care unit, x-ray and blood; unavailability of ambulances and improper casualty were some of the more specific disincentives mentioned. One hospital was said to be *'poor and deteriorating'* meaning that it was lacking resources and was in a poor state of maintenance. One GP was discouraged by a lack of private hospital. Referral trauma centres were also reported to be inaccessible. It was felt that there was '*poor hospital treatment'* (meaning suboptimal quality of trauma care). One

respondent said: *'most trauma patients go to hospital and not practice'* (meaning the majority of trauma patients preferred to go to hospital for trauma care), while another wrote: *'trauma hospital with specialists, ambulance service with well-trained paramedics-no sense in trying to treat severe injuries at my rooms'* (meaning hospitals are better resourced to treat trauma patients). It was also noted that *'general practice not equipped as hospital.'* (meaning GP facilities were inadequate to handle trauma cases).

5.6.5.2 Time for trauma care

Of the 103 respondents 15% identified lack of time as disincentive to trauma practice. Some said that they were focusing on other areas of medical practice. That could explain why there was shortage of trauma equipment, drugs and skills.

5.6.5.3 Trauma care support

Lack of trauma care support was also found to be another disincentive to trauma practice with 14.9% of respondents citing it. It was alleged that there was no proper back-ups from EMS; and not enough medical, nursing and specialist support. Trauma was said to be unpredictable, inconveniencing and interfered with routine office work. It was also found to involve lots of theatre work and hours.

5.6.5.4 Cost-benefit considerations

The cost-benefit of trauma care was found to be disincentive factor to 12% of the respondents. They complained that trauma involved lots of bad debts and unpaid accounts. Trauma management costs were said to be high. It was claimed that there was poor recognition of the surgical subspecialty. Remuneration was said to be low particularly amongst low-income population where trauma was more prevalent. More specifically remuneration by the Compensation Commissioner

was reported to be non-competitive. Trauma care was also perceived as offering very limited career opportunities.

5.6.5.5 Trauma performance improvement

About 11% of the subjects said that they were not keen to improve their efforts in trauma management because they were focusing on other medical fields. They were also de-motivated by the need for continuous trauma training and long theatre work.

5.6.5.6 Trauma care risks

Almost 10% of the respondents were worried about the risks associated with trauma management. They noted the risk of HIV and Hepatitis and other infections, and contamination during trauma care. They were also concerned about '*septic hospital facilities'* (meaning facilities that were not hygienic). They feared for their safety from uncooperative patients. There were also '*fears of violence which accompanies domestic squabbles-this extends to a period during management-drunkenness'* (meaning fear of violent attacks while treating injured patients). The possibility of litigation posed a serious legal risk.

5.6.5.7 Trauma knowledge and skills

The inability to handle very serious trauma cases, low likelihood to keep trauma skills up to date, and lack of continuous involvement in emergency cases to practice the skills acquired were identified by 4% of respondents as other reasons not to practice trauma.

5.6.5.8 GP practice location

GP practice location was a disincentive to trauma practice amongst 4% of the respondents. Long distances from trauma units and close proximity to a hospital also contributed about 4% of the disincentives in trauma practice. The major concerns were the fact that they were based on farms and transport and travel to trauma centre was a challenge.

5.6.5.9 Healthcare regulations and policies

Two subjects (2%) found regulations and policies related to trauma care prohibitive. They complained that '*hospitals not offering enough sessions covering casualty to gps'* (meaning lack of job opportunities for GPs at hospitals). Three respondents said that there was a low rate of trauma in their area of practice and felt that it was not worth practicing trauma.

6 RESEARCH DISCUSSION

6.1 INTRODUCTION

In this section conclusions are drawn and discussions and thought stimulated from the results in line with the study's aims and objectives. The aim of the study was to determine the state of pre-hospital trauma training and preparedness of and practice by general medical practitioners in Limpopo Province.

6.2 PROFILE OF THE RESPONDENTS

Amongst the 103 respondents who said that they spent at least 50% of their time in private medical general practice there was no one younger than 26 years. Of the respondents 41% were above 45 years indicating an ageing GP population. The result is consistent with that of a study by Gallagher that found that the average age of general practitioners in South Africa was 47 years.[99] Undergoing trauma training was not associated with the age of a general practitioner (p value= 0.120; Fisher exact=0.127) as shown in table 33 below. The majority (62%) of young GPs (less than 36 years) tended to undergo trauma training while amongst the older group of GPs there was an almost equal number of those who underwent training (53%) and those who did not (47%). See table 34 below.

The majority of respondent GPs in the province were males. They comprised 85% of the sector. However the number of female GPs who reported undergoing trauma management training (freq.=8) was almost equal to the number of those who did not (freq.=7) as shown in table 35 below. More male GPs underwent trauma training (freq.=48) than those who did not (freq.=39). But sex was not found to be associated with trauma training (p=0.895; Fisher exact=1.000) as illustrated in table 35 below.

Table 33: Association between age of GP and trauma management training

	Trauma management training					
	YES		NO		TOTAL	
Age of GP	Freq.	%	Freq.	%	Freq.	%
26-35 yrs	16	61.5	10	38.5	26	100
36-45 yrs	22	64.7	12	35.3	34	100
>45 yrs	18	42.9	24	57.1	42	100
Total	56	54.9	46	45.10	102	100
Pearson Chi2 (2) =4.2433. p value = 0.120. Fisher's exact = 0.127						

Table 34: Trauma management training amongst younger and older GPs.

	Trauma management training					
	YES		NO		TOTAL	
Age of GP	Freq.	%	Freq.	%	Freq.	%
Young (<36 yrs)	16	61.5	10	38.5	26	100
Older (>36 yrs)	40	52.6	36	47.4	76	100
Total	56	54.9	46	45.1	102	100
Pearson Chi2 (1) =0.6207. Fisher exact = 0.498. p value = 0.431						

The shortage of female GPs could be attributed amongst others, to inconvenient or demanding hours for GP work, preference for other medical fields and family responsibilities. It could also be a result of historical gender inequalities in medical training. Most of the practices were concentrated in urban centres (53%) where business prospects appeared to be good. The other 47% was located in rural areas. Even though location of GP's practice was reported to be both an incentive

and disincentive to trauma management training (see tables 20 and 21) it was statistically found not to be associated with trauma management training (p=0.393; Fisher exact=0.426; Pearson chi2=1.5687) as shown in table 36.

Table 35: Association between GP's sex and trauma management training

	Trauma management training					
	YES		NO		TOTAL	
Sex	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**
Male	48	55.2	39	44.8	87	100
Female	8	53.3	7	46.7	15	100
Total	56	56	46	45	102	100
Pearson Chi2 (1) =0.0175. p value = 0.895. Fisher's exact = 1.000						

Table 36: Association between location of GP's practice and trauma management training

	Trauma management training					
	YES		NO		TOTAL	
Location of GP practice	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**
Urban	27	51.9	25	48.1	52	100
Rural	29	60.4	19	39.6	48	100
Total	56	56.0	44	44.0	100	100
Pearson Chi2 (2) =0.7308. p value = 0.393 Fisher's exact = 0.426						

There was no association between location of GP's practice and preparedness for trauma management as illustrated in the table 37 below showing availability of airway and breathing equipment where respondents practiced as private general practitioners (p-value more than 0.050). The exception to the finding was in terms of availability of chest drains where the p-value was 0.001. It was found that 31% of respondents who indicated that they had chest drains were based in rural areas while about 6% were practicing in urban areas. Given remoteness of their practices and inaccessibility to healthcare resources rural GPs could perhaps have felt the need to be more self-sufficient and better equipped with life-saving equipment such as chest drains.

The lack of association between the location and preparedness for trauma was also observed in terms of availability of emergency drugs and other equipment. The exception to that lack of association was observed in terms of availability of morphine and other analgesics (p-value=0.025, Fisher's exact=0.038, Pearson Chi2 (1)=5.0165). The association between morphine and other analgesics and location of a GP's practice is perhaps not surprising given that pain is one of the commonest presenting complaints at primary care level.

The results about location of GP's practice tended to indicate mal-distribution of the medical doctors. The concentration in urban centres could be a result of the economic challenges that are impacting negatively on GPs' ability to deliver effective trauma care. Bateman noted that the focus of most doctors is more on survival than patient care with some of the GPs reporting that their income had dropped by more than 70%.[100]

Most of the respondents (62%) operated solo practices and 34%, partnerships. Operating a solo private general medical practice or a partnership has an impact on the time that can be devoted to trauma management training, preparedness and practice as illustrated below. As was stated above 26 (29%) respondents indicated that lack of time was a disincentive factor to trauma training while 14 (15%) said that it was disincentive to trauma practice. Operating solo private medical practice means that for a GP to attend a trauma course or undergo

training during office hours he would have to close the practice temporarily or hire a locum while he is away. Those with more than one surgery were said to be causing patients to suffer as the GPs had very little chance of emergency care during office hours (as they are rushing between the surgeries) and do not engage in after-hours care.[101] Being in a partnership medical practice could allow more time for trauma training and practice.

Table 37: Association between location of GP's practice and preparedness for trauma management, measured in terms of availability of airway and breathing equipment

	ITEM	P value	Fisher exact	Pearson Chi(2)
a.	pocket face mask	0.210	0.317	1.5687
b.	venturi mask	0.401	0.428	0.7048
c.	Oropharyngeal airway	0.447	0.516	0.5774
d.	Suction e.g. manual	0.197	0.234	1.6648
e.	bag-valve-mask ventilation device	0.772	0.834	0.0842
f.	tracheal tubes	0.183	0.210	1.7735
g.	Laryngoscope	0.220	0.273	1.5014
h.	cricothyrotomy set	0.597	0.706	0.2790
i.	oxygen supply	0.287	0.322	1.1319
j.	spacers/nebulisation set	0.372	0.493	0.7979
k.	peak flow meter	0.617	0.633	0.2507
l.	Stethoscope	0.339	1.000	0.9147
m.	pulse oximeter	0.183	0.249	1.7694
n.	needle with one-way valve	0.452	0.604	0.5664
o.	chest drains	0.001	0.001	11.2620

But out of the GPs who received trauma training 57% (freq.=35) operated solo practices, followed by 56% (freq.=19) who were in partnerships and 29% (freq.=2) who were in other types of practices. See table 38 below. Despite those observations there was no association between type of GP practice and trauma management training (Pearson Chi2 (2) =2.1242. p value = 0.346. Fisher's exact

= 0.429). It is possible that those solo practitioners underwent trauma management training before embarking on private general medical practice.

Almost all (95%) those who stated that they spent at least 50% of their time in private general medical practice were full-time. That appeared to be important from a primary healthcare delivery point of view in a largely rural province like Limpopo that has a critical shortage of doctors. According to the South African Health Review of 1995, Limpopo province constituted 12,5% of total South African population and is 90,8% rural, and had 15,5 doctors per 100,000 population and 293, 2 nurses per 100000 population compared to Gauteng province which made up 17% of the country's population, was 4% rural and had 127.4 doctors for every 100000 population and 618,4 nurses per 100000 population.[102]

Table 38: Association between type of GP's practice and trauma management training

	Trauma management training					
	YES		**NO**		**TOTAL**	
Type of GP practice	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**
Solo	35	57.4	26	42.6	61	100
Partnership	19	55.9	15	44.1	34	100
Other	2	28.6	5	71.4	7	100
Total	56	54.9	46	45.1	102	100
Pearson Chi2 (2) =2.1242. p value = 0.346 Fisher's exact = 0.429						

The availability of full-time GPs tends to decrease patient waiting time and improve access to healthcare. Being fulltime also means that a GP would be available to attend to presenting trauma earlier.

In the survey it was found that out of GPs who indicated that they underwent trauma training 53% (freq.=51) were in full-time practice while all of those who were in part-time practice had received the training even though their number was lower (freq.=4) (table 39 below).

It could be that those who were in part-time private practice had more time to devote to trauma management training than those who were full-time. The finding that not all full-time GPs had undergone training could be further indicative of lack of time as a disincentive to trauma training (see table 21 above). Despite the observed differences between full-time and part-time general practitioners there was no association between time spent in private general medical practice and trauma management training (p-value=0.062; Fisher's exact=0.123; Pearson Chi2=3.4834.

Table 39: Relationship between time spent in private general medical practice and trauma management training

	Trauma management training					
	YES		**NO**		**TOTAL**	
Time spent in private general practice	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**
Full-time	51	52.6	46	47.4	97	100
Part-time	4	100	0	0.00	4	100
Total	55	54.5	46	45.5		100
Pearson Chi2 (2) =3.4834. p value = 0.062 Fisher's exact = 0.123						

It was observed that being in full-time private general medical practice did not necessarily translate into a higher proportion of the practice that comprised

emergency trauma care. Table 40 below shows that 64% of the respondents who were in full-time private medical practice had an emergency trauma care burden of less than 10% compared to 36% that had a proportion of 10% and more. Amongst part-time practitioners the percentage of those whose burden of emergency trauma care was less than 10% was equal to that of those with 10% and more. The findings imply lack of an association between time spent in private general medical practice and proportion of the practice that constitutes emergency trauma care (p=0.621).

It was noted that the majority of the respondents graduated as medical practitioners from the university of Pretoria (38%) and MEDUNSA (now part of University of Limpopo) (31%). The two universities are geographically close to each other and closest to Limpopo province. It was outside the scope of the study to determine whether a medical school from which a GP graduated as a medical practitioner was a predictor of the likelihood of that doctor choosing trauma management as a career.

Table 40: Correlation between time spent in private general medical practice and proportion of the practice comprising emergency trauma care.

	Proportion of medical practice comprising emergency trauma care					
	< 10%		**10 % and more**		**TOTAL**	
Time spent in private general practice	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**
Full-time	57	64.0	32	36.0	89	100
Part-time	2	50	2	50	4	100
Total	59	63.4	34	36.6	93	100

It was however observed that undergoing trauma management training was not associated with the medical schools from which respondents graduated as medical practitioners (p=0.767; Fisher's exact=0.827; Pearson chi2 = 4.9075). The medical schools from which respondents graduated was also not related to the proportion of the practice that comprised emergency trauma care as shown below (p= 0.372). That might not be unexpected as most medical institutions have come to recognize the importance of trauma as a disease and are endeavouring to offer more training in it.

6.3 TRAUMA TRAINING

6.3.1 Trauma training methods

6.3.1.1 Working in casualty department at hospital

In the study, working in hospital casualty departments was the commonest method of trauma training amongst the respondents. Perhaps the reason it was the most popular method was because it formed part of their undergraduate medical training. The other reason could be that it had monetary rewards compared to the other trauma training methods such as internet-based training and enrolling for a trauma management course. Working in hospital casualty departments also allows for hands-on approach to trauma care resulting in acquisition of practical experience.

6.3.1.2 Working with EMS

Almost 15% of the respondents indicated that they obtained trauma training through collaboration and working together with EMS. It was observed that the attitude of EMS personnel to doctors at a pre-hospital emergency scene is variable. It was found that some are appreciative of the medical assistance with its

implicit advanced life support capability. The doctor is qualified to offer both technical and patho-physiological education and support at a trauma scene. His advanced medical background gives him an advantage allowing him to play a leading role in the care of the injured in a pre-hospital setting. On the other hand a doctor who is incompetent in basic or advanced life support techniques, has a hostile attitude, does not adhere to safety standards, lacks equipment and is unfamiliar with out-of hospital conditions, is likely to receive a cold reception from other members of EMS.

6.3.1.3 Technology-based trauma training

Technology-based trauma training was the most unpopular method amongst the respondents with only 2 of them indicating that they received it. Possible reasons for the unpopularity amongst the GPs could be lack of awareness, costs of the technology and lack of human interaction. The advantage with the method is that the GP can go through it at his own convenient time. Whether the methods will remain unpopular despite information technological advancements is yet to be seen.

6.3.1.4 Trauma and related management courses

Between the years 2001 and 2006 (5 years), 18 of the respondents registered for trauma management courses compared to 7 spanning a period 1989 through to 2000 (11 years) suggesting that in recent years more GPs enrolled for the courses or that the courses became more accessible. Trauma-related courses registered for included BLS and ATLS. The results indicated that while the scope of trauma management courses might be wide the number of GPs in Limpopo province who qualified in them was still low (less than 30%.

Table 41 shows that most of the trauma management certificates were received in the last 3 to 5 years of the study.

Table 41: Period qualified with trauma and related management courses

Course	No. qualified (%)	>5 years (%)	3-5 years (%)	≤2 years (%)
BLS	28	34.5	51.7	13.8
ATLS	23	24.2	41.7	29.2

While the short course trauma training system has been credited with increased geographic access to training and production of a higher number of graduates it has experienced problems stemming from the fact that the system has been running parallel to the tertiary education structures.[22] Gibbs *et al* questioned the tendency to view satisfactory completion of vocational training as adequate to determine competence in practice.[70] It was pointed out that trauma learners should be assessed through the levels of defined competency relevant to their professional career.

6.3.2 Updating trauma management courses

It was mentioned that 6 out of 29 (21%) respondents updated their BLS between the years 2001 and 2006 (see table 42 too). On the other hand 5 (21%) of those who were trained in ATLS updated their qualification during the last 5 years (2001 to 2005). The updating was done in the years 2004 to 2005 also indicating a low rate of updating of trauma management courses. Two respondents updated other non-specified trauma management courses. Over and above BLS and ATLS other respondents had other emergency medical certificates such as ACLS and APLS suggesting increased efforts to broaden overall emergency care skills.

A total of 13 respondents (6-BLS; 5-ATLS; 2-other) updated their trauma management courses. Overall the findings were that most of the subjects obtained their trauma and related management courses more than 2 years ago and that few of them had updated their courses. The disincentives factors to trauma training,

preparedness and practice discussed below probably accounted for some of the reasons why most of them did not update their courses as recommended.

It is known that infrequent use of emergency trauma skills results in loss of the skill. It was said that in any sphere of medical care, care could be improved by continuous education of healthcare professionals[80] suggesting that continuous professional development (CPD), training and research should become an essential component of trauma care.

Table 42: Proportion of those who updated trauma and related management courses

COURSE	Number who Updated	Percentage Updated
BLS	6	5.8
ATLS	5	4.9
OTHER	2	1.9
TOTAL	**13**	**12.6**

6.3.3 Updating Trauma management techniques

In the research study the reported four main techniques of updating trauma skills were personal study of journal articles (37%), attending trauma meetings (24%), working with trauma patients (23%) and enrolling for trauma management courses (15%). Personal study of journals was more popular than enrolling for trauma management course. Journal readings and attending meetings were used to update and improve knowledge about trauma. Refresher courses were attended for re-certification purposes and update skills. Given that 12.4% of the subjects said that they updated their trauma management qualifications (see table 39) while 37% updated their techniques through personal study it appeared that most of the

doctors preferred to update themselves in an informal way without writing examinations in trauma management. It would seem that the main aim of updating trauma management techniques was to improve clinical performance more than getting an academic qualification.

The need for refresher training to improve retention of trauma skills was highlighted by Woollard *et al* in a prospective study that evaluated the acquisition and retention of skills in CPR and the use of the automated external defribillator (AED) by lay volunteers in the UK.[103] Treloar *et al* showed that the use of human patient simulators (HPS) is one means by which trauma management skills may be practiced with sufficient numbers to learn and maintain emergency skills.[104] It was found that HPS education improves perceived preparedness and self-efficacy.

6.3.4 CPR Training

Although Cardiopulmonary resuscitation (CPR) is not classified as trauma training or trauma management course it is critical to a severely injured patient who has gone into cardiac-respiratory compromise. *Guidelines for essential trauma* care published by World Health Organization, International Society of Surgery, International Association for the Surgery of Trauma.[44] recognize that opening airway (A); providing breathing (B) and ensuring sufficient circulation(C) and administering drugs (D) appropriately is essential service and therefore require that it be provided at all levels of trauma care.

In the research study the rate of CPR training was about 1 respondent per annum in the 1990s rising to a frequency of almost 6 per annum recently. That suggested increased efforts being made to train as many people in CPR as possible. The Resuscitation Council of South Africa recommends CPR refresher training on a regular basis, that is, every second year.[105] The number of those who had not undergone trauma management training (46%) was almost the same as that of respondents who had not been trained in cardio-pulmonary resuscitation (49%).

Some researchers have questioned the need for mouth-to-mouth resuscitation saying that the focus of CPR should be on chest compression, which keeps oxygen-rich blood flowing to vital organs after cardiac arrest. In one study it was found that 22% of people who received chest compressions alone survived with good neurological function, compared with 10% who received combination CPR.[106]

The practice of CPR remains a challenge. One study found that even medical experts fail to do cardio-pulmonary resuscitation correctly (CPR) highlighting the need for refresher training.[107] It was found that retention of the ability to do CPR declines rapidly after a course is taken, for professionals and lay people. It was also reported that a 50% failure rate occurs within 6 months and maximum attrition of cognitive skills occurs within 2 years of ATLS completion.[108]

6.3.5 ATLS at College of Emergency Care in Polokwane

In the study even though ATLS was the second commonest qualification that 23% of the respondents had, it appeared that there was a need to popularise it in Limpopo Province given that 46% of the respondents was still unaware of its availability at the College of Emergency Care in Polokwane City. Of those who had not done ATLS before 64 (62%) reported that they would be willing to enrol for one offered by the College. That further suggested a greater need for training in advanced trauma management in the province. Raising awareness about the course at the College appeared to be one of the main requirements to promote it amongst GPs in the province.

The study found no association between ATLS training and the level of trauma preparedness even though most of the ATLS trained respondents felt that they were at level 5 (manage independently). The lack of association applied even when the year of qualification in ATLS was taken into consideration. To illustrate the point the p-value for adhering to universal safety measures amongst ATLS

trained GPs was 0.775 and 0.594 for assessing trauma patients rapidly and adequately.

In South Africa an estimated 4000 doctors had completed the Advanced Trauma Life Support (ATLS) course of the American College of Surgeons, presented by the Trauma Society of South Africa and they formed part of approximately 500000 doctors internationally.[6] In an effort to promote access to trauma and standardize the required skills and resources the Trauma Society of South Africa proposed that at least 1000 ATLS trained practitioners per annum be produced.[4]

The ATLS is designed such that the lone doctor can safely look after a multiply injured patient and tasks are carried out sequentially, one after the other.[105] It was found that medical staff who have either undertaken the full ATLS course or an abbreviated form of the course were more effective in their management of the simulated trauma cases.[109]

6.4 INCENTIVES AND DISINCENTIVE FACTORS TO TRAUMA CARE TRAINING

6.4.1 Trauma prevalence

The major incentive for trauma management training was the high prevalence of trauma in the area where the respondents practiced. It constituted 33.3% of the incentives for undergoing trauma management training. The number of motor vehicle accidents, assault, crime, mining accidents and emergencies that occurred from time to time was reported to be the main reasons for choosing to undergo training in trauma management.

The prevalence of trauma was responsible for 12% of the disincentives to trauma management training. The scarcity of trauma cases made up 70% of the 12% of

the disincentives. One made the point by citing an example of seeing: ‘1 ectopic, 1septic shock, 1 mva out of 6500 patients in 2 years’. Another respondent claimed to be seeing non-trauma patients. Trauma was viewed as a hospital emergency and ‘serious trauma cases are to be treated in hospital.’ The findings suggested that scarcity of trauma patients and perception about where definitive trauma care should take place were disincentives to trauma training. In areas where the prevalence of trauma was low the respondents saw not much need to get involved in it. On the other hand because major trauma was perceived as a hospital emergency it had to be referred directly to hospital. The question seemed to have been why trouble oneself to get trained in trauma management when the patients will most likely receive definitive care in hospital, away from the GP’s rooms? On the other hand in areas where it was prevalent it was perceived as an incentive to be trauma trained as noted above.

6.4.2 Performance improvement

The need to improve performance when treating trauma patients comprised 20% of the motivators to be trained in trauma management. The respondents wanted to be able to manage adequately in emergency situation and further their education. Three respondents stated that they gained personal fulfilment of having saved life even when there was no financial gain. The other three felt that knowledge of trauma management would give them more power. One said that he was actively running his own casualty unit and therefore needed to perform better.

Trauma management information and patient records are of strategic importance to performance improvement. Information is needed for planning, preparing, responding, rehabilitating and promoting trauma prevention.[7] Sources of information about trauma patients that could be used for performance improvement include audit filters, preventable death studies, morbidity and mortality conferences and periodic case review meetings. It was further said that there should be willingness to become a life-long learner on trauma and one should be equally involved in epidemiological and sociological aspects of trauma

prevention. Continuous professional education (CPD) and training helps resolve uncertainties and improve research standards around trauma.[92]

Continuing competence was said to require that the candidate continually develop his or her knowledge and skills, both through traditional continuing medical education and re-certification, consultation with colleagues, chart reviews, peer review, and regular reading of professional journals and other relevant publications.[97]

6.4.3 Trauma care facilities

Trauma care facilities, and trauma knowledge and skills, each contributed 17% of the incentives for undergoing trauma management training. Improved referral hospital facilities and staffing with specialists; good hospital facilities for minor emergencies; better equipment and preparedness were some of the attractions into trauma management training.

The state of trauma care facilities constituted 16% of the disincentive to trauma management training. The facilities (both public and private) were either scarce, unavailable or in a sub-optimal state. Some respondents reported ‘disarrays at hospitals’ (meaning lack of management and control) and some ‘provincial hospital facilities are non-existent or septic’ (meaning severely dysfunctional hospital facilities). One state facility was said to be ‘not up to standard.’ The equipment was also either unavailable or outdated.

In reviews of trauma care capacity in low-and middle-income countries, it was found that even in hospitals handling large volumes of trauma cases, many healthcare professionals did not have adequate trauma skills; many hospitals lacked essential low-cost supplies for trauma care; there was shortage and under-utilization of protocols for trauma care; there were prolonged delays before emergency surgery; and low utilization of fundamental resources despite availability of physical resources.[25] Concern about the lack of trauma specialist at

all hospitals were raised; and the fact that not all hospitals are necessarily able to provide timeous and effective emergency or trauma care. It has also been established that the vast majority of trauma cases (almost 98%) can be treated at level two and level three emergency units (secondary hospitals, district hospitals, and private emergency units), provided that these facilities are geared towards the delivery of 'first line' emergency care including sufficiently trained medical staff.[64] The remaining 2% of patients attending tertiary hospital trauma units require such a facility.

According to the Department of Health key objectives for the prevention and treatment of trauma and the provision of emergency medical care include: the improvement in emergency medical services, facilities, equipment and vehicles; improvements in the training of EMS personnel throughout the country; and improvement of in-hospital emergency medical services.[110] A trauma management system is needed to meet those objectives.

In Limpopo Province in 1994 there were 265 health centers. This increased to 477 by 2004 while 4 new hospitals were built in this period. By 2005 the number of hospitals stood at 44. In 1998 there were no tertiary health services. By 2005 there were fully-fledged institutions providing services that include oncology and 262 clinics operate 24 hours a day. However challenges in the clinical trauma services at primary, secondary and tertiary levels in South Africa remain. The services are still overloaded with cases and under-staffed. Not many of the health care workers working in these areas are trauma trained.[36]

6.4.4 Trauma knowledge and skills

Regarding trauma knowledge and skills the respondents said that trauma is 'problem specific', allows for 'honing of skills' and it has a 'systematic approach' (meaning it allows for a definite diagnosis to be made and an organized approach to be followed in managing it). There was recognition of the importance of training

in and regular updating of trauma management techniques. There was also a realization of the paucity of trauma management knowledge. One respondent stated that he was working as an Occupational Medical Practitioner (OMP) and therefore needed to be knowledgeable and skilled in trauma management. Another said that knowledge is power.

There were 6.7% of the respondents who cited lack of trauma knowledge and skills, and difficulties retaining them as disincentives to undergoing trauma training. Retention of trauma knowledge and skills is made more difficult through an ad hoc involvement in trauma care. The danger of an ad hoc response to trauma was shown by Tolhurst *et al* who reported that 8,4% of emergency attendances of rural GPs involved "very urgent" or "life-threatening" problems.[66]

Even during training in trauma, certain skills may not be regularly encountered. Trauma skills could be infrequently used for various reasons such as the following: practicing in an area where there are low trauma levels; not practicing trauma surgery as a fulltime career; not having time for trauma care or preoccupation with other concerns and interests. A question might therefore be raised that why undergo training if the knowledge or skill will soon be degraded through infrequent use?

Maximizing chances of survival of the injured patient depends on a series of critical interventions that include early access by competent and well-equipped medical emergency responders. Central to those interventions and meeting the injured patient's needs is the ability to manage the airway, control bleeding, restore and maintain adequate circulation and administer emergency drugs appropriately.

6.4.5 GP practice location

The location of GP's practice and trauma care support rendered, each made up 7% of the incentives for trauma management training. Regarding location of the GP's practice, a respondent stated that he was motivated to get trained in trauma because he was practicing in a rural area where there was no good trauma facility in a radius of 100km. One said that his practice was closer to a bigger centre while another reported that he was 'practicing in predominantly industrial area with many sharp and eye injuries'. Proximity to a major trauma centre or an industrial area where trauma was common was seen as strategically important offering an opportunity to get trained and be involved in trauma care. Another claimed that there was community awareness of advertised 24 hours casualty service that he offered.

The location of GP practice and lack of trauma care support each comprised 10% of the disincentives factors. Two respondents practiced next to a hospital while one was based on a farm. Transport constraints and distance from trauma centres and training institutions appeared to be the main reasons why location of a practice was an important disincentive factor. Proximity to a hospital was a disincentive to trauma training perhaps because it was perceived that the patient with major trauma would tend to be transported directly to hospital. Practicing away from a trauma centre (for example, on a farm) posed travel challenges for the respondents by prolonging response times. The respondents felt that without access to a trauma centre their trauma skills would find limited application.

Having a community-based trauma centre tends to be consistent with McWhinney's principle of family medicine that states that a family physician lives within the community he serves.[111] It would appear from the study that being far from or near to a trauma care facility were both incentives for trauma training. The observations meant that lack of trauma care facilities in areas where respondents practiced; proximity to a well-equipped trauma care centre; and location where trauma was prevalent were all incentives to get trauma trained.

6.4.6 Trauma care support

In the study the support rendered by trauma specialist and an anaesthetist at a local private hospital was one incentive for opting for training in trauma management. There was a feeling that one could call on private healthcare enterprise for assistance in an emergency. One GP was encouraged to undergo training after observing that there were very few specialists in the field of trauma. Another said that his incentive was being more helpful to trauma interns.

For trauma care support to be effective there should be a team approach. The team approach has been shown to significantly reduce resuscitation times compared to 'vertical organization' of trauma care where the lone caregiver performs tasks sequentially.[105] Members of the trauma response team can also support one another given that trauma care can lead to psychological stress. It was reported that responses exhibited by stress, burnout and posttraumatic stress disorder have a profound effect on the emergency care in South Africa.[112] A drawback with the team approach is that it can be costly and human resource constraints can make it difficult to establish one.

6.4.7 Time for trauma care

The major disincentive to trauma management training amongst the respondents was lack of time. It accounted for 29% of the disincentives. The 29% of the respondents cited limited time, busy medical practice and work pressure, and the need for fulltime attention for trauma as reasons why they perceived time as a major disincentive to trauma management training. Trauma care was seen as an inconvenience and the training tended to take place during office hours. It was viewed as an inconvenience because it presented abruptly and unpredictably.

There is ongoing debate over permissible time that pre-hospital trauma responders should take to attend to the injured patient. In the USA it was believed

that in the absence of extrication problems, the on-scene time for assessment, airway management and splinting should not exceed ten minutes.[4] It was advised that total pre-hospital time in the urban environment should normally be between 20 and 30 minutes and should never exceed 30 minutes. In the suburban or rural environment, where travel times are longer, the shortest pre-hospital transport time should be achieved unless there are extenuating circumstances, such as extrication, hazardous conditions, or multiple patients. In rural areas field stabilization is particularly critical given prolonged transport times that can be more than 3 or 4 hours.[4]

6.4.8 Cost-benefit considerations

Cost-benefit considerations comprised 16% of the disincentives to trauma management training. The respondents who cited high travelling costs, locum tenens and course fees as disincentives to trauma management training were 12. There were 2 respondents who complained about lack of financial rewards to motivate sufficiently. The pay had to be commensurate with the qualification and be competitive in order for trauma training to attract more participants and for personnel to be retained.[64]

There are growing concerns about the decreasing number of applicants presenting themselves for general surgery training in South Africa, and the increase in vacant posts in the state sector. With that is a lack of trauma specialists. It was reported that the country was producing only 25 newly qualified general surgeons per year which was found to be well below the between 60 and 70 needed to provide the necessary services.[113] The major disincentives for the General surgeons remained the long working hours and the lower remuneration compared to other specialties and professions.

Many young doctors were reported to be saying that they had no choice but to develop skills in other areas as they were simply not able to rely on their medical

training to succeed.[114] They cited among others a medical aid system that does not seem to support their interests and brutal hospital conditions which are taking an emotional toll on them. Given that a doctor has an ethical duty to render emergency trauma care to any patient whose life is threatened regardless of that patient's ability to pay for the service there might be a concern that emergency trauma care is a cost centre with minimal monetary rewards.

6.4.9 Trauma care support

The lack of support from the referral (provincial) hospital; no good auxillary services such as ambulances, hospital; and 'limitation to stabilisation due to lack of specialists and mentoring' were all expressions of the feeling of lack of support in trauma care. One respondent complained of 'poor support from incompetent nursing staff''. The 'attitudes of staff towards nursing' also came in for criticism. Another apportioned blame on 'failure of trauma training co-ordinator to answer / return calls.' Others experienced difficulty obtaining suitable locums for solo practice whilst attending a trauma course. It appeared from the responses that the main support the GPs were looking for was perhaps in terms of trauma skills transfer by specialists and positive staff attitude. They also needed assistants to work at their practices while they were away undergoing training.

The support needed was also in terms of recognition and appreciation of the role that trauma practitioners play. Reporting on the poor quality of letters sent to GPs after an accident and emergency attendance Jansen and Grant found that 29% of the information was incomplete or misleading. The main reasons for the inadequate correspondence included failure to provide specific information relevant to patients' follow up.[115]

6.4.10 Healthcare regulations and policies

The least disincentive factor was healthcare regulations and policies and they comprised 2% of the disincentives. Healthcare regulations and policies were reported to be restrictive to trauma training. One respondent highlighted the point by saying: ‘emergency opd (out patient department) sessions at local provincial hospital cancelled and given to community service doctors’. One pointed to: ‘restrictions to work in emergency dept/casualty while working in another’. Another said that he ‘stopped doing first calls at government hospital some years ago.’ Even though healthcare regulations and policies contributed 2% of the disincentives it appeared that their influence on the respondents choosing to be trained in trauma was notable. They were perceived as barring the respondents from undergoing training or getting involved with trauma.

It was said that in order for a trauma management system to function effectively leadership is required at national level to foster the growth of regional trauma systems or support injury research; raise funds for trauma research and trauma system development; and to represent the trauma constituency.[7] That entailed formulating policies that allow for the advancement of trauma management.

6.5 PREPAREDNESS FOR TRAUMA

When asked about their level of preparedness to manage trauma patients independently respondents who had received trauma training responded as follows: 45% said that they adhered to universal safety measures; 54% stated that they could assess trauma patients rapidly and accurately; 62% reported that they could open and protect the airway; 40% said they could stabilize the spinal cord; 48% claimed they could provide adequate breathing; 49% said they could restore and maintain sufficient circulation; 44% said they could monitor trauma patients after resuscitation and; 48% reported that they could re-evaluate response to

resuscitation. The findings indicated that despite having undergone trauma management training few respondents were confident to manage trauma patients independently.

Further consideration of the state of preparedness amongst the trauma trained GPs revealed that perhaps with the exception of stabilizing the spinal cord (p=0.008) and restoring and maintaining sufficient circulation (p=0.019), there was no correlation between trauma management training and the level of preparedness as shown in table 43 below.

Table 43: Correlation between trauma management training and level of preparedness

	ITEM	P value	Fisher exact	Pearson Chi(2)
a.	Adhering to universal safety measures	0.651	0.657	1.6381
b.	Assessing trauma patients rapidly and accurately	0.057	0.055	7.5265
c.	Opening and protecting the airway	0.353	0.351	3.2609
d.	Stabilizing the spinal cord	0.008	0.008	11.8833
e.	Providing adequate breathing	0.326	0.340	3.4569
f.	Restoring and maintaining sufficient circulation	0.019	0.020	9.9151
g.	Monitoring trauma patient after resuscitation	0.137	0.144	5.5191
h.	Re-evaluating response to resuscitation	0.266	0.264	3.9569

The lack of association could be indicative of the challenges and difficulties of retaining and updating trauma management skills. Alternatively it could indicate a need to boost the level of confidence of trauma trained GPs to manage trauma patients independently.

It was found that among many doctors the main areas where there was sub-optimal emergency care and lack of preparedness was in the management of airway, breathing, circulation, oxygen therapy and monitoring in severely ill patients before admission to intensive care.[83]

The Centre for the study of bioterrorism and emerging infections said that plans for emergency management for healthcare facilities should take account of such factors as human resources when preparing for mass casualties such as often occurs in cases such as bioterrorism**.**[116] It was further said that when preparations for trauma are made there should be a plan for trauma management and it should be known when to activate it. The plan should identify needed trauma management skills. An alerting system is crucial for early response to trauma. The plan should provide for appropriate trauma response resources and personnel.

6.5.1 Respondents' trauma management preparedness

There was shortage of trauma equipment and ill-preparedness for trauma as evidenced by the finding that while the commonest airway and breathing equipment that 102 (99%) of the respondents had was a stethoscope followed by pocket face mask (82 or 80% of respondents) and laryngoscopes (73 or 71% of respondents), only 7% of the respondents had cricothyrotomy set followed by 18% who had needle with one-way valve and chest drains. It appeared that equipment that is used for invasive emergency surgical procedures such as cricothyrotomy and inter-costal drainage insertion were infrequently stocked by the respondents. Not having equipment for invasive procedures could be a result of a perception that such equipment tends to be associated with major trauma that most often

ends up treated in hospital; the equipment could be expensive; or is infrequently utilised.

The finding of shortage of trauma equipment and drugs, and low levels of trauma competence all indicated a need to further establish why that was the case and to consider how skills levels could be improved and retained. There was further need to explore how accessibility to contact numbers of other emergency trauma service providers such as fire brigade could be improved.

That almost all the respondents had stethoscopes was perhaps not surprising as virtually every doctor is expected to have one even if he is not a trauma care practitioner. Preparedness for trauma cannot be measured in terms of availability of a single piece of equipment. Instead it involves having accessible different sets of equipment that can be used for various types of trauma such as those listed in appendices 4 and 5.

Even though adrenaline, aspirin and other analgesics were commonest stocked trauma care drugs and Ketamine and zidovudine, the least stocked drugs, preparedness for trauma required that other trauma drugs (such as those listed in appendices 4 and 5 be readily available and accessible too.

Other emergency equipment that 98% of the respondents possessed was gloves, antiseptics, scissors, gauze and bandages, and BP apparatus. They form part of standard equipment that a trauma care giver should have (see appendices 4 and 5). The other equipment that was infrequently available included goggles (frequency 47; 46%). The unavailability of protective goggles could also pose a major health risk to the health-workers during treatment of trauma patients.

When taking into consideration the equipment and drugs that the respondents identified as being available at places where they worked as GPs it was found that the majority of them needed varying degrees of support, assistance and

supervision to manage trauma patients. Overall the results indicated a low level of preparedness to manage trauma patients independently. It was interesting to note that 43% of the respondents said that they could independently adhere to universal safety measures and yet, as reported above, only 46% had protective goggles and 7% had zidovudine where they served as GPs. It is also worth noting that whereas 52% of the respondents stated that they had received training in CPR (see above) 54.5% were found to be equipped and prepared to open and protect the airway (A); 43% said they could independently provide adequate breathing (B) while 45% claimed they could restore and maintain sufficient circulation (C).

Given that only 74% of the respondents had contact numbers of the fire brigade there was perhaps a need to increase distribution of contact number of the fire department amongst GPs given the important role that the department plays in trauma situations. Appendix 5 shows that being able to call for help is an essential duty that should be provided at all levels of pre-hospital trauma care.

6.6 TRAUMA PRACTICE

6.6.1 Proportions of injuries managed by respondents

Determining trauma caseload at GP's practice is important because it gives an indication of the likelihood of that GP being motivated to undergo further trauma training or having sufficient equipment and drugs to prepare for and manage trauma. The survey revealed that blunt trauma was the commonest form of trauma that the respondents dealt with followed by penetrating trauma. The finding of blunt trauma as the commonest form of trauma that the respondents attended to in their practices could be due to a number of reasons including patient selection whereby blunt trauma is viewed as minor injury that can be treated at GPs' rooms while penetrating injury and other forms of trauma are seen as serious requiring treatment at a hospital. It could also be associated with the largely rural nature of

Limpopo Province where the use of more penetrating weapons such as guns is not yet so prevalent compared to other provinces in the country.[19]

The findings seem to contrast with those of a study by Adotey that sought to establish the extent of treatment of trauma cases by private general practitioners. In that study it was found that more males than females were treated by GPs for trauma and that lacerations constituted the commonest injury followed by fractures of long bones.[117] Physical violence and motor vehicle accidents were the commonest causes of injuries. The commonest complication encountered in that study was wound infection.

It was noteworthy that 58 (56.3%) respondents classified the following as other forms of trauma: ocular damage, burns, lacerations, abrasions, bruises, fractures, and concussions, foreign bodies, psychological damage, chemical injuries, poisoning, snakebites, spider bites and sexual assault and rape. But these listed 'other forms of trauma' could be classified as blunt (example bruises and concussions) or penetrating (lacerations, foreign bodies, snakebites, fractures and abrasions) trauma. That suggested that the proportion of blunt trauma and penetrating trauma could in actual fact be higher than what the respondents stated. Other forms of trauma include sexual abuse and psychological damage.[118] It is most likely that the respondents referred to minor soft tissue injuries as being types of trauma that they could treat with excellence as major trauma (such as rhabdomyolsis where only about 16% of respondents said they could handle with excellence) tends to require hospitalisation.

Table 44 showed that trauma trained GPs tended to have a higher proportion of their practices that comprised emergency trauma care (p-value = 0.030; Fisher's exact =0.050) than those who had not. There was however no link between the proportion of medical practice comprising emergency trauma care and sex of GP (p-value=0.153; Fisher 's exact=0.214; Pearson Chi2(1) as shown in table 45 below**.**

Table 44: Association between trauma management training and proportion of GP's practice comprising trauma care.

	Proportion of medical practice comprising trauma care					
	< 10%		10 % and more		TOTAL	
Trauma management training	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**
Yes	28	53.9	24	46.2	52	100
No	31	75.6	10	24.4	41	100
Total	59	63.4	34	36.6	93	100
Pearson Chi2 (2) =4.6817. p- value = 0.030 Fisher's exact = 0.050						

Table 45: Correlation between sex and proportion of medical practice comprising trauma care.

	Proportion of medical practice comprising emergency trauma care					
	< 10%		10 % and more		TOTAL	
Sex of GP	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**
Male	54	66.7	27	33.3	81	100
Female	6	46.2	7	53.9	13	100
Total	60	63.8	34	36.2	94	100
Pearson Chi2 (2) =2.0416. p- value = 0.153 Fisher's exact = 0.214						

6.6.2 Support for local EMS

Determining support for local EMS by GPs gave an indication of how they were likely to collaborate with and team up with EMS in pre-hospital trauma care delivery. It could also be an indicator of incentives to trauma care. The support rendered could be divided into clinical and non-clinical support. The clinical support included helping EMS at trauma scenes, sports games and in hospital. Some GPs said that they were available and could be called upon for back-ups and assistance. One said that he was part of a local hospital sessional clinical work and discussion group. Some claimed that they advised on trauma management and basic life support techniques. Others reported that they intubated patients whenever the need arose and accessed circulation and breathing. One said that he previously helped with emergency evacuation by aeroplane while another helped with extrication of accident victims and with transport. The non-clinical support involved calling EMS for patients who needed emergency services to hospital and lecturing at EMS. Appendix2 highlights support that should be rendered at a pre-hospital trauma scene.

Doctors are expected to play a leading role in the prevention and management of trauma because prevention of death, management of injuries and the costs incurred impact directly on the medical profession. Their role in running ambulance services, offering medical advice and EMS training can enhance pre-hospital patient care.[39]

6.6.3 Sources of information used to guide trauma management

Personal experience was the frequently used source of information that respondents relied upon to guide trauma management. Its frequency was 58%. Experience is an important factor in the practice of trauma because it creates better outcomes- and eventually reduces costs. Birkmeyer said that by performing particular procedures over and over, teams increase their learning opportunities and thereby reduce mortality rates.[119] It was further said that cost and quality can improve simultaneously as providers prevent errors, boost efficiency, and develop expertise.[118] Figure 3 illustrates the value of experience as argued by Birkmeyer.

However personal experience needs to be accompanied by continuing medical education (CME) in order to keep abreast with medical advances. In the survey 50% of the respondents relied upon CMEs to guide trauma management decisions. Continuous medical education (CME) is encouraged to prevent loss of cognitive knowledge and skills, particularly among those who are not working with trauma on a fulltime basis. They offer updates and the opportunity to better define the core essential elements of trauma management for a given environment. CMEs have been shown to improve the process and outcome of trauma care.

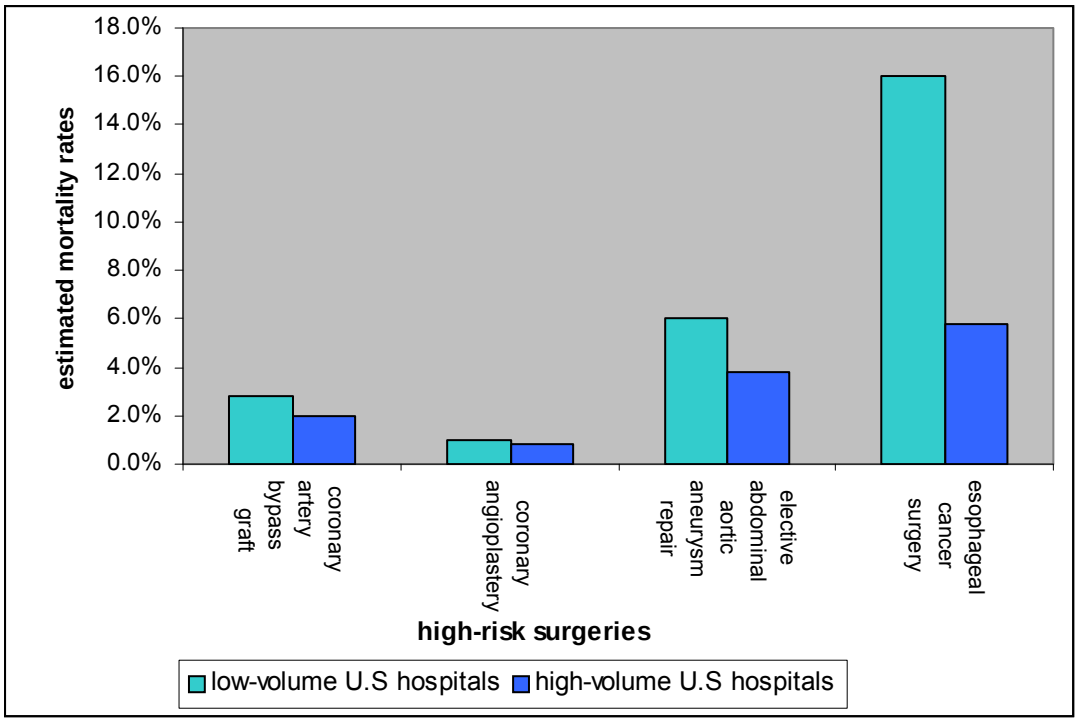

Figure 3: Experience matters.

It is also advisable to consult trauma management guidelines and accredited trauma journals in order to ensure that one is practicing evidence-based medicine. In the survey 43% of the respondents occasionally referred to trauma management guidelines while 34% read trauma journals. Forty per cent (40%) of the respondents who said that they relied on preferences of medical staff to guide trauma management decisions might be indicating a need for clinical support but they faced challenges of having to make split-second decisions in emergency situations where that support might not be readily available.

6.6.4 Skill levels to render pre-hospital trauma care

Fifty one per cent (51%) of the respondents reported that they were fairly skilled to manage in a pre-hospital situation the injuries listed in the questionnaire. Sixty eight per cent (68%) of them felt that they could manage minor soft tissue injuries with excellence. Nine (9%) of them reported total lack of skills to manage rhabdomyolysis.

In a study that surveyed General Practitioners to determine their confidence in trauma management after completing The Early Management of Severe Trauma (EMST) course GPs felt least confident in performing certain invasive procedures such as diagnostic peritoneal lavage and cricothyroidectomy. Their confidence in some of the skills was linked to the frequency of managing trauma cases as opposed to the interval since obtaining the EMST course. A systematic approach to trauma handling, accessible refresher courses and practical skills training were found to be essential requirements in increasing confidence levels.[120]

6.7 INCENTIVES AND DISINCENTIVES TO TRAUMA PRACTICE

6.7.1 Respondents' incentives to trauma practice

The respondents provided the following incentives to trauma practice: trauma prevalence (21%); trauma knowledge and skills (17.2%); patient benefits (14%); doctor psycho-emotional gains (12%); trauma care facilities (10.4%); trauma care support (6.9%); and GP practice location (6.9%). The following incentives to trauma practice were found to apply to trauma training as well: trauma prevalence; trauma care facilities; trauma knowledge and skills; performance improvement; trauma care support; and GP practice location as shown in table 46 below. Patient benefits and doctor psycho-emotional gains were additional incentives to trauma practice.

Whether the finding of common incentives to both trauma training and practice were indicative of an association between trauma training and practice was outside the scope of the study. But the results tended to suggest that a respondent motivated to undergo trauma training could be expected to want to practice trauma as well. Fourteen (14%) per cent of the respondents cited benefits to the patient as incentives to get involved in trauma while 12% of them claimed to have gained personal satisfaction for having helped someone even if there were no monetary rewards. Respondents saw trauma care as a life saving and beneficial service to

their patients. One wondered whether the psycho-emotional benefits that respondents referred to were primary motivators to participate in trauma care or altruistic rewards derived from having treated trauma patients even though they might not have chosen trauma as a career.

The downplaying of financial rewards by 12% of the respondents that claimed personal satisfaction from having helped trauma patients despite lack of financial gains contrasted with the 16% that identified insufficient financial compensation as a disincentive to trauma practice. That implied that even though saving a patient's life might be personally rewarding**,** when choosing trauma as field of practice financial benefits would tend to be taken into serious consideration.

Table 46: Incentives to trauma training and practice

INCENTIVE	TRAUMA TRAINING (% respondents)	TRAUMA PRACTICE (% respondents)
Trauma prevalence	33.3	20.7
Performance improvement	20	12.1
Trauma care facilities	17	10.4
Trauma knowledge and skills	17	17.2
GP practice location	7	6.9
Trauma care support	6.7	6.9
Patient benefits	-	13.8
Doctor psycho-emotional gains	-	12.1

6.7.2 Disincentives to trauma practice

It is perhaps worth noting that whereas there were 58 reported incentives for trauma practice there were 94 disincentives, suggesting that respondents had more reasons not to practice trauma. The following disincentives to trauma practice were found to be the same as those for trauma management training: trauma care support; cost-benefit considerations; healthcare regulations and policies; time for trauma care; trauma care facilities; trauma knowledge and skills; trauma prevalence and; GP practice location (see table 47). Trauma care risk (10% of respondents) and reluctance to improve trauma management performance (11% of respondents) were other disincentives to trauma practice.

Table 47: Disincentives to trauma training and practice

DISINCENTIVE	TRAUMA TRAINING (% respondents)	TRAUMA PRACTICE (% respondents)
Trauma care support	10	14.9
Trauma care risk	-	9.6
Cost-benefit considerations	15.6	11.7
Regulations and policies	2.2	2
Time for trauma care	28.9	14.9
Trauma care facilities	15.6	24.5
Trauma knowledge and skills	6.7	4.3
Trauma prevalence	11.1	3.2
GP practice location	10	4.3
Performance improvement	-	10.6

6.7.2.1 Time for trauma care

Trauma was viewed as an inconvenience because it presented abruptly and unpredictably. It followed that given such perceptions the respondents were unlikely to participate in trauma care in a more dedicated manner.

It was observed that most of primary healthcare clinics open for business during office-hours only and yet prime time for trauma is after hours and over weekends. According to Thomas pressures of work seem to prevent some GPs from attending and treating acutely ill patients and other General practitioners seem to have relinquished their *raison d'etre* to other providers.[121]

6.7.2.2 Trauma care risk

It was said that a hospital physician used to examining and treating patients in the clear, bright lit, organized world of a well run resuscitation room is potentially life-threatening to patients in the field as in danger of seriously injuring himself due to lack of awareness of adequate safety precautions.[122] Rescuers in a pre-hospital trauma environment are also vulnerable to crime that includes personal injury, muggings and car-hijackings.

There is growing public concern regarding patient safety and error reduction in all of health care following many published reports of surgical malpractice. There is also growing awareness about patient rights and medical information is getting more freely available to the public. With the increased public knowledge there could be a tendency towards malpractice litigation. Trauma is a field dealing with patients who might be critically injured and where major decisions regarding treatment have to be made rapidly. The potential for complications and adverse events during the assessment and management of such patients is also high. In

such an environment mistakes are not uncommon. That further increases the risk of litigation. The fear of making mistakes and getting sued is another disincentive that needs to be considered.

6.7.2.3 Trauma care facilities

The critical importance of the organization of trauma care services was highlighted in a study which found that persons with life-threatening but salvageable injuries are six times more likely to die in a low cost setting (36% mortality) than in a high-income setting (6% mortality).[30] In part the improved survival and functional outcome among injured patients in developed countries was attributed to high-cost equipment and technology. However much of the improvement comes from the improvements in the organization of trauma care services. Better organization and planning should lead to low-cost and sustainable care to the injured.

6.7.2.4 Trauma care support

The lack of trauma care support was found to discourage trauma care practice amongst the respondents. The problems of shortage of trauma care professionals and support are not confined to South Africa. In other countries a number of factors that contribute to the shortage of trauma care professionals include decreasing funding for graduate medical education and few financial incentives for pursuing a specialty that frequently involves night shift work.

7 SUMMARY

Trauma is a pandemic and is indiscriminate. Until its drivers are contained, its prevalence is set to increase. There is a need for a holistic patient-centred team approach to the care of the injured. The trauma management systems should provide dedicated personnel, facilities and equipment for effective and coordinated trauma care in a suitable area. Field resuscitation and stabilization are particularly critical if chances of patient survival are to be increased in a pre-hospital setting. Care for the injured could also be improved through a more bio-psycho-social approach that takes into account the trauma patient's psycho-social and emotional needs.

The research report revealed that trauma training, preparedness for and practice by private general medical practitioners in Limpopo province is not without challenges. There are concerns about lack of time for trauma training and practice. Trauma is perceived as an inconvenience. Cost-benefit considerations, trauma care risks are some of the disincentives to trauma training and care. The obstacles to trauma training and practice also include inappropriate habits amongst healthcare professionals and knowledge degradation through infrequent use. There is therefore a need for preparedness, readiness and continuous retraining in trauma.

8 RECOMMENDATIONS

There is a need to improve training in and preparedness for trauma amongst the respondents in Limpopo province. The practice of trauma care should also be prioritised as trauma is a pandemic that has major negative physical, psycho-emotional and economic impact.

There is also a need to contain the drivers of trauma such as alcohol, traffic-related accidents and interpersonal violence. Trauma prevention means preventing the injury from occurring in the first place; minimising the effects of the injury force and reducing the outcome of the injury. A multidisciplinary team approach, public awareness campaigns and law enforcement are some of the strategies that could be used to prevent the spread of trauma. Core integrated injury prevention program based on a qualitative community health assessment is also needed.

Trauma management systems should be comprehensive focusing on trauma prevention, treatment of the injured, rehabilitation and taking into consideration the psycho-social and economic impact of trauma. Leadership is fundamental to effective implementation of trauma management system and injury prevention.

The ability to manage trauma patients outside a hospital environment is important because it was observed that in South Africa most deaths occur in a pre-hospital setting. Time spent in a pre-hospital trauma scene should be minimised as much as possible so as to increase chances of patient survival. Early access to trauma scene and speedy transportation of the injured to definitive trauma centre is critical in minimising morbidity and mortality. But first priority in a pre-hospital trauma scene is safety of the rescuers and therefore universal safety precautions should be observed. Timely and up to date information has the ability to save lives as it enables critical and correct decisions and actions to be taken rapidly. Therefore there should be access to information and instruction in a trauma scene.

Efforts should continue to be made in Limpopo Province to improve trauma care by development of the necessary infrastructure, recruitment and retention of appropriate trauma care staff and other monetary and non-monetary resources.

GPs are expected to have a working knowledge of what to do in an emergency. That includes involvement in triage, patient assessment and management as required, assistance with extrication and patient evaluation and liaison with the receiving hospital. They are also encouraged to become trauma prevention lobbyists. Having a working knowledge about trauma management also means that GPs should, on a regular basis, undergo trauma training and update their trauma management qualifications.

Methods that could be used to improve their trauma knowledge and skills include short and degree courses, use of trauma management guidelines, attending refresher training sessions, using simple algorithms and charts, or registering for IT-based training. They should also be in a state of readiness at all times if they are to respond effectively to trauma call-outs. That could be achieved by having appropriate emergency care equipment. They should also have a positive attitude towards trauma management by among others, viewing trauma as a disease (and not an accident) requiring their response and by committing themselves to optimum care of the injured patient as much as possible. In Limpopo Province there is a need to explore how the ageing GP population will affect delivery of future trauma care. It is also perhaps necessary to explore how the shortage of female GPs in the province affects delivery of effective trauma care. There should be consideration of how to improve the distribution of GPs in the province in an effort to increase accessibility to trauma care services. Given that solo private medical practice tends to limit time that can be spent on trauma care it is perhaps necessary to explore how GPs could be encouraged to consider other models of private medical general practice that can allow more time to be devoted to trauma care. More GPs should be encouraged to enrol for other trauma and trauma-related management courses. They should also be urged to update their trauma management skills as the field of trauma is evolving rapidly. There is also a need

to raise further awareness about ATLS course offered by Limpopo Provincial EMS in Polokwane City so as to increase the number of medical practitioners with the qualification and hopefully the standard of trauma care.

Increasing GPs' incentives for trauma care training and practice while addressing the disincentives could help increase the number of GP participants in trauma care and improve pre-hospital trauma management system. When addressing the incentives and disincentive factors to trauma training, preparedness and practice the following should be taken into consideration: trauma prevalence, time for trauma care, performance improvement, the state of trauma care facilities; an assessment of trauma knowledge and skills; medical practice location and trauma care support. It should also look into cost-benefit issues; medico-legal risk associated with trauma care; trauma management regulations and policies and doctor's psycho-emotional benefits. The association between trauma training and practice should be further explored given common incentives and disincentives that were observed.

Further research is needed to explore how trauma trained GPs could be better equipped, prepared and supported in the management of trauma. There is also a need to address the disincentive factors to trauma training, preparedness and practice while strengthening the incentives. Given the critical shortage of advanced emergency practitioners (such as paramedics) in Limpopo province and the growing burden of trauma, it is perhaps necessary to consider how GPs, with their advanced medical qualifications and strategic positioning within communities, could be better deployed in emergency trauma care.

9 APPENDICES

Appendix 1: Trauma-related short courses in South Africa.

TITLE	COURSE NAME	LENGTH	ORGANIZATION	VENUE	ACCREDITATION
BLS-HCP	Basic life support for Healthcare Providers	1 day	Resuscitation Council of South Africa	Countrywide	American Heart Association
ATLS	Advanced Trauma Life Support	3 days	Trauma Society of SA	Countrywide	American College of Surgeons
EMSB	Emergency Management of Severe Burns	1 day	SA Burn Society	Cape Town and Johannesburg	Australian & New Zealand Burn Association
BSSC	Basic Surgical Skills Course	3 days	College of Surgeons of SA	Countrywide	College of Surgeons of England
FCCS	Fundamental Critical Care Support	2 days	Critical Care Society of SA	Johannesburg & Durban	US Society of Critical Care Medicine
EMAP	Emergency Management of Acute Poisonings	2 days	Academy of Accident & Emergency Medicine	Durban	Local
ATM	Advanced Trauma Management	3 days	Academy of Accident & Emergency Medicine	Durban	Local
	Immobilization Techniques	1 day	University of Cape Town/Stellenbosch	Cape Town	Local
	Wound Management	1 day	University of Cape Town/Stellenbosch	Cape Town	Local

Source: SA Fam Pract 2006:48(9):43

Appendix 2: Example equipment scale for BASICS practitioners

The list below is adapted from **EAST MIDLANDS IMMEDIATE CARE SCHEME** and **CARE Team** lists found on the website.

BASICS does not officially endorse any product supplier listed or inferred.

Airway	Trauma pack
• Pacific A300 doctors bag (alternative is Thomas 1x ALS Ultra back pack • 1x advanced aeromedical and 1x AED bag • Suction unit • Adult and paediatric 'Full stop' Rigid suction catheter (Yankauer) • Flexible suction catheter sizes 18fg, 8fg • Disposable Non-rebreathing bag/valve with reservoir (adult and child) • Disposable Mask paediatric, child, adult Non-rebreathing trauma mask with reservoir and tubing (adult and child) • Nasopharyngeal airway sizes 6.0 7.0 • Lubricating jelly • Oropharyngeal airway sizes 0 1 2 3 4 • Oxygen cylinder CD size (460 litres) with integral regulator • Uncuffed endotracheal tube 2.5, 3.5, 4.5, 5.0, • Cuffed endotracheal tube 6.0, 7.5, 8.5, • Gum elastic bougie - Frova Catheter only introducer Cook C-CAE-14.0-65-FIC • Catheter mount Intubation equipment pouch for bag (roll bag) • Cook Emergency Pneumothorax Set C-TPTSJ-8.5-6.0 • Asherman chest seal 1 • Kawe laryngoscope handle • Lite Blade green laryngoscope disposable blades Mackintosh 2,3,4, • Lite Blade green laryngoscope disposable blades Miller 0,1 • Magill forceps adult • Wee tester (tube confirmation device)	• Pacific A1000 doctors bag Pacific A1000 doctors bag (alternative is Thomas 1x ALS Ultra back pack, • 1x advanced aeromedical and 1x AED bag) • Pelvic splint • Arm-Loc elbow immobilizer adult X1 • Arm-Loc elbow immobilizer child X1 • Ambulance dressing No 1(5X4") No 2 (8X6") No 3(11X8") No 4(13X8") • Adhesive tape (Blenderm/Micropore) 25mm, 50mm • Gauze swabs sterile 10X10cm pack of 5 • Triangular bandage • Wide crepe roller bandage • CAT - Tornique x2 • FAST1 - sternal IO x1 • Venflons sizes 14g, 16g, 18g, 20g, 22g, • Adhesive IV dressing • Blood giving set • Syringes 2ml, 5ml, 10ml, 20ml • Sterile gloves Latex free non sterile examination gloves Nitrile • Needles 21g(green) 23g(blue) 25g(orange) • Philadelphia adult + paediatric adjustable "patriot" collars • Intraosseous needles Cooks Dieckmann C-DIN-15.5-3.0-T45-DKM-HD • 2 way tap with 10cm extension for Intraosseous needle • Long 14G cannula and needle X2 femoral / jugular venous access or Abbocath-T 16G no C453 4535-76 • Cut down set with artery forceps, curved forceps,

• Disposable colorimetric adult and paediatric EtCO2 analysers for integration into the breathing circuit • Wet ones/wipes • Advanced Airway Support Equipment • Laryngeal mask airway set. single use, size 3,4,5 • LMA set, reusable if not available as single use, size 1, 1.5, 2, 2.5 • Cricothyroidotomy set ENK Oxygen Flow modulator set Cook C-EFMS -100 • ET tape • ET tube bite block [Thomas Tube Holders]	silk suture, disposable scalpel size 15 blade, dressing pack • Surgery pack with sterile needle holder, artery forceps X2, toothed and non-toothed forceps, scissors, Sutures Ethilon 3/0, 4/0, silk 2/0 Hand held suture (Prolene 2/0 with large needle)
Drugs	**Personal items**
• Suxamethonium 50mg/ml 2ml amps • Atracurium • Vecuromum • Fentanyl • Etomidate • Propofol • Ketamine 20ml amp of 10mg/ml (200mg per 20ml amp) • Midazolam 10mg in 2ml. (5mg/ml) To be diluted prior to use with 10ml water Standard drugs carried in a drugs case (only supplied to practitioners with training in their use) • Diamorphine 5 mg ampoule • Flumazenil 100 micrograms/ml, 5 ml ampoule • Cyclizine 50mg/ml, 1 ml ampoule • Naloxone 400 microgram/ml in 1ml prefilled syringe (Min-I-Jet) Or • Narcan 400 microgram/ml in 1ml amp • Benzylpenicillin 600mg vial X2 • Cefotaxime 1g amp powder X2 Adrenaline 1 in 1000 1mg/ml in 1ml ampoule • Atropine 600 mcg/ml in 1ml ampoule • Chlorphenaramine (Pirton) 10mg/ml, 1ml amp • Hydrocortisone powder for reconstitution 100mg vial with 2ml water • Water for injection 2ml amp for dilution • Diamorphine • Water for injection 10ml amp for dilution	• Mobile phone • Pager • BASICS identity card • Patient report form • Local area maps • High visibility jacket • Protective overalls squad suit • High visibility over trousers • High visibility waistcoat • Heavy duty safety boots (Warwick safety plus) • Heavy duty gloves (Firemaster II) • Protective glasses (Tourguard IV) • Helmet Helmet torch with helmet clip and batteries • Tough-cut shears • Stethoscope Anaeroid sphygmomanometer with adult cuff and thigh cuff for traumatic lower limb injuries • Pocket face mask with oxygen inlet • Venous tourniquet • Pentorch • Sharps box • Peak flow meter with mouth pieces • Nebuliser with adult and child mask • Defibrillator - Laedel FR2 plus with ECG module and paediatric pads • Pulse Oximeter Handheld, pocket size Oximeter saturation monitor for immediate assessment • Glucometer, strips and finger pricking device

- Aspirin 300mg tabs dissolvable
- Salbutamol Nebuliser solution 2mg/ml in 2.5ml vial
- Ipratropium bromide
- Nebuliser solution 250mcg/ml in 2ml vial
- Syntometrine ergometrine 500 micrograms and oxytocinin 5 units/ml, 1ml amp
- Intravenous fluids Normal saline 500ml bag X3 10%
- Dextrose saline 500ml bag X1

Cardiac drugs carried in a drugs case (only supplied to practitioners with training in their use)

- Frusemide 10mg/ml 80mg in 8ml amp (Min-I-Jet)
- Lignocaine 10mg/ml 100mg in10ml prefilled disposable syringe (Min-I-Jet)
- Adrenaline 1 in 10,000 1mg in 10ml (100mcg in 1ml) prefilled disposable syringe (Min-I-Jet)
- Adrenaline 1 in 1000 1mg in 1ml prefilled disposable syringe paediatric use (Aurum)
- Atropine 300mcg/ml 3mg in 30ml prefilled syringe (Min-I-Jet)
- Amiodarone 30mg/ml 300mg in 10ml prefilled syringe (Aurum)

Diamorphine is controlled under Schedule 2 of the "Misuse of drugs" and should be in a locked drug bag in a locked car. Practitioners should keep their own register of the use of controlled drugs as well as other injections given recording batch number and expiratory date.

lower limb fractures

- Tabard Medical incident Officer
- Triage Action Cards (MIMMS)
- Medical incident aide memoire (SMART MEMO)

Thanks are offered towards the following schemes who have contributed to this page.

Mercia Accident Rescue Service

East Midlands Immediate Care Scheme

West Midlands CARE Team

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Webmaster - Andrew Thurgood

Appendix 3: Matrix of essential knowledge, skills, equipment and supplies for prehospital providers

	Type of provider in prehospital setting			
	Basic first aid	Advanced first aid	Basic prehospital trauma care	Advanced prehospital trauma care
Knowledge and skills				
Alert				
Able to call for help	E	E	E	E
Science survey				
Assess scene safety(physical and environment hazards)	E	E	E	E
Establish need for additional help	E	E	E	E
Assess cause of injury	D	D	E	E
PROVIDER SAFETY				
Receive training n universal precautions	E	E	E	E
Limit exposure to HIV,hepatitis B and , using available supplies	E	E	E	E
Limit exposure to airbone pathogens	D	D	E	E
Patients assessment				
Initial assessment				
Evaluate adequacy of airway	E	E	E	E
Evaluate adequacy of breathing	E	E	E	E
Evaluate extent of external bleeding	E	E	E	E
Recognize level of consciousness	D	E	E	E
Recognize when injuries are not survivable	D	E	E	E
Establish priorities for immediate care	D	E	E	E
Conduct triage for multiple patients	PR	D	E	E
Recognize at-risk patients and arrange transport	D	E	E	E
Detailed assessment				
Assess head injury	I	D	E	E
Asses spinal injury	I	D	E	E
Assess Chest injury	I	D	E	E
Assess abdominal injury	I	D	E	E
Assess extremity injury	I	D	E	E
Assess neurological function	I	D	E	E
Assess patient for psychological trauma	I	D	E	E
Recognize presence of life-threatening or limb-threatening injury	D	D	E	E
Evaluate level of discount	D	E	E	E

Recognize hypothermia	D	D	E	E
Assess evidence of shock	D	D	E	E
Assess wounds for potential mortality and disability	I	D	E	E
Assess degree of burns (depth and extent)	I	D	E	E
Formulate differential diagnosis of cause of shock	I	I	E	E
Recognize platysmal penetration	I	I	I	E
Interventions				
Scene management				
Manage rescue situation	PR	D	E	E
Manage safe rescue to prevent further neurovascular damage	PR	D	E	E
Manage crowds, traffic and other threat	D	E	E	E
Avoid secondary collisions and injury	D	E	E	E
Manage transport of patient	D	E	E	E
Document incident	I	D	E	E
Air and breathing				
Remove foreign bodies from airway(e.g. using Heimlich manoeuvre)	E	E	E	E
Restore open airways using manual manoeuvres (e.g.chin lift, jaw thrust)	E	E	E	E
Restore open airways using recovery position	E	E	E	E
Provide respiratory support (mouth-to-mouth resuscitation)	PR	E	E	E
Use suction devices	I	D	E	E

5. RESOURCE MATRIX FOR PREHOSPITAL TRAUMA CARE SYSTEM

Insert oropharyngeal or nasopharyngeal airway	i	D	E	E
Provide respiratory support (use pocket mask fir mouth-to-mouth ventilation)	I	D	E	E
Assist ventilation using bag-valve-mask device(BVM)	I	D	E	E
Administer oxygen	I	D	E	E
Use airway adjuncts (i.e. blind insertion device)	I	I	D	E
Use three-way dressing	I	I	D	E
Use endotracheal intubation	I	I	I	E
Use oesophageal detection device	I	I	I	D
Perform needle cricothyroidotomy	I	I	I	E
Perform surgical cricothyroidotomy	I	I	I	PR
Perform gastric decompression	I	I	I	E
Perform needle thoracostomy for thoracic decompression	I	I	I	E
Perform tube thoracostomy	I	I	I	PR
Circulation, hypothermia and shock				
Control external haemorrhage through direct pressure	E	E	E	E
Elevate victim's legs if there is evidence of shock	D	D	E	E
Immobilize the patient to ease pain, reduce bleeding and Complications	D	D	E	E
Splint fractures for haemorrhage control and pain control	D	D	E	E

Prevent heat loss with a blanket or other material	D	D	E	E
Use external rewarming for hypothermia(e.g. blankets)	D	D	D	E
Measure and record blood pressure and pulse rate	I	E	E	E
Monitor body temperature	I	D	E	E
Apply arterial tourniquet (in extreme situations)	I	PR	E	E
Understand parameters of fluid resuscitation	I	I	PR	E
Wrap pelvic fractures for haemorrhage control	I	I	D	E
Establish peripheral percutaneous intravenous access	I	I	PR	E
Administer intravenous fluid replacement	I	I	PR	E
Establish peripheral venous cutdown access	I	I	I	PR
Establish intraosseous access for children <5 years	I	I	I	E
Transfusion knowledge and skills	I	I	I	PR
Wounds				
Nonsurgical management of wounds(e.g. dressing)	E	E	E	E
Use deep interfacial packing for severe wounds				
(e.g. landmine injuries)	I	I	D	E
Administer tetanus prophylaxis (toxoid)		I	I	IPR
Administer tetanus antiserum	I	I	I	PR
Use minor surgical management of wounds(e.g. cleaning suturing)	I	I	I	PR
Burns				
Cool the burn area with water	E	E	E	E
Cover the skin with clean dressing	E	E	E	E
Control risk of hypothermia	D	D	E	E
Cover the skin with sterile dressing	I	I	D	E
Use intravenous therapy for burn <15% body surface area	I	I	PR	E
Injuries to extremities and fracture				
Use basic immobilization for fractured extremities	E	E	E	E
Use available material for splints	D	D	E	E
Use spine board	I	I	D	E
Use skin traction	I	I	D	E
Use closed reduction	I	I	I	PR
Head and spinal injuries				
Use spinal precautions when extricating or moving patients	E	E	E	E
Use selective immobilization (e.g. C-collar, backboard)	D	D	E	E
Properly manage immobilization patient to prevent complications	I	I	E	E
Maintain nomotension and oxygenation to prevent secondary				
brain injury	I	I	D	E
Monitor neurological function	I	I	D	E
Pain management				
Manage pain without medicine using ice elevation, immobilization	D	E	E	E
Manage pain with non-narcotic analgesics	I	I	I	PR
Manage pain with narcotic analgesics	I	I	PR	E
MedicineS				

Apply topical antibiotic dressing, disinfectants or antiseptic as				
Appropriate	I	I	D	E
Administer vaccines and antibiotic (e.g. tetanus prophylaxis)	I	I	I	PR
Administer other medicine	I	I	PR	E

PRE HOSPITAL TRAUMA CARE SYSTEM

Equipment and supplies				
Communications				
Wireless communication (e.g. radio, mobile phone)	I	D	D	D
Protection				
Non –sterile single –use glove in size medium-large	D	E	E	E
Eye protection(plastic or glass goggles with side shields)	D	E	E	E
Light-reflective clothing(e.g. waistcoat) for identification and				
Protection	D	D	E	E
Flags or other traffic control devices	D	D	E	E
Torch plus spare batteries and bulb or reflector or candle	D	D	E	E
Soap or bactericidal foam for hand washing	D	E	E	E
Cleaning solution	D	E	E	E
Towel	D	D	E	E
Protective clothing, gowns or aprons	I	D	E	E
Disinfectant solution for equipment	I	D	E	E
Plastic bag for non-biohazard waste	I	D	E	E
Waterproof matches	I	D	D	E
Incineration bags for biological waste	I	I	E	E
Fire extinguisher	I	I	E	E
Sharps container	I	I	E	E
Extrication				
Basic extrication equipment (e.g. machetes, crowbars, cars jacks)	I	D	E	E
Other extrication equipment (e.g. shears, saw, rope, shovel,				
protective clothing)	I	PR	D	E
Short –board for extrication	I	I	E	E
Specialized extrication equipment(e.g. cutters, spreaders, rams)	I	I	PR	D
Immobilization and patient transfer				
Long, rigid wood, metal or plastic board	D	D	E	E
Boards for limb splints	I	D	E	E
Stretcher(wooden, plastic or cloth device)	I	D	E	E
Head immobilization device	I	I	E	E
Cervical collar	I	I	E	E

Airway and breathing management

Face shield	i	D	E	E
Pocket mask (e.g. for mouth-mask breathing	I	D	E	E
Bag-valve mask	I	D	D	E
Nasopharyngeal and \or oropharyngeal airways (for infants,				
children and adults)	I	D	D	E
Nasal cannula and associated tub	I	D	D	E
Tongue depressor	I	D	E	E
Fixed oxygen equipment and administration equipment	I	D	E	E
Non-rebreather face mask	I	I	E	E
Suction device (manual or powered)	I	I	E	E
Yankauer or other regid suction tip	I	I	E	E
Blind insertion device	I	I	PR	D
Laryngoscope handle and blades	I	I	I	E
Endotracheal tube and connector	I	I	I	E
Introducing stylet\bougie	I	I	I	E
Splinter forceps	I	I	I	E
Oesophageal detector device	I	I	I	E
Magil forceps	I	I	D	E
Needle and syringe	I	I	I	E
Needle for thoracostomy	I	I	I	E
Haemorrhage control and skin injuries				
Potable water	D	D	E	E
Bandages	I	D	E	E
Elastic bandages	I	D	E	E
Gauze rolls	I	D	E	E
Compresses	I	D	E	E
Absorbent cotton wool	I	D	E	E
Adhesive tape	I	D	E	E
Oral rehydration solution	I	D	E	E
Blankets	I	D	E	E
Adhesive dressing bandage(wound plaster)	I	D	E	E

5. RESOURCE MATRIC FOR PREHOSPITAL TRAUMA CARE SYSTEMS

4X4 bandages, triangular bandages	I	I	E	E
Arterial tourniquet	I	I	E	E
Needles and syringes	I	I	E	E
Sterile compresses	I	I	E	E
Intravenous infusion set(line and cannulas)	I	I	I	E
Intraosseous needle or equivalent	I	I	I	E
Burns				
Vaseline or paraffin gauze	I	I	E	E

Sterile dressing	I	I	D	E
Dressing for burns	I	I	I	D
Diagnosis and monitoring				
Clock or watch with second hand	I	D	E	E
Stethoscope	I	D	E	E
Blood-pressure measuring device	I	D	E	E
Penlight	I	I	E	E
Torch (flashlight)	I	D	E	E
Thermometer	I	I	D	E
Pulse oximeter	I	I	I	D
Electronic cardiac monitoring device	I	I	I	D
Medicines				
Oxygen	I	D	E	E
Topical antibiotic dressing	I	I	D	E
Diazepam (or equivalent)	I	I	I	D
Controlled substance lockbox	I	I	I	D
Morphine sulfate	I	I	I	D
Acetylsalicylic acid	I	I	I	D
Ibuprofen (or equivalent)	I	I	I	D
Paracetamol (acetaminophen)	I	I	I	D
50% dextrose solution	I	I	I	E
Crystalloid solution (normal saline)	I	I	I	E
Water for injection	I	I	I	E
Miscellaneous				
List of local emergency contacts	D	E	E	E
Knife, scissors	I	D	E	E
Flask for drinking water or bottles of water	I	I	E	E
Container for supplies and equipment(e.g. shoulder bag, backpack or box)	I	I	E	E
Rescue blanket (silver/silver or silver/gold	I	I	E	E
Shovel	I	I	D	E
Triage tape	I	I	D	E
Lubricating jelly	I	I	E	E
Writing material				
Pencil	I	D	E	E
Permanent market	I	D	E	E
Notepad	I	I	E	E
Charts for documenting care and incident	I	I	D	E

Items in the resource matrix are categorized as E fir essential, D for desirable, PR for possibly required, and I for irrelevant

Appendix 4: QUESTIONNAIRE

RESEARCH TOPIC

Pre-hospital trauma care: Training and preparedness of and practice by medical general practitioners in Limpopo Province.

PART A. BIOGRAPHICAL QUESTIONANAIRE

1. Are you in private general medical practice in Limpopo Province for **at least 50%** of your time?

Yes ☐ **No** ☐

If **NO to question 1.** please return the questionnaire and the card to the address indicated on the enclosed envelope.
If **YES to question 1,** please complete the questions below:

2. Age (in yrs): (√ Tick appropriate square)

< 26 ☐ 26-35 ☐ 36-45 ☐ >45 ☐

3. Sex: Male ☐ Female ☐

4. Location of medical practice: Urban ☐ Rural ☐

5. What kind of medical practice are you working in?

Solo ☐ Partnership ☐ Other ☐

If other, specify below:

……

6. Are you in full-time or part-time private medical practice?

Full-time ☐ Part-time ☐

7. Which medical school did you graduate from as a medical practitioner?

……..

8. In which year did you qualify as a medical practitioner?

……..

9. How long have you been working as a private general medical practitioner?

……..

PART B. TRAUMA TRAINING

10. Have you ever received trauma training since you commenced work as a general practitioner?

YES☐ NO☐

If **YES** to question 10, indicate how you received the training:

	Method of **Training**	Yes	No	**Year/s in which training was received**
a.	Worked in casualty job at hospital			
b.	Enrolled for a trauma management course			
c.	Was involved with emergency medical services			
d.	Underwent internet-based training			

e.	Registered for compact disc (CD) based training			
f.	Other			
g.	If other specify here:			

11 Have you undergone training in cardio-pulmonary resuscitation (CPR)?

YES ☐ NO ☐

If **YES**, what was the last year of certification in cardio-pulmonary resuscitation (CPR)?

……..

12. If you have undergone training in trauma management indicate which qualification(s) you have?

	Course	Yes	No	Year first **completed**	**Year updated**
a.	Basic Life Support(BLS)				
b.	Advanced Trauma Life				

	Support(ATLS)				
c.	Advanced Cardiac Life Support(ACLS)				
d.	Advanced Paediatric Life Support (APLS)				
e.	Diploma in Primary Emergency Care (Dip PEC)				
f.	Definitive Surgical Trauma Care Course				
g.	Other : Specify				

13. How do you keep yourself up to date with the latest trauma management techniques?

……..

……..

……..

……..

……..

……..

14. Are you aware of Advanced Trauma Life Support Course (ATLS) course offered by the College of Emergency Care in Polokwane (Provincial capital of Limpopo Province)?

YES ☐ NO ☐

15. If you have done Advanced Trauma Life Support (ATLS) before, indicate whether you would be willing to attend trauma refresher courses offered by the College of Emergency Care in Polokwane:

YES ☐ NO ☐

16. If you have not done Advanced Trauma Life Support (ATLS) before indicate whether you would be willing to enroll for one offered by the College of Emergency Care in Polokwane:

YES ☐ NO ☐

17. What are the incentives and disincentives factors **in the area where you practice** that have impacted on your trauma management **training**?

a **Incentives** to trauma management **training**:

……..

……..

……..

……..

b. **Disincentives** to trauma management **training**:

……..

……..

……..

……..

PART C. TRAUMA MANAGEMENT PREPAREDNESS

18. Indicate by ticking the appropriate item, which of the following equipment you have **where you practice as a private general medical practitioner:**

Airway and Breathing

ITEM	YES	NO
a. Pocket face mask		
b. Venturi mask		
c. Oropharyngeal airway		
d. Suction e.g. manual		
e. Bag-valve-mask ventilation device		
f. Tracheal tubes		
g. Laryngoscope		
h. Cricothyrotomy set		
i. Oxygen supply		
j. Spacers/Nebulisation set		
k. Peak flow meter		
l. Stethoscope		
m. Pulse oximeter		
n. Needle with one-way valve		
o. Chest drains		

Drugs

a. Antihistamine		
b. Cyclokapron		
c. Phenytoin		

d. Magnesium sulphate		
e. Zidovudine		
f. Normal saline and/or Ringer's Lactate bags		
g. 50% Dextrose 50ml and/or glucose gel		
h. Ketamine		
i. Adrenaline 1:1000		
j. Atropine		
k. Salbutamol inhalers/nebulas		
l. Diazepam		
m. Aspirin		
n. Glyceryltrinitrate (GTN) sublingual spray		
o. Morphine and other analgesics		
p. Hydrocortisone		

Others

a. Gloves		
b. Masks		
c. Goggles		
d. Tourniquet		
e. Glucometer		
f. Pen Torch		
g. Antiseptics/Swaps		
h. Scissors		
i. Gauze and bandages		
j. Plasters, Bandaids and Steri-strips		

k. Sterile suture packs and materials		
l. Burn dressings		
m. Eye-pads		
n. Sanitary pads		
o. Cervical collar		
p. Intravenous cannulae		
q. Fluid giving sets		
r. Needles and syringes		
s. BP apparatus		
t. Umbilical clamps		
u. Sharps disposal container		

19. Considering the equipment and drugs you identified in 18 above as available where you practice as a general practitioner, rate your level of preparedness (using the scale below) to manage trauma patients in terms of the following:

(**0**=not at all prepared; **1**=manage with constant supervision; **2**=manage with much support; **3**=manage with some assistance; **4**=manage with minimal supervision; **5**=manage independently):

		0	1	2	3	4	5
a.	Adhering to universal safety measures						
b.	Assessing trauma patient rapidly and accurately						
c.	Opening and protecting the airway						

d.	Stabilizing the spinal cord						
e.	Providing adequate breathing						
f.	Restoring and maintaining sufficient circulation						
g.	Monitoring trauma patient after resuscitation						
h.	Re-evaluating response to resuscitation						

20. Indicate whether you have contact numbers of the following emergency services likely to be present at a trauma incident:

	YES	NO
a. Ambulance		
b. Fire		
c. Police		
d. Other : specify:		

PART D. TRAUMA PRACTICE

21. What percentage (%) of your medical practice comprises emergency care? ☐ %

22. What percentage of the **injuries that you manage** constitute:

a. Blunt trauma ☐ %

b. Penetrating trauma ☐ %

c. Other trauma ☐ %

If **other** trauma, specify types:

……..

23. Do you support the local emergency medical services (EMS) in your area where you practice as a private general practitioner?

Yes ☐ No ☐

24. If yes, describe the support you render to them

……..

……..

……..

……..

25. Indicate, using the scale below your frequency of use of the following sources of information to guide trauma management:

(Scale: 0=never used; 1=rarely used; 2=occasionally used; 3= used frequently).

SOURCE OF INFORMATION	**0**	**1**	**2**	**3**
a. Continuing medical education				
b. Trauma journals				
c. Trauma textbooks				
d. Preferences of medical staff				
e. Emergency medical training				
f. Trauma management guidelines				
g. Personal experience				
h. Internet-based sources				
i. Other : Specify..				

26. Rate, using the scale below, your skill level to render pre-hospital emergency management of the following trauma incidents:

(Scale: 0=no skill; 1=poor; 2=fair; 3=excellent)

Injury	0	1	2	3
a. Head injury				
b. Eye injuries				
c. Maxillo-facial injuries				
d. Penetrating injuries of the neck				

e. Chest injuries				
f. Abdominal injuries				
g. Uro-genital injuries				
h. Spinal cord injuries				
i. Extremity injuries				
j. Soft tissue injuries				
k. Needlestick injury				
l. Rhabdomyolysis				
m. Compartment syndrome				
n. Nerve injuries				
o. Peripheral vascular injuries				
p. Pelvic fractures				
q. Burns				
r. Paediatric injuries				
s. Human and animal bites				
t. Missile and blast injuries				

27. What are the incentives and disincentives to trauma practice in your area:

a. **Incentives** to trauma **practice**

……..

……..

……..

……..

……..

……..

b. **Disincentives** to trauma **practice**

……..

……..

……..

……..

……..

……..

THANK YOU FOR YOUR ASSISTANCE

Appendix 5: INFORMATION LETTER

P.O. Box 4272
TZANEEN
0850

Tel. 015 307 3705
Fax 015 307 3705
e-mail: obbyrose@mweb.co.za

Dear Sir / Madam

I am a fourth year postgraduate medical student registered for the degree in Masters in Medicine (Family Medicine), University of the Witwatersrand. I am conducting research to determine **pre-hospital training and preparedness of and practice by medical general practitioners in the private sector in Limpopo Province.**

The study is being conducted in response to the high levels of trauma in South Africa. As an indication of its commitment to have as many people trained in emergency medicine as possible the Division of Emergency Medical Services of the Limpopo department of health and welfare is offering more courses in emergency medicine including ATLS, ACLS and APLS. Candidates who successfully complete the courses get reimbursed tuition fees by the department. The department is also willing to assist trainees in emergency medicine with accommodation where necessary.

I would really appreciate it if you could spare a few minutes of your precious time to complete the attached questionnaire. The questionnaire is entirely anonymous. Participation in the study is voluntary and refusal to participate will involve no penalty or loss of benefits to which you are entitled. Responses to the questionnaire will be treated with strict confidentiality.

Enclosed with the questionnaire is a pre-stamped self-addressed return envelope and a postcard. After completing the questionnaire place it in the envelope and return it to me. Send the postcard independent of the questionnaire to the address on its back.

Thank you very much for your co-operation and assistance.

Yours Truly

Dr Obby Risiva

Appendix 6: ETHICAL CLEARANCE CERTIFICATE

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