Contents

Section1:

Abstract

Background:

Trauma and intentional injury form a major burden of disease in South Africa. The rates of Interpersonal Violence (IPV) in South Africa are five times higher than the global average. The face, head and neck are often the primary site of injury resulting from IPV, due to their lack of protection and these injuries are associated with considerable morbidity and mortality.

Objective:

This study examines the changing patterns of injury to the head and neck, resulting from IPV in patients presenting at a Level One trauma centre serving an urban population over 5 years.

Methods:

Data was collected of patients attending the Johannesburg Hospital Trauma Unit, over a period of 40 consecutive days (26 July – 4 September) in 2007 and 2012. The data was collected in two separate periods of 40 consecutive days on the exact same calendar dates, five years apart, initially in 2007 and subsequently in 2012.

Data from patients with injuries to the head and neck as a result of IPV were extracted and a cross-sectional analysis was performed. A secondary data analysis was performed on the existing data set from these two separate periods.

Results:

A total of 498 patients in 2007 and 372 patients in 2012 presented with IPV injuries over the same 40-day period. In 2007, 43% (n=212) of patients had injuries to the head and neck compared to 49% in 2012 (n=181). The median age was 28 years (23-33) in 2007 and 27years (24-33) in 2012 with males making up 86% (n=183) and 83% (n=151) of the total respectively. There were significantly more minor injuries (swellings, lacerations; tangential gunshot wounds (GSW) and closed fractures) compared to major injuries in 2012 (p=0.02). Injuries from knives and bottles were similar in both years but gunshot wounds decreased by a third, and assault with hands and feet doubled. The face was more commonly injured than the neck in both years.

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Initially dates are 26 July to 1 August

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Conclusion:

Trauma to the head and neck from IPV remains a major burden to the South African health care system and to society. Minor injuries from more accessible weapons such as knives, bottles and fists significantly increased with gunshot wounds decreasing possibly due to stricter gun laws. Violence prevention programs and community education are needed to help prevent IPV.

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List of figures and tables

Figures

Tables

Abbreviations

IPV –– Interpersonal Violence

CMJAH – Charlotte Maxeke Johannesburg Academic Hospital

GSW – Gunshot wounds

CT – Computerized Tomography

MRI – Magnetic Resonance Imaging

Section 2: Submitted article

Title Page

The Changing Face of Trauma: Head and Neck Injuries resulting from interpersonal violence in Johannesburg, South Africa

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Running title:

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The authors declare no conflicts of interest.

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Trauma and intentional injury form a major burden of disease in South Africa. The rates of Interpersonal Violence (IPV) in South Africa are five times higher than the global average. The face, head and neck are often the primary site of injury resulting from IPV, due to their lack of protection and these injuries are associated with considerable morbidity and mortality.

Objective:

The objective of this study was to examine examines the changing patterns of injury to the head and neck, resulting from IPV in patients presenting at a Level One trauma centre serving an urban population over 5 years. Data was collected of patients attending the Johannesburg Hospital Trauma Unit, over a period of 40 consecutive days (26 July – 4 September) in 2007 and 2012. The data was collected in two separate periods of 40 consecutive days on the exact same calendar dates, five years apart, initially in 2007 and subsequently in 2012.

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Data was collected of patients attending the Charlotte Maxeke Johannesburg Academic Hospital (CMJAH) Trauma Unit, over a period of 40 consecutive days (26 July – 4 September) in 2007 and 2012.

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A total of 498 patients in 2007 and 372 patients in 2012 presented with IPV injuries over the same 40-day period. In 2007, 43% (n=212) of patients had injuries to the head and neck compared to 49% in 2012 (n=181). The median age was 28 years (23-33) in 2007 and 27 years (24-33) in 2012 with males making up 86% (n=183) and 83% (n=151) of the total respectively. There were significantly more minor injuries (swellings, lacerations; tangential gunshot wounds (GSW) and closed fractures)

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Conclusion:

Trauma to the head and neck from IPV remains a major burden to the South African health care system and to society. Minor injuries from more accessible weapons such as knives, bottles and fists significantly increased with gunshot wounds decreasing possibly due to stricter gun laws. Violence prevention programs and community education are needed to help prevent IPV.

The Changing Face of Trauma: Head and Neck Injuries resulting from interpersonal violence in Johannesburg, South Africa

Introduction

Trauma places a heavy burden on South Africa's healthcare system with an estimated 1.5 million cases of trauma presenting to secondary and tertiary hospitals per year. (Matzopoulos et al. 2006). Violence accounts for more than 50% of these presentations and almost 50% of all injury deaths as recorded by the National Injury Mortality Surveillance System (Donson 2008). Interpersonal violence (IPV) is defined as "the intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community that either results in or has a high likelihood of resulting in injury, death, psychological harm, mal-development, or deprivation" (Krug et al. 2002). The rates of IPV in South Africa are five times higher than the global average (Seedat et al. 2009).

Alvi et al. (2003), have shown that the most common cause for facial trauma was assault. The face and neck are often the first site of attack in IPV and are prone to injury due to their lack of protection. Trauma to the head and neck can be considered devastating due to the potential cosmetic consequences, close proximity of vital structures and high morbidity resulting from brain and spine trauma. Treatment often involves a multidisciplinary approach including otolaryngology, ophthalmology, maxillofacial surgery, plastic surgery and neurosurgery. Medical literature (Gandhi et al. 2011; Alvi et al. 2003; Ykeda et al. 2013), is rich in epidemiological studies reporting on patterns of IPV to the face, head and neck. The objective of this study was to examine the changing patterns of injury to the head and neck, resulting from IPV in patients presenting at a Level One trauma centre serving an urban population over 5 years

Methods:

This report is based on a cross-sectional observational study. For the project, the records of all patients who attended a tertiary level hospital, Charlotte Maxeke Johannesburg Academic Hospital (CMJAH) Trauma Unit over two fixed periods of 40 consecutive days (26 July – 4 September) in 2007 and in 2012 were reviewed. The data was collected in two separate periods of 40 consecutive days on the exact same calendar dates, five years apart, initially in 2007 and subsequently in 2012 The first part of the project (2007) was completed by Asbury (2011) who investigated IPV to the whole body in patients presenting at the CMJAH Trauma Unit. The second part (2012) was a repetition of the first part by author. Data were extracted from both parts of the studies in order to examine the nature of head and neck trauma, as this specific analysis was not done by Asbury in 2007. The present study provides a secondary data analysis of the existing data set.

The admissions book for the Trauma Unit contained the identification data, demographics and mechanism of injury for each patient, in addition to time and date of admission. This book was used to obtain data regarding every admission to the Trauma Unit in the specified time period. Inclusion criteria were all mechanisms of injury consistent with an episode of IPV in patients 17 years of age or older.

Data collected on each patient included: date of presentation, age, gender, assault type, weapon type, primary site of injury, primary type of injury, secondary and tertiary sites and types of injury. Additionally, the data included, investigations, x-rays that ensued. Consultations from other departments and whether there was a hospital admission or discharge home was also recorded.

The injury pattern was recorded by the doctor performing the initial patient assessment and supplemented later by additional findings from other specialty consultations. Injuries were recorded in anatomical terms, sometimes with drawings of the anatomical site of injury. These sites included; eye, ear, lips, face and head which included scalp injuries. The injuries were recorded according to one of 16 anatomical body areas during data collection and subsequently further condensed into six regions for analysis. The severity of each injury was then assessed, recorded and categorized into major and minor injuries. Minor injuries include swellings, lacerations, tangential gunshot wounds (GSW) and closed fractures. Major injuries included internal organ damage and intracerebral bleeds or contusions.

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Patients were excluded from the study if the mode of injury was determined to be accidental or non-intentional. This category included all motor vehicle accidents, pedestrian accidents, falls from height and occupation-related injuries. Patients presenting with old injuries, either with sepsis or wounds treated at referring hospitals were also excluded as the initial assessment and management phase had passed. Minors under 16 years of age were not included in the study.

The study data were recorded using a proforma allowing for the information to be kept anonymous. Data was processed in Microsoft Excel (Microsoft Excel 97-2003, Microsoft Office). As the nature of the data obtained in this study required only a simple descriptive analysis, results have been reported as frequencies and mean ± standard deviation, or median and range. Where comparative analysis was possible, the statistical package SAS (V9.2) was used for Chi-square and Fisher's exact tests to determine differences between groups with a p-value less than 0.05 regarded as significant.

Ethics

The Human Research Ethics Committee of the University of the Witwatersrand issued a clearance certificate on 11/10/2017, certificate number M170129.

Results

Altogether 870 patients were identified, (2007 and 2012), who had been seen in the Trauma Unit for IPV. There were fewer in the second period (372) than in the first period (498).

Demographics of the patient sample

During the two 40-day study periods (26 July – 4 September in 2007 and 2012), the percentage of patients with trauma to the head and neck resulting from IPV was 43% (212/498) in 2007 and 49% (181/372) in 2012(See Table 1). The median age and gender were similar in both years and there were no significant differences between the samples.

Table 1: Trauma to The Head and Neck from IPV in 2007 And 2012

Variable	2007	2012	Statistical Test
Head and neck trauma	212	181	
Full body trauma	498	372	
Age in years (median) (range)	28 (17-58)	27 (14-64)	0.8406 Mann Whitney
Gender Female/Male % (n)	13.7/86.3 (29/183)	16.6/83.4 (30/151)	0.4794

Injuries:

The head was the most common site injured in 2007 (44% (94/212), while the face was the most common site injured in 2012 (37% 68/181). Injuries to the neck were similar in both years (See Table 2). There was significantly more minor trauma than major trauma in head and neck cases in 2012 compared to 2007(p=0.0208) (See Fig.1).

Table 2: Site of Injury in Patients with IPV Injuries to Specific Areas Of The Head And Neck

Site of injury	2007 n(%)	2012 n(%)
Face	72(34%)	68(37%)
Neck	26(12%)	20(11%)
Eye	18(8%0	22(12%)
Lip	7(3%)	11(6%)
Head	94(44%)	64(35%)
Ear	9(4%)	5(3%)
Total	212	181

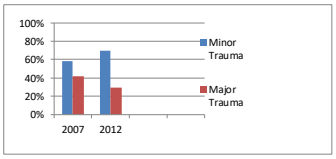

Figure 1: Minor and Major Trauma in IPV Head and Neck Injuries

Specialist Consultations

Around half of patients presenting to the Trauma Unit in both samples were managed completely by Trauma Unit staff (See Table 3). When other specialist consultation was needed, plastic surgery was the most commonly consulted surgical specialty followed by neurosurgery.

Table 3: Specialist Consultations

Specialty	**2007** (Total=212) No(%)	**2012** (Total=181) No(%)	P Value

Ear, Nose and Throat	1(0.5)	8(4.4)	0.0136 *
Maxillo Facial	21(9.9)	14(7.7)	0.4823
Plastic Surgery	37(17.5)	33(18.2)	0.8950
Ophthalmology	14(6.6)	16(8.8)	0.4915
Neurosurgery	36(17.0)	26(14.4)	0.4491
Total	109(51)	97(53,5)	

*Statistically significant difference

Investigations

X-rays were requested in 71.7% of patients who had injuries to the head and neck in both 2007 (152/212) and 70.7% in 2012 (128/181). More patients had CT scans in 2012, 39.7%,than in 2007, 32.5% (See Table 4).

Table 4: Radiological Investigations

Investigation	2007 (n=212) No(%)	2012 (n=181) No(%)	P Value
Plain x-ray	152 (71.7)	128 (70.7)	0.9110
CT scan	69 (32.6)	72 (39.8)	0.1412

Weapon Types

Weapons used over the two separate time periods in IPV were divided into blunt force trauma and sharp trauma. The sharp trauma weapons were further divided into low and high energy. Weapons that were used are displayed in Table 5.

Table 5: Types of Weapons Used

Blunt Force Trauma	**Sharp Trauma**
Brick	Firearm
Bottle (blunt)	Bottle (sharp)
Metal Bar	Knife
Sjambok	Axe

Petrol	Glass
Chair	Screwdriver
Wooden bat	
Steering lock	
Spanner	
Snooker Cue	

Injuries from low velocity sharp weapons increased from 2007 to 2012 while gunshot wounds decreased over that same period. There was a highly significant increase in blunt injuries caused by weaponless assault (fists and feet) (p=0.0001) over the two separate time periods. Bottle injuries increased significantly (p = 0.0009) from 2007 to 2012. (See Table 6.)

Table 6: Comparison of Weapons Most Commonly Used in IPV in 2007 And 2012

Variable	**Weapon**	**2007 (n=212)** **No(%)**	**2012 (n=181)** **No(%)**	**P Value**
Sharp	Total	N=109	N=85	
	Knife	16.5 (18)	22.3 (19)	0.3584
	Bottle	36.7 (40)	61.2 (52)	0.0009 *
	Gunshot wounds	10.1(11)	2.3 (2)	0.0419
Blunt	Total	N=102	N=96	
	Fists and feet	20.6 (21)	64.6 (62)	<0.0001*
	Blunt object	25.5(26)	19.8 (19)	0.3974

*Significant difference

Site of Injury

In 2007, bottle injuries were significantly more commonly targeted at the head (p=0.001) and face (p=0.0001) than other weapons. See Table 7.

Table 7: Site of Injury Vs Weapon 2007

Area	Gun	Knife	Bottle	Blunt
Face	2	10	23	12
Head	9	21	40	15
Neck	4	5	6	0
Total	15	36	69	27

Comparisons between the two samples regarding weapon and site of injury are shown in Table 8. (See Table 8). There were no significant differences for the two samples.

Table 8: Weapon and Site of Injury Comparing 2007 With 2012

2007	Total n	GSW*	Knife	Bottle	Blunt
Face	72	2	5	20	35
Head	80	5	4	11	54
Neck	26	4	4	6	0
2012					
Face	68	1	5	20	39
Head	55	1	5	12	36
neck	20	0	7	8	1
Chi Square comparing 2007 to 2012		1.4477 P = 0.4778	0.4031 P=0.8175	0.2126 P=0.8991	3.816 P=0.1484

* GSW= Gunshot Wounds

Discussion

Males between the age of 23-33 years accounted for the vast majority (>83%) of patients who presented to the CMJAH Trauma Unit with injuries from IPV, over both study periods. This is consistent with European studies that found young males were also the most common offenders (O'Sullivan & O'Conor 2003) (Howe & Crilly 2002). Fry (2014), also demonstrated that this demographic was a factor in predicting involvement in IPV in South Africa.

Attendance for assault injuries followed a weekly pattern with the greatest attendances over the weekend and fewer cases presenting throughout the week. The monthly trend showing the greatest incidence of assaults and attendance was around the end/start of the month. This normally followed the monthly remuneration payments which take place on the last Friday of the month. Neither this study nor other studies categorically recorded such data, however it supports the known link between the availability of money, the use of alcohol and IPV as reported by Luke et al (Luke et al. 2002).

The head was the most common site injured in 2007, while the face was the most common site injured in 2012. Injuries to the neck were similar in both years. In the study from Chorley in Lancashire (UK), injuries to the head, neck and throat were more serious in comparison to injuries inflicted on the rest of the body (Howe and Crilly, 2002), and in all the studies examined for the present study, the head was the most commonly affected area (Asbury 2011, Alvi et al. 2003, Gandhi et al. 2011, Ykeda et al. 2013).

There was significantly more minor trauma than major trauma in head and neck cases in 2012 compared to 2007. The increase in minor trauma is attributed to a decreased access to guns and more significant weapons; stricter gun laws enforced by the South African Police Service may be a considerable factor (South African Police Service, 2012). Weapons that cause minor injuries are more easily available in the home and the public space. Minor trauma might be considered quite common in our setting with many cases being managed in district or secondary hospitals. Lacerations, swellings and fractures were classified as major trauma (Howe & Crilly 2002) which further emphasizes the burden of trauma that is experienced in South Africa as these injuries were classified as minor in our study and are often managed by primary or secondary hospitals.

Injuries from low velocity sharp weapons increased from 2007 to 2012 while gunshot wounds decreased over that same period. This may be due to more stringent gun laws with perpetrators having easier or immediate access to knives, bottles and fists and feet. When beer is drunk from glass bottles, spontaneous decisions under the influence of alcohol and the availability of a weapon already in hand make a dangerous combination that often ends in violence.

Gun-related crimes have decreased by 21.2% in 2011/2012 following stricter controls which were introduced by the South African Government in 2004/2005 (South African Police Service, 2012). The Medical Research Council's Gender and Health Research Unit, determined that the use of guns as a cause of non-natural death of women almost halved between 1999 and 2009, while deaths from other means, including stabbing and blunt injuries were similar in this time period (Abrahams et al. 2013). However, there was a significant increase in blunt injuries caused by weaponless assault.

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Fry (2014), found six factors that predicted physical violence in South Africa; being a victim of property crime, poverty, gender, age, fear of crime in the home and the respondents' faith. IPV is a complex problem impacting on many sectors of our already resource strained society where violence is now a public health issue.

In Bogota, Colombia, one of the few places with comparable homicide rates to urban South Africa, a joint violence prevention program between many different departments of local government and other institutions dramatically decreased rates of homicide by three-quarters over ten years. The program followed a public health approach and assumed a multi-factorial causal mechanism, requiring interventions in the police, legal, educational and cultural systems, as well as multi-sectoral partnerships with governmental agencies, with the private sector, and the community around the theme of violence prevention (Guerrero 2007).

Conclusions:

Trauma to the head and neck from IPV remains a major burden to the South African health care system and to society. Minor injuries from more accessible weapons such as knives, bottles and fists significantly increased from 2007 – 2012, whereas gunshot wounds decreased possibly due to stricter gun laws. Violence prevention programs and community education are needed to help prevent IPV

Limitations:

This study may be subject to selection bias as it was conducted over a fixed time period during the year but provides a snapshot of the burden of IPV. Due to the data collection method, an accurate history of the assault was not always available when patients were unconscious or intoxicated. Trauma from IPV may be small and unreported, serious enough that patients die before arriving at hospital or treated. Minor trauma is often treated at smaller district hospitals while private hospitals treat a large portion of major and minor trauma cases like these were therefore not recorded in our study. Future studies over longer periods of time that include multiple institutions will provide more insight into the full impact of IPV in our society.

Summary

We live in a violent society where alcohol, poverty, unemployment and insecurity all contribute to high levels of IPV. The police and law system cannot cope with the volume of violent and non-violent crime. Continued social injustice, economic inequalities, poor personal security, gender inequalities

and lack of family cohesion due to economic migration or disease continue to contribute to the ongoing levels of violence. Stricter gun control laws are a step in the right direction but a multi departmental strategy involving the departments of education, police, health and social services is needed to address this complex problem. Successful partnerships and interventions from other countries should be explored.

References

Abrahams, N., Mathews, S., Martin, L.J., Lombard, C. & Jewkes, R., 2013. Intimate partner femicide in South Africa in 1999 and 2009. PLoS Medicine, 10(4), p.e1001412. Available at: http://www.ncbi.nlm.nih.gov/pubmed/23565064 [Accessed April 25, 2018].

Alvi, A., Doherty, T. & Lewen, G., 2003. Facial Fractures and Concomitant Injuries in Trauma Patients. *The Laryngoscope*, 113(1), pp.102–106. Available at: http://doi.wiley.com/10.1097/00005537-200301000-00019 [Accessed November 17, 2016].

Asbury, S.L., 2011. Patterns of interpersonal violence presenting to a Level One trauma centre in Johannesburg. University of the Witwatersrand.

Donson, H., 2008. *A Profile of Fatal Injuries in South Africa, Annual Report for South Africa based on the National Injury Mortality Surveilance System*, [online] Mrc.ac.za. Available at: http://www.mrc.ac.za/sites/default/files/files/2016-07-15/NIMSSGauteng2010.pdf

Fry, L.J., 2014. Factors which predict interpersonal violence in South Africa. *South African Family Practice*, 56(5), pp.271–275. Available at: http://dx.doi.org/10.1080/20786190.2014.975436.

Gandhi, S., Ranganathan, L.K., Solanki, M., Mathew, G.C., Singh, I. & Bither, S., 2011. Pattern of maxillofacial fractures at a tertiary hospital in northern India: a 4-year retrospective study of 718 patients. *Dental Traumatology*, 27(4), pp.257–262. Available at: http://doi.wiley.com/10.1111/j.1600-9657.2011.00996.x [Accessed November 15, 2016].

Guerrero, R., 2007. Violence prevention through multi-sectoral partnerships: The cases of Cali and Bogotá, Colombia. *African Safety Promotion: A Journal of Injury and Violence Prevention*, 4(2). Available at: http://www.ajol.info/index.php/asp/article/view/31595 [Accessed April 25, 2018].

Howe, A. & Crilly, M., 2002. Violence in the community: a health service view from a UK Accident and Emergency Department. *Public health*, 116(1), pp.15–21. Available at: http://www.ncbi.nlm.nih.gov/pubmed/11896631 [Accessed March 7, 2018].

Krug, E.G., Mercy, J. a., Dahlberg, L.L. & Zwi, A.B., 2002. The world report on violence and health. *Lancet*, 360(9339), pp.1083–1088. Available at: http://www.ncbi.nlm.nih.gov/pubmed/15298158.

Luke, L.C., Dewar, C., Bailey, M., McGreevy, D., Morris, H. & Burdett-Smith, P., 2002. A little nightclub medicine: the healthcare implications of clubbing. *Emergency medicine journal : EMJ*, 19(6), pp.542–5. Available at: http://www.ncbi.nlm.nih.gov/pubmed/12421781 [Accessed March 7, 2018].

Matzopoulos, R.G., Prinsloo, M., Butchart, A., Peden, M.M. & Lombard, C.J., 2006. Estimating the South African trauma caseload. *International Journal of Injury Control and Safety Promotion*, 13(1), pp.49–51. Available at: http://www.tandfonline.com/doi/abs/10.1080/15660970500036382 [Accessed November 15, 2016].

O'Sullivan, J.M. & O'Conor, C.E., Patterns of patient presentation to a Dublin urban emergency department with assault related injuries. *Irish medical journal*, 96(10), pp.305–7. Available at: http://www.ncbi.nlm.nih.gov/pubmed/14870810 [Accessed March 7, 2018].

Seedat, M., Van Niekerk, A., Jewkes, R., Suffla, S. & Ratele, K., 2009. Violence and injuries in South Africa: prioritising an agenda for prevention. *The Lancet*, 374(9694), pp.1011–1022. Available at: http://linkinghub.elsevier.com/retrieve/pii/S014067360960948X [Accessed November 17, 2016].

South African Police Service, 2012. *An analysis of the national crime statistics: addendum to the annual report 2011/2012*,

Ykeda, R., Ballin, C., Moraes, R., Ykeda, R. & Miksza, A., 2013. Epidemiological profile of 277 patients with facial fractures treated at the emergency room at the ENT Department of Hospital do Trabalhador in Curitiba/PR, in 2010. *International Archives of Otorhinolaryngology*, 16(04), pp.437–444. Available at: http://www.thieme-connect.de/DOI/DOI?10.7162/S1809-97772012000400003.

Protocol

The Changing Face of Trauma; Head and Neck Injuries resulting from interpersonal violence in Johannesburg South Africa

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Introduction

Trauma places a heavy burden on South Africa's healthcare system with an estimated 1.5 million cases of trauma presenting to secondary and tertiary hospitals per year (Matzopoulos et al. 2006). Violence accounts for more than 50% of these presentations and almost 50% of all injury deaths as

recorded by the National Injury Mortality Surveillance System (National Injury Mortality Surveilance System, Donson 2008).

Interpersonal violence (IPV) is defined as "the intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, mal-development, or deprivation"(Krug et al. 2002). In 2000, an estimated 520 000 people died worldwide as a result of IPV (Peden et al. 2002). In 2012, this figure had decreased to an estimated 475 000 globally, with low- and middle-income countries having the highest estimated rates of homicide. The highest rate in 2012 was in the Region of the Americas, with 28.5 homicides per 100 000 population, followed by the African Region with a rate of 10.9 homicides per 100 000 population. The lowest estimated rate of homicide is in the low- and middle-income countries of the Western Pacific Region, with 2.1 per 100 000 population. The global average was estimated to be at 8.0 per 100 000 population in 2000, declining to 6.7 per 100 000 population in 2012 with (World Health Organization 2014). South Africa had a reported homicide rate of 31.1 per 100 000 population in 2012/2013 which is higher than the highest world average seen in the Region of the Americas (National Injury Mortality Surveillance System, World Health Organization Global Status Report on violence prevention 2014).

Death is only one part of the burden that IPV has on society. This violence can contribute to lifelong illness as well as early death. Many causes of death such as heart disease, stroke, cancer and HIV/AIDS are the result of victims of violence adopting behaviors such as smoking, alcohol and drug misuse and unsafe sex in an effort to cope with the psychological impact of violence. Violence also places a heavy strain on health and criminal justice systems, social and welfare services (World Health Organization Global Status Report on violence prevention 2014).

The rates of IPV in South Africa are five times higher than the global average (Seedat et al. 2009). In 2000, violence and unintentional injuries combined were the second leading cause of all death and disability-adjusted life years (DALYs) lost in the country, after HIV/AIDS. (Norman et al. 2007). Interpersonal violence was the leading risk factor, after unsafe sex, for loss of DALYs (Norman et al. 2007). The results of the Victims of Crime Survey show that in over 85% of incidents of assault, a weapon was used and resulted in injury to the victim. A knife was the most commonly used weapon followed by a club (Statistics South Africa 2015)

Charlotte Maxeke Johannesburg Academic Hospital (CMJAH) is a Level One Trauma Centre and is a state referral hospital for trauma for the greater Johannesburg area with the nearest other Level One Trauma Centres being located in Soweto (+-14km) and Pretoria (+-52km). There is an on-site specialist Trauma Surgeon, a general surgery registrar and two medical officers. Patients are triaged,

resuscitated if necessary, investigated radiologically and are then either admitted to the trauma wards, referred to other specialties, sent to step down facilities or discharged home.

Patterns of IPV in patients with injuries anywhere on the body presenting to CMJAH, were investigated by Dr S Asbury over a 40-day period in 2007. Out of the 486 patients included in the study, 427 were males (mean age 29.3 +- 7.7 years) and 59 were female (mean age 28.6+-8.6 years). This is in keeping with the reporting that the highest IPV mortality rates worldwide are among males aged 15-29 with more than 60% IVP mortalities worldwide occurring among persons aged between 15-44 years (Peden et al. 2002). In New Zealand, classified a high income country, the mean age of patients was with facial fractures resulting from IPV was 28 with a male-to-female ratio 0f 9:1 (Lee 2009). Asbury found that more than 65% of assaults involved a known weapon whereas 8% had no evidence suggesting that a weapon was used. Out of the sharp or penetrating injuries, gunshot wound was the most common followed by bottle then knife. The assault mechanism was not known in 26% of cases, while 64.8% of patients with an unknown mechanism of assault suffered injury to the head, in comparison with 37.3% of those with known mechanisms. (Asbury 2011)

In a retrospective review of four years involving 151 trauma patients with facial fractures presenting to a level-one trauma centre in Chicago, Illinois, USA, it was documented that the most common cause for facial fractures was assault (41%) (Alvi et al. 2003). He investigated concomitant injuries in trauma patients with facial fractures and found that 43.7% of patients had cerebral hematomas with subdural hematoma being the most common. Pulmonary injury was the second most common associated injury (31.1%) with lung contusion being the most common. Intubation was required in 42% of patients and 14.8% required tracheostomy during their hospital stay. Eleven patients died of neurologic injuries. Even though the setting of this study was in a high income, first world country with a low incidence of IPV, its findings that most facial trauma results from IPV is in keeping with the findings from low to middle income third world countries (Ykeda et al. 2013, Asbury 2011). The concomitant injuries, morbidity and mortality associated with facial trauma highlight the importance of multidisciplinary treatment of these patients and the burden that these patients have on the healthcare system.

The face and neck are often the first site of attack in IPV and are prone to injury due to their lack of protection (Gandhi et al. 2011). Trauma to the head and neck can be considered devastating due to the potential cosmetic consequences, close proximity of vital structures and high morbidity resulting from brain and spine trauma. The long-term psychological effects and loss of work due to visual loss and, swallowing and speech problems add to this burden. Treatment often involves a multidisciplinary approach including otolaryngology, ophthalmology, maxillofacial surgery, plastic surgery and neurosurgery (Ykeda et al. 2013).

Medical literature is rich in epidemiological studies reporting on patterns of IPV and trauma to the face, head and neck. The majority of these studies were conducted in South America and Africa.(Ykeda et al. 2013, Table 1. Afolabi 2010). Unfortunately, many of these studies from South America are not published in English.

It appears that there no similar studies (e.g. Asbury 2011, Norman et al 2011) compared to the present study on IPV and head and neck injuries have been done in South Africa. Of those found, none have looked at the relationship of weapon versus injury to the entire head and neck area, relationship of weapon versus investigations and management, as well as which disciplines manage different injuries and when these patients are referred.

The study performed by Asbury in 2007 will be repeated for the same period of 40 days in 2012, 5 years after the initial study. The data captured will be analysed specifically for trauma to the head and neck. This study aims to show the patterns of IPV to the Head and Neck, illustrating the weapons used and injuries sustained. It will look at the patterns of head and neck trauma between 2007 and 2012 and show how these were managed at a Level One Trauma Unit in Johannesburg. This is a secondary data analysis of an existing data set collected by Asbury in 2007 and the author of this MMED degree in 2012.

Objectives

The objectives for the present study were to determine:

The percentage of the total trauma from IPV which involved the head and neck.

Any changes in patterns of such trauma from IPV to the head and neck between 2007 and 2012

Any significant association between weapons used and injuries sustained.

The investigations and interventions performed for patients with these head and neck injuries.

1) Which patients with injuries of the head and neck were referred to other disciplines and when the patients are referred.

Methods

This is a cross-sectional observational study allowing the sampling of all patients who attended the CMJAH Trauma Unit over a fixed period of 40 consecutive days in 2007 and 2012. The study in 2007 was done by Asbury (2011) to investigate IPV presenting at the CMJAH Trauma Unit and. It will be repeated by the author for this MMED degree in 2012 built on her previous work using the same methodology (as described below). Data will be extracted from both studies in order to look at the nature of head and neck trauma specifically as this was not done by Asbury in 2007. This study is a secondary data analysis of an existing data set.

The admissions book for the Unit contains the identification data, demographics and mechanism of injury for each patient, in addition to time and date of admission. This book will be used to gain data regarding every admission to the Unit. Inclusion criteria are all mechanisms of injury consistent with an episode of IPV. The records for each patient suitable for inclusion will be reviewed.

Files to be reviewed will include all patient files documenting the assessment and treatment in the accident receiving area of the Unit with observations by the nursing sisters and junior medical staff in the Unit. Resuscitation forms will be obtained for those patients requiring a multi-person resuscitation, those with severe or life-threatening injuries or mechanisms of injury; and hospital files of admitted patients that documented any operations or further treatments undergone over the first twenty-four hours since presentation, will be sourced.

The data collected from these files will include:

Date of presentation, age, gender, assault type, weapon type, primary site of injury, primary type of injury, secondary and tertiary sites and types of injury, investigations done, plain x-ray done, consults from other departments and admission or discharge home.

The injury pattern is recorded by the doctor doing the initial patient assessment and often supplemented by additional findings on specialist consult. Injuries are recorded in anatomical terms often with drawings of the anatomical site of injury. This will enhance the accuracy of data collected, especially on the face. The injuries will be recorded to one of sixteen anatomical areas in data collection and subsequently further condensed into six regions for analysis. The severity of each injury will then be assessed, categorized and recorded. These categories were then separated into major and minor injuries. Minor injuries include swellings, lacerations; tangential gunshot wounds (GSW) and closed fractures. The mechanism of trauma, whether blunt or penetrating, will be recorded giving close attention to head wounds where blunt-force trauma may often result in

heavily-bleeding lacerations. The presence of a weapon in the assault will be noted either as described by the patient or as evidence from the type of wound (such as a gunshot). In low-velocity penetrating trauma, the type of weapon used will also be recorded, albeit patient intoxication and location of injury may affect the accuracy of that description. No further description of the incident such as information that could be used in a police report will be noted in accordance with the University of the Witswatersrand Human Research Ethics Committee. There will be no follow-up of cases beyond the initial assessment and management.

The initial management of injuries for the patients will be recorded. This will be limited to investigations and management within the acute receiving area and includes X-rays Computerised Tomography (CT), Magnetic Resonance Imaging (MRI) or contrast studies. Interventions such as suturing, management of wounds requiring theatre and all specialist consultations whilst in the Trauma Unit will also be recorded. It should be noted that the Unit manages all intra-abdominal, thoracic and vascular injuries within the Unit. The final variable to be noted was the deposition of the patient, whether discharged from the Unit or admitted.

Patients will be excluded from the study if the mode of injury was determined to be accidental or non-intentional. This included all motor vehicle accidents, pedestrian accidents, falls from height and occupation-related injuries. Patients presenting with old injuries, either with sepsis or wounds treated at referring hospitals will be excluded as the initial assessment and management phase had passed. Minors (under 16 years) will be excluded because the overlap of referrals between the Paediatric Emergency Department, Paediatric Surgical Department and Trauma Unit meant the full cohort of patients could be missed and subsequently represent younger patients inaccurately.

The optimal study length was determined at 40 consecutive days in order to obtain an adequate sample size for accurate statistical analysis. This study was also previously designed to take advantage of the natural variation of daily trauma unit attendance, which follows an ebb-and-flow pattern over a weekly and monthly cycle. It is proposed here that this pattern is closely associated with the availability of money, increased social interaction, increased alcohol consumption and violence previously described. Classically, the weekend closest to the end of the month has the highest incidence of trauma unit attendances, which then decline gradually over the month. The study length ensured that at least one full month 'cycle' was covered.

Data Analysis:

This is a secondary data analysis of an existing data set. The study data will be recorded using a proforma allowing for the data to be kept anonymous. It will then be processed in Microsoft Excel

(Microsoft Excel 97-2003, Microsoft Office). As the nature of the data to be obtained in this study requires only a simple descriptive analysis, results have will be reported as frequencies and mean ± standard deviation, or median and range. Where comparative analysis is possible, the statistical package SAS (V9.2) will be used for Chi-square and Fisher's exact tests to determine differences between groups with a p-value less than 0.05 regarded as significant.

1) To find out what percentage of IPV involved the head and neck data will be extracted from the total number of cases of IPV from the 2007 study by Dr S Asbury and from the data collected from 2012. This will be recorded using the same data sheet (Appendix 1). Data will be presented in proportions.

2) The number of patients presenting to CMJAH Trauma Unit with injuries to the head and neck during the study periods in 2007 and 2012 will be compared using a Chi-square test to determine whether the pattern changed over the two separate periods.

3) Data collected will include information of the weapons used and the injuries sustained. These will be analyzed to determine whether there was an association between these two factors from the data collected in 2007 and 2012. The results will be analyzed using a Chi-square test and will be presented in proportions.

4) Radiological investigations as well as clinical interventions performed will be recorded on the data analysis sheet (Appendix 1). These data will be extracted and analysed using a Chi-square test and will be presented in proportions.

5) Patients were treated by the Trauma department staff and were also referred to other specialty disciplines. The data will be analysed to see when and why patients were referred to these disciplines. The results will be presented as proportions.

Ethics:

Data was collected by Dr S Asbury with approval of from the Human Research Ethics Committee of the University of the Witwatersrand (clearance certificate number M017007, 23/07/2012.) An extension of the study was granted by the above-mentioned ethics committee on 22/02/2013 to collect the data from 2012 (Appendix 2). This was collected by the author of this protocol under the supervision of Dr S Rayne (nee Asbury). This protocol has been submitted to the Human research Ethics Committee of the University of the Witwatersrand for permission to use the data mentioned above for the purpose of pursuing this MMED degree with Ethics number M170129 with approval pending.

Budget

The costs associated with photocopying and stationery will be covered by the author and are estimated to be approximately R500

Timeline

	2016 Q4	2017 Q1	Q2	Q3	Q4	2018 Q1	Q2	Q3
Literature Review	✓							
Protocol assessment		✓						
Ethics application	✓	✓						
Recruitment and study		✓						
Data cleaning and analysis			✓					
Manuscript prep			✓					
Research preparation				✓				
Submission of Report					✓			

References

Afolabi, O.A. & Alabi, B.S., 2010. Aetiological profile of nasal trauma in Ilorin North-Central Nigeria. *Nigerian journal of medicine : journal of the National Association of Resident Doctors of Nigeria*, 19(4), pp.348–51. Available at: http://www.ncbi.nlm.nih.gov/pubmed/21526619 [Accessed November 17, 2016].

Alvi, A., Doherty, T. & Lewen, G., 2003. Facial Fractures and Concomitant Injuries in Trauma Patients. *The Laryngoscope*, 113(1), pp.102–106. Available at: http://doi.wiley.com/10.1097/00005537-200301000-00019 [Accessed November 17, 2016].

Asbury, S.L., 2011. Patterns of interpersonal violence presenting to a Level One trauma centre in Johannesburg. University of the Witwatersrand.

Donson, H., 2008. *A Profile of Fatal Injuries in South Africa, Annual Report for South Africa based on the National Injury Mortality Surveilance System*, [online] Mrc.ac.za. Available at: http://www.mrc.ac.za/sites/default/files/files/2016-07-15/NIMSSGauteng2010.pdf

Gandhi, S., Ranganathan, L.K., Solanki, M., Mathew, G.C., Singh, I. & Bither, S., 2011. Pattern of maxillofacial fractures at a tertiary hospital in northern India: a 4-year retrospective study of 718 patients. *Dental Traumatology*, 27(4), pp.257–262.

Krug, E.G., Mercy, J. a., Dahlberg, L.L. & Zwi, A.B., 2002. The world report on violence and health. *Lancet*, 360(9339), pp.1083–1088. Available at: http://www.ncbi.nlm.nih.gov/pubmed/15298158.

Lee, K.H., 2009. Interpersonal Violence and Facial Fractures. *Journal of Oral and Maxillofacial Surgery*, 67(9), pp.1878–1883. Available at: http://linkinghub.elsevier.com/retrieve/pii/S027823910900620X [Accessed November 17, 2016].

Matzopoulos, R.G., Prinsloo, M., Butchart, A., Peden, M.M. & Lombard, C.J., 2006. Estimating the South African trauma caseload. *International Journal of Injury Control and Safety Promotion*, 13(1), pp.49–51. Available at: http://www.tandfonline.com/doi/abs/10.1080/15660970500036382 [Accessed November 15, 2016].

Norman, R., Matzopoulos, R., Groenewald, P. & Bradshaw, D., 2007. The high burden of injuries in South Africa. *Bulletin of the World Health Organization*, 85(9).

Peden, M., McGee, K. & Sharma, G., 2002. The injury chart book : a graphical overview of the global burden of injuries. *Geneva, World Health Organization*, pp.6–76. Available at: http://www.who.int/iris/handle/10665/42566 [Accessed November 15, 2016].

Seedat, M., Van Niekerk, A., Jewkes, R., Suffla, S. & Ratele, K., 2009. Violence and injuries in South Africa: prioritising an agenda for prevention. *The Lancet*, 374(9694), pp.1011–1022. Available at: http://linkinghub.elsevier.com/retrieve/pii/S014067360960948X [Accessed November 17, 2016].

Statistics South Africa, 2015. Victims of crime survey 2014/2015. , pp.1–124.

World Health Organization, 2014. *Global Status Report on violence prevention 2014*,

Ykeda, R., Ballin, C., Moraes, R., Ykeda, R. & Miksza, A., 2013. Epidemiological profile of 277 patients with facial fractures treated at the emergency room at the ENT Department of Hospital do Trabalhador in Curitiba/PR, in 2010. *International Archives of Otorhinolaryngology*, 16(04), pp.437–444. Available at: http://www.thieme-connect.de/DOI/DOI?10.7162/S1809-97772012000400003.

Appendix 1

IPV Data Collection Sheet

Variable	
Date of presentation:	
Age: s	
Gender:	
Assault type:	
Weapon type:	
Primary site of injury:	
Primary type of injury:	
Secondary site and type of injury:	
Tertiary site and types of injury:	
Investigations done:	
Plain x-ray done:	
Consults from other departments:	
Admission or discharge home:	