The burden and outcomes of firearm injuries at two district-level emergency centres in Cape Town, South Africa: A descriptive analysis

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Background. In South Africa (SA), injuries are the second leading cause of years of healthy life lost, and interpersonal violence dominates the SA injury profile. Half of all injury-related deaths in SA are intentional, and firearms contribute to a quarter of these deaths. Injury surveillance systems are essential to develop, implement and monitor strategies that reduce preventable trauma.
Objectives. To describe the burden of patients with firearm injuries and their outcomes at district-level emergency centres in the Western Cape.
Methods. This study was a retrospective analysis of a prospectively collected database. All patients who presented to two district-level emergency centres with a firearm injury over a 12-month period (1 January 2019 - 31 December 2019) were eligible for inclusion.
Results. Firearm injuries represented 5.7% of the trauma burden at the two district emergency centres. Of the 776 patients with firearm injuries who were included, the median age was 27 years, and 91% were male. A total of 520 (67%) patients self-presented, and there were 18 (2.3%) deaths in the emergency centre and a further 23 (3%) as inpatients. Of the total where wound location was determined (*n*=595), 30.4% sustained more than one firearm injury, and 112 out of the 167 admitted to Mitchells Plain Hospital required at least one visit to theatre. This accounted for 413 theatre hours and 1 376 inpatient bed days at Mitchells Plain Hospital. A significant proportion of patients (*n*=219, 29%) were transferred from the emergency centres to a tertiary service for further care.
Conclusion. Firearm injuries represent a substantial proportion of the trauma burden at district emergency centres in the Western Cape Province. Managing patients with firearm injuries is resource intensive, as evident by their high acuity, the need for operative care, the long length of stay, the high burden on emergency medical services with interfacility transfers and the high demand for tertiary care. Data from this study aid our understanding of the prevalence and burden of firearm injuries at district level emergency centres, and multisectoral action, supported by evidence-based primary and secondary preventive strategies, is required to reduce the burden of firearm injuries, and mitigate their effects.

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Globally, 251 000 deaths, or 5.4% of all injury-related deaths, were due to firearm injuries in 2016, with 41% of deaths due to interpersonal violence as a result of a firearm, a 5.7% increase from 2006.[1] Interpersonal violence was estimated to account for 1.5 million hospital admissions, with a further 28 million managed as outpatients in 2016. While there has been a global decrease in interpersonal violence between 1990 and 2013, the south sub-Saharan and Oceania regions have seen an estimated 50% increase in interpersonal violence disability adjusted life-years (DALY).[2]

In South Africa (SA), injuries are the second-leading cause of years of healthy life lost, and interpersonal violence dominates the SA injury profile.[3] An estimated 49% of all injury-related deaths in SA are intentional, and firearms are involved in a quarter of these deaths.[4] Between 1990 and 2016, the SA firearm-related age-standardised death rate declined from 13.1 to 7.1 per 100 000,[5] with some of this decline attributable to the Firearms Control Act No. 60 of 2000.[4,6] Since 2013 there has been a 7.8% year-on-year increase in murders in the Western Cape Province of SA, with communities such as Philippi East, in the Cape Town metropole, recording a murder rate of 247 per 100 000 people.[7] This is more than 40 times the estimated global murder rate of 6.2 per 100 000 people.[8] Mortuary statistics in the Western Cape from 2015 revealed that firearm victims outnumbered victims due to road traffic crashes and penetrating injuries,[9] and in 2018/2019, 46% of all homicides were due to firearm injuries.[10]

Long-term mortality is likely higher for survivors of firearm injuries than other injury profiles,[11,12] and injury surveillance systems are essential to develop, implement and monitor strategies that reduce preventable trauma.[13] Unfortunately, barriers exist in low- and middle-income countries, and an attempt at implementing such a system at a district hospital in Cape Town concluded that it was not sustainable.[14] Beyond mortality data and without adequate injury surveillance, the available SA firearm injury literature is further limited in scope and depth. The focus is on pre-hospital,[15] hospital-specific,[16-21] or tertiary and orthopaedic services,[22-26] with little co-ordinated research documenting the complete burden of this injury profile on health services and society. There is no local research documenting rates of recidivism or strategies that reduce this, or the escalation of violent injury patterns that is suggested by the international literature.[27]

This study aims to describe the burden of patients with firearm injuries and their outcomes at district-level emergency centres in the Western Cape Province, SA.

Methods

Study design

A retrospective analysis of an observational database was performed, with missing data and additional variables from a subsequent chart review.

Study setting

Mitchells Plain Hospital (MPH) is a large district-level hospital about 30 km from Cape Town and the nearest trauma centre and tertiary hospital, Groote Schuur Hospital. It has around 300 beds and serves a population of approximately 600 000. Sixty-two percent of Mitchells Plain's population is <29 years of age, with 48% of households living below the poverty line and only 43% of the working-age population employed.[28] The reported violent crime rate of the area that MPH serves is 1 930/100 000 population,[28] and includes Philippi, a nearby informal settlement with a murder rate of 247 per 100 000 people.[7]

Heideveld Hospital (HEC) is the only stand-alone district level emergency centre in the Western Cape Province, ~20 km from Cape Town. Communities adjacent to Heideveld have deeply entrenched gangs, and much of the violent crime is related to inter-gang warfare and control of the local drug trade.[10] MPH and HEC are co-managed by a team of four emergency physicians and treat over 70 000 patients per annum – approximately 55% being of high acuity (red and orange triage category).[29]

Patients presenting to MPH Emergency Centre, depending on the level of care required, may be admitted to MPH, or be referred to the tertiary hospital. MPH has access to 24/7 operating theatres, two full-time general surgery consultants and one anaesthetic consultant. Outside of office hours, a medical officer or registrar manages cases with a consultant on call from home. MPH has no after-hours computed tomography scan service, nor does it have a high care or intensive care unit. HEC has no on-site surgical, anaesthetic support service or advanced radiology services, and patients requiring admission or operative care are referred to either MPH or the tertiary hospital, depending on the acuity. Neither facility has an on-site blood bank, with only limited O-positive and negative packed red cells and freeze-dried plasma immediately available for transfusion.

Sampling and study participants

A convenience sampling strategy was used. All patients with a firearm injury over a 12-month period (1 January 2019 - 31 December 2019) were included. These facilities were chosen because they share similar care pathways and a mutual tertiary facility. The SA National Defence Force (SANDF) was deployed from 17 July 2019 in several of the communities serviced by the two facilities to reduce gang-related violence.

Data collection and content management

The data collection process involved two phases. The first phase comprised of exporting demographic, triage and emergency centre process data for all patients with firearm injuries from the Hospital and Emergency Centre Tracking Information System (HECTIS) registry by performing an ICD-10 search (X93-95, W32-34, X72-74). Manually entered triage descriptors (gun, GSW, GWS) were also searched for, to ensure that no cases were excluded because of an inaccurate ICD-10 code. Phase 2 involved the collection of admission and outcome details from the Clinicom database and clinical details from the electronic content management system (ECM) database at MPH, and by scrutinising patient folders at HEC. Where available, the electronic continuity of care record (ECCR) provided discharge summaries for the MPH patients.

MPH and HEC utilise an electronic patient tracking and registration system called HECTIS. It was designed to streamline and track patient processes in the emergency centre, by collecting patient process times, triage scores, ICD-10 diagnosis assigned at disposition and disposition decisions. The data are stored electronically in an off-site Oracle database version 12.1.0.2.0 (Oracle Corp., USA). Clinicom is a patient administrative and billing system, and ECM provides scanned clinical records and ECCR summaries. Age categories were defined as per World Health Organization classification, and incident location and home address were retrieved to allow for geospatial analysis. All data were de-identified and exported to an Excel (Microsoft, USA) database stored in a protected University of Cape Town Microsoft OneDrive.

Statistical analysis

Descriptive statistics were used to describe the demographics and clinical details of patients. Categorical data were presented as frequency counts and proportions and assessed for non-random associations with the χ^2 test. The Shapiro-Wilk test was applied to assess the distribution of all numerical data and expressed as median and interquartile range if non-normal. Weekends were defined as Saturday and Sunday, after hours between 16h00 and 8h00, and time data presented as hours:minutes. Data were analysed with SPSS Statistics version 26.0 (IBM Corp., USA), and geospatial analysis presented as a Kernel density heatmap using ArcGIS software (Esri, USA). Statistical significance was defined as $p<0.05$.

Ethical considerations

Ethical approval was granted by the University of Cape Town Human Research Ethics Committee (ref. no. 044/2020) and facility approval was obtained via the National Health Research Database (ref. no. WC_202002_029).

Results

During the study period, MPH and HEC emergency centres attended to a total of 49 577 and 18 051 emergency visits, respectively, of which 9 629 (19%) and 4 035 (22%) were trauma related. Of the trauma-related presentations, 565 (5.9%) and 286 (7.1%) were because of firearm injuries at the two facilities, respectively, and therefore eligible for inclusion. Only 9 (1.5%) of the MPH folders were excluded because of incomplete or inaccessible clinical documentation (Fig. 1).

Demographics and process data

The age distribution was skewed to the right, with 80% of all patients <36 years old (Table 1). There was a strong male preponderance of 714 (91%), with a median age of 27 years (interquartile range (IQR) 21 - 34). A total of 89 (11%) were <18 years old, with 18 (2.3%) aged <13 years. Of the included sample, 520 (67%) arrived using their own transport, with 242 (31.2%) arriving by ambulance, either as a primary call or as an interfacility transfer. A total of 581 (74%) presented outside of office hours, with presentations on weekends totalling 340 (43.2%) (Fig. 2). The maximum daily numbers of patients with firearm injuries arriving at MPH and HEC were 14 and 6, respectively. The median emergency centre process times were arrival to triage 0:16 (IQR 0:31), triage to consultation 1:03 (IQR 3:09) and arrival to exit 8:00 (IQR 8:48). Fig. 3 depicts the monthly distribution of firearm presentations. It includes a period before and after the deployment of the SA National Defence Force, as a response to the apparent increasing levels of gang-related firearm violence at the time.[29]

Geospatial data

The home suburb, within the geographically defined service area of the facility, was determined for 593 patients, generating the heatmap in Fig. 4.

There were 52 records available where the distance between the street address and incident location could be accurately recorded from the ambulance record on ECM. Including those injured at home, the median incident distance from home was <1 km.

Clinical and outcome data

A total of 595 (30.4%) patients sustained more than one firearm injury, with 13.7% sustaining a head or neck injury, 22.4% a chest, 21.5% an abdominal and 66.9% an extremity injury (Table 2).

Overall, 18 (2%) patients died in the emergency centre, and of those that survived to emergency centre disposition (*n*=749), 313 (41.6%) were discharged home, 224 (29.7%) were transferred out and 167 (22.2%) admitted to a ward at MPH, accounting for 1 376 inpatient bed days. In total, 417 (55.3%) required an admission to hospital beyond their emergency centre care or following transfer to the tertiary centre trauma unit. A total of 30 (4%) patients required an admission to an intensive care unit (ICU).

More than a third of the patients at MPH were referred to the surgical team and almost one in five to the orthopaedic service. A total of 49 (9.5%) patients that presented to MPH emergency centre went directly from the emergency centre to theatre. Of the 167 patients admitted to MPH, 112 (67.1%) required at least one theatre visit, resulting in 125 operations, with a total of 413 hours of

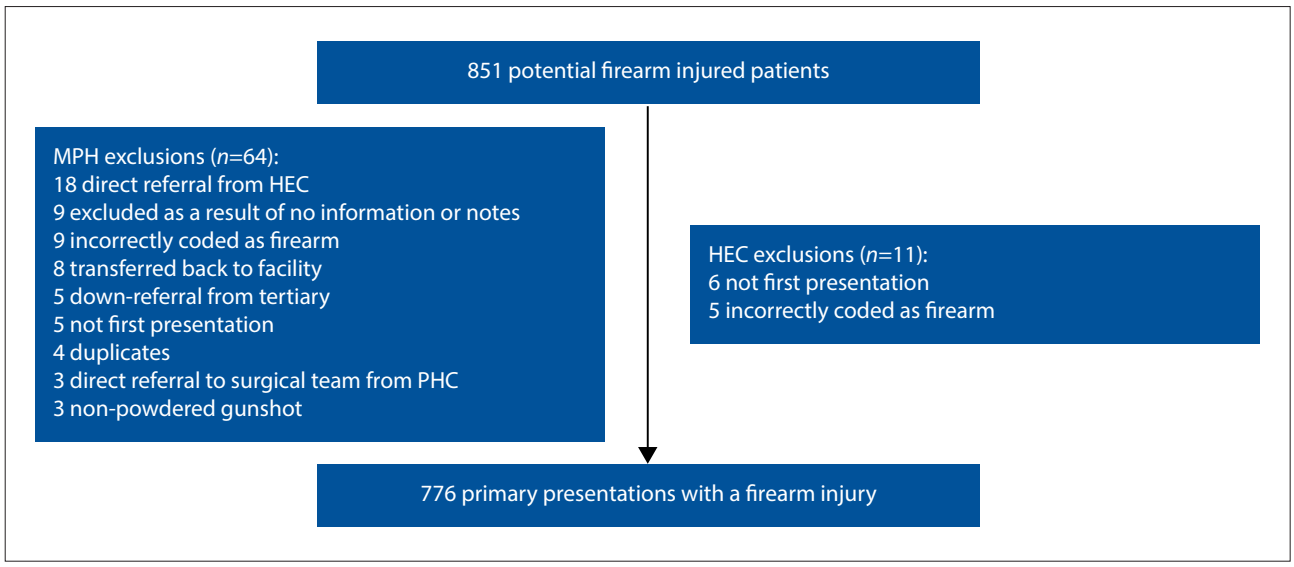

Fig. 1. Exclusions. (MPH = Mitchells Plain Hospital; HEC = Heideveld Hospital; PHC = primary healthcare facility.)

Table 1. Demographic and arrival details of all patients with firearm injuries (*N*=776)

Characteristic		Mitchells Plain Hospital, *n*=501, *n* (%)	Heideveld Hospital, *n*=275, *n* (%)	Total, *n*=776, *n* (%)
Gender				
	Male	455 (90.8)	251 (91.3)	706 (91.0)
	Female	46 (9.2)	24 (8.7)	70 (9.0)
Age category (years)				
	0 - 5	4 (0.8)	2 (0.7)	6 (0.8)
	6 - 12	8 (1.6)	4 (1.5)	12 (1.5)
	13 - 17	35 (7.0)	29 (10.6)	64 (8.3)
	18 - 25	154 (30.7)	93 (33.9)	247 (31.9)
	26 - 35	182 (36.3)	97 (35.4)	279 (36.0)
	36 - 45	77 (15.4)	32 (11.7)	109 (14.1)
	46 - 55	32 (6.4)	14 (5.1)	46 (5.9)
	56 - 65	8 (1.6)	2 (0.7)	10 (1.3)
	>65	1 (0.2)	1 (0.4)	2 (0.3)
Referral category type				
	PHC referral via EMS	58 (11.6)	6 (2.2)	64 (8.2)
	PHC referral (own transport)	1 (0.2)	0 (0.0)	1 (0.1)
	Metro EMS from scene	152 (30.3)	23 (8.4)	175 (22.6)
	Private EMS from scene	2 (0.4)	1 (0.4)	3 (0.4)
	SAPS	7 (1.4)	5 (1.8)	12 (1.5)
	Self-presented	280 (55.9)	240 (87.3)	520 (67.0)
	Other	1 (0.2)	0 (0.0)	1 (0.4)
Transported via EMS				
	From PHC	58 (27.4)	6 (20.0)	64 (26.4)
	From scene	154 (72.6)	24 (80.0)	178 (73.6)

Percentages may not add up to 100% because of rounding.
PHC = primary health care; EMS = emergency medical services; SAPS = South African Police Service.

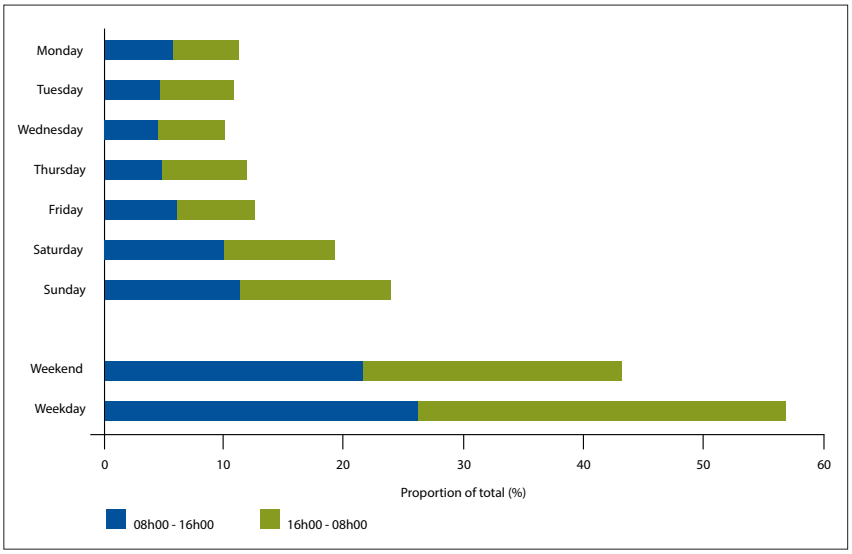

Fig. 2. Daily distribution of firearm injuries.

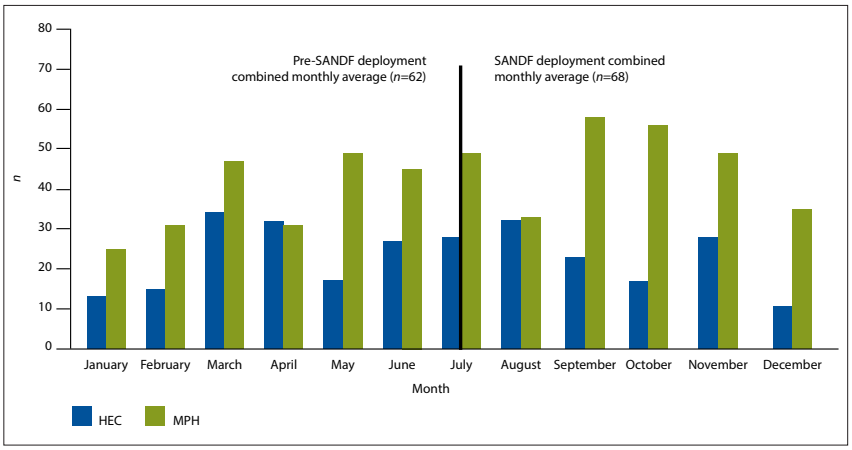

Fig. 3. Monthly distribution of firearm injuries in relation to South African National Defence Force (SANDF) deployment from 17 July 2019 to March 2020. (MPH = Mitchells Plain Hospital; HEC = Heideveld Hospital.)

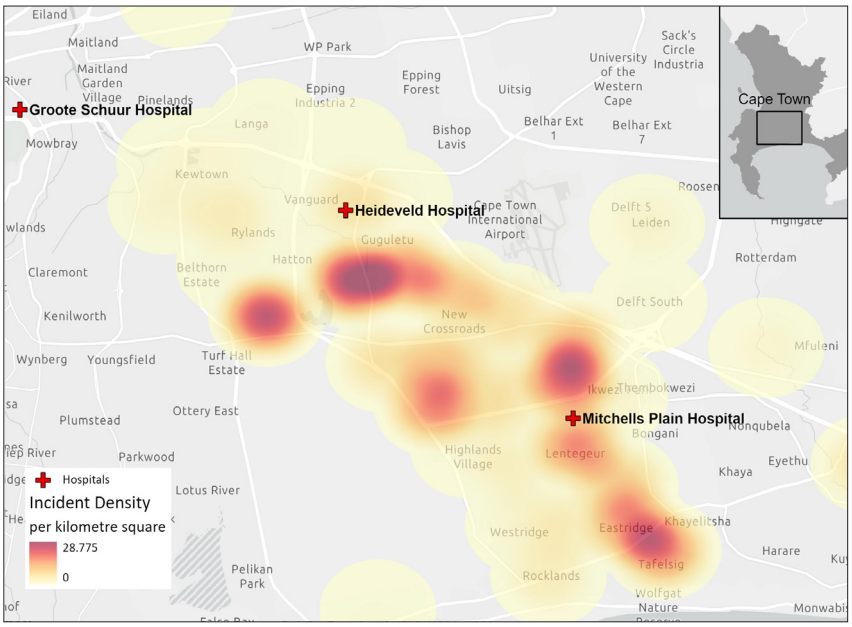

Fig. 4. Firearm injury heatmap in relation to relevant health facilities and drainage area (N=593).

theatre time required. A total of 41(5.3%) patients died after arrival to both emergency centres, and almost a third (*n*=9, 1.2%) of those admitted to ICU died (Table 3).

The Triage Early Warning Score (TEWS) and SA Triage Scale (SATS) categories[30] showed marked variation in the proportion categorised to each colour code (Table 2). Almost a third of those triaged red died, and despite the variation in less urgent categories, there were no deaths in those triaged yellow or green (Table 3). The TEWS numeric score and the Shock Index (SI – heart rate divided by systolic blood pressure) also showed a difference in those surviving to discharge.

The Revised Trauma Score (RTS) could only be calculated from the MPH patients, and included 21 of the 28 deaths and total of 478 patients.

Discussion

This study set out to describe the burden of patients with firearm injuries and their outcomes at two district-level emergency centres in the Western Cape. A total of 776 patients with firearm injuries presented to the two facilities during the study period, comprising 6% of all trauma presentations. Because firearm injury victims presented with a high acuity (82% triage red and orange with SATS), they were prioritised and this resulted in resources, including staff and resuscitation room space, being redirected from the other patients. This is reflected in significantly shorter time to triage (16 minutes v. 30 minutes) and time to consultation (60 minutes v. 200 minutes) than the general patient population.[31] The burden on the hospitals and emergency medical services (EMS) was significant, with 43% requiring admission and half of these requiring transfer to the tertiary hospital. At the district hospital, 67% of admitted patients received operative interventions, with a resultant 413 theatre hours required (~4 hours per patient). A total of 5.3% died because of the firearm injury, and half of those occurred after being transferred to the tertiary hospital. The majority (78%) presented outside of traditional office hours, further straining the emergency centre during times when staffing numbers are usually more constrained.

The surgical burden is apparent by the high proportion of admissions and transfers out to a tertiary service for surgical care (1 in 5). This is partly a result of HEC not having access to any onsite surgical services. Limited after-hours surgical cover and the absence of advanced imaging, an onsite blood bank, high care or an ICU may

Table 2. Comparison of triage characteristics, anatomical injury location, and emergency centre disposition (*N*=776)

Characteristic		Mitchells Plain Hospital, *n*=501, *n* (%)	Heideveld Hospital, *n*=275, *n* (%)	Total, *N*=776, *n* (%)
SATS category				
	Green	4 (0.8)	7 (2.5)	11 (1.4)
	Yellow	70 (14.0)	60 (21.8)	130 (16.8)
	Orange	350 (69.9)	174 (63.3)	524 (67.5)
	Red	77 (15.4)	34 (12.4)	111 (14.3)
AVPU				
	Unresponsive	24 (4.8)	11 (4.0)	35 (4.5)
	Pain	7 (1.4)	6 (2.2)	13 (1.7)
	Voice	15 (3.0)	4 (1.5)	19 (2.5)
	Alert	455 (90.8)	252 (92.3)	707 (91.3)
TEWS category				
	Green	113 (22.6)	63 (22.9)	176 (22.7)
	Yellow	199 (39.7)	123 (44.7)	322 (41.5)
	Orange	115 (23.0)	58 (21.1)	173 (22.3)
	Red	74 (14.8)	31 (11.3)	105 (13.5)
Firearm injury location*				
	Head	69 (13.8)	13 (11.6)	82 (13.7)
	Chest	107 (22.2)	26 (23.2)	133 (22.4)
	Abdomen	106 (22.0)	22 (19.6)	128 (21.5)
	Extremities	321 (70.5)	77 (68.8)	398 (66.9)
	Multiple†	145 (30.1)	36 (32.1)	181 (30.4)
Hospital outcome‡				
	MPH surgical referral	190 (38.4)	2 (0.7)	192 (24.7)
	MPH orthopaedic referral	91 (18.4)	4 (1.5)	95 (12.2)
	Transfer to tertiary hospital	105 (21.2)	114 (41.9)	219 (28.6)
	Required theatre at MPH	109 (22.0)	3 (1.1)	112 (14.4)
	ICU	25 (5.1)	5 (1.8)	30 (3.9)
	Died (total)	28 (5.7)	13 (4.8)	41 (5.3)
	Died in EC	10 (2.0)	8 (2.9)	18 (2.3)
	Died in ward at MPH	1 (0.2)	0 (0.0)	1 (0.1)
	Died in theatre at MPH	3 (0.6)	0 (0.0)	3 (0.4)
	Died at tertiary facility	14 (2.8)	5 (1.8)	19 (2.5)

Percentages may not add up to 100% because of rounding.
SATS = South African Triage Scale; AVPU = alert, verbal, painful, unresponsive; TEWS = Triage Early Warning Score; MPH = Mitchells Plain Hospital; ICU = intensive care unit; EC = emergency centre.
*Firearm injury location: MPH *n*=483 and Heideveld Hospital (HEC) *n*=112 for *N*=595 (see limitations).
†Sustained more than one firearm injury.
‡Hospital outcome: MPH *n*=495 and HEC *n*=272 for *N*=767 (see limitations).

have influenced decisions to transfer to a higher level of care. The fact that almost a third of patients who required admission at MPH went directly to theatre from the emergency centre highlights the significant onsite surgical requirements at district level, which may have deleterious effects on theatre access in general.

Most firearm injuries occurred in the same suburb in which the injured person lived. This is in keeping with international research,[32] and 67% (*n*=520) arrived at MPH/HEC using their own transport. If you include those transferred to MPH and HEC from primary healthcare, three out of every four patients self-presented to a primary or district level service, either to be managed at these facilities or transferred to a higher level of care. This is not unusual in low- and middle-income countries, where EMS systems are immature or access to prehospital care is limited,[33,34] and even in well-resourced settings, interfacility transfer of firearm injuries may result in better outcomes.[35] Considering the high proportion of transfers to the tertiary centres after presenting to the district hospital, one could argue that patients transported by EMS should go directly to the tertiary centres.[15] This argument is, however, complicated by unclear transfer guidelines and care pathways, with patients potentially too physiologically unstable to transport further than the nearest hospital. Wound location[36] and shock index may assist in recognising those at highest risk for deterioration.[37,38]

The young male predominance is consistent with data from other facilities in Cape Town.[17,20,21] It is apparent that triage for the majority of those injured occurred timeously, 0:16 (IQR 0:31) after arrival. With a median time from triage to consult at 1:03 (IQR 3:09), and arrival to exit at 8:00 (IQR 8:48), it is likely that this injury profile is prioritised both in terms of triage and other processes.[39] This may result in improved quality of care or rapid access to services for those with firearm injuries, but likely negatively affects other patients requiring emergency care, especially outside of office hours. The prioritisation of firearm injuries may theoretically have deleterious effects on patient safety in general, and may affect access to emergency care because of longer waiting times for the general population.

Almost a third of patients sustained more than one firearm injury, with 54% of the 741 wounds sustained to extremities, 11% to the head

Table 3. A summary of factors impacting survival in patients with firearm injuries (*N*=767)

Characteristic		Survival to hospital discharge				*p*-value
		No, *n*=41 (5.4%), *n* (%)		Yes, *n*=726 (94.6%), *n* (%)		
Sex						
	Male	36 (5.2)		661 (94.8)		0.483
	Female	5 (7.1)		65 (92.9)		
SATS category						
	Green	0 (0.0)		11 (100.0)		<0.005
	Yellow	0 (0.0)		130 (100.0)		
	Orange	10 (1.9)		514 (98.1)*		
	Red	31 (30.4)*		71 (69.6)		
TEWS category						
	Green	0 (0.0)		176 (100.0)		<0.005
	Yellow	0 (0.0)		322 (100.0)		
	Orange	10 (5.8)		163 (94.2)		
	Red	31 (32.3)*		65 (67.7)		
TEWS numerical: median (IQR)		8 (4)		4 (2)		<0.005†
Shock index: median (IQR)		0.92 (0.47)		0.72 (0.18)		<0.005†
RTS: mean (IQR)		7.55 (5.97 - 7.84)		7.84 (7.84 - 7.84)		<0.01†
Firearm injury location						
	Head	Yes	8 (9.8)*	74 (90.2)		0.031
		No	22 (4.2)	502 (95.8)		
	Chest	Yes	11 (8.3)	122 (91.7)		<0.005
		No	9 (2.0)	452 (98.0)*		
	Abdomen	Yes	12 (9.4)	116 (90.6)		<0.005
		No	8 (1.7)	458 (98.3)*		
	Extremities	Yes	9 (2.3)	389 (97.7)*		0.027
		No	10 (5.9)*	159 (94.1)		
	Multiple	Yes	11 (6.1)*	170 (93.9)		0.015
		No	9 (2.2)	404 (97.8)*		
Theatre required at MPH	Yes	9 (8.0)		103 (92.0)		<0.005
	No	9 (2.4)		368 (97.6)*		
Admission to ICU	Yes	9 (30.0)*		21 (70.0)		<0.005
	No	9 (1.9)		455 (98.1)		

Percentages may not add up to 100% because of rounding.
SATS = South African Triage Scale; TEWS = Triage Early Warning Score Colour; IQR = interquartile range; RTS = Revised Trauma Score; MPH = Mitchells Plain Hospital; ICU = intensive care unit.
*Statistically significant higher proportion ($p<0.05$).
Revised trauma score *n*=478 (21 deaths).
†Mann-Whitney U-test.

and neck, 18% to the chest and 17% to the abdomen. Expectedly, those sustaining multiple injuries or those with head, neck, or torso injuries were most likely to die.

The TEWS predicted critical outcomes and mortality more accurately than the SATS, specifically for the orange triage category. SATS was not created or validated to predict outcomes, but rather to sort patients in categories of priority. The SATS discriminator accounts for this variation. It is unclear as to the discriminators used, being subjective, without evidence base and not documented at triage.

A total of 50 patients (41 who arrived alive and 9 declared dead on arrival) went to the forensic mortuary. These deaths account for a very small portion of the total forensic burden caused specifically by firearms and violent deaths in general.[40]

It is unclear what practical interventions should be undertaken to reduce repeat and escalating patterns of violent injury for survivors of all violent injury, and how this should be integrated into hospital services. The international literature provides advice specific to firearm violence,[41] but local strategies including the tightening of gun laws, combatting gangsterism and drugs and specific alcohol and violence prevention interventions should be developed.[42-44] By reducing the number of those injured, the costs of implementing such strategies may be recovered from the direct and measurable healthcare cost savings without even considering the benefit to society. The total effect and cost on society of violent injury, specifically firearm injury, is unmeasured, and evidence-based primary and secondary preventive strategies must be integrated into government and civil society's response to this preventable epidemic of violent injury.[44]

Limitations

The firearm wound location data for patients at HEC were incomplete, and this accounts for the 595 patients included in the wound location data. There was no determination made as to entrance and exit, as this is determined incorrectly ~50% of the time.[45] There is also possibly an undercount of firearm wounds, as unless the notes specified the number of retained bullets, two entrance wounds may have been documented as a single wound. Where the notes were unclear, an even number of wounds were taken as entrance and exit and so documented as a single wound,

so as not to double-count bullets, with location documented in order of the following: head/neck, chest, abdomen and extremity. There is also significant missing information with regard to the wound location of patients who died, as their folders were with forensic services and unavailable. This may have impacted the accuracy of the wound location data, especially when compared with those who survived. The RTS also excluded HEC patients for the same reason, and also those where a Glasgow Coma Scale or blood pressure was not documented. Although RTS predicts mortality, including an Injury Severity Score and the Trauma Injury Severity Score would have better documented severity and probability of death. The study under-reports the burden on theatre services, as only MPH theatre data were recorded. With 105 MPH patients and 114 HEC patients transferred to the tertiary institution, the theatre burden at tertiary level is likely significant.

Suggestions for future research

Future studies should consider multicentre epidemiological assessment of the burden of firearm injuries on the health system, and should include all levels of care. This information would allow for a more accurate economic assessment of the healthcare costs,[46,47] including years lived with disability, years of life lost,[2,48] and potentially add to a list of all deficits framework, which would measure the full burden of injury and violence across individual, family, and societal domains.[49]

Conclusion

Firearm injuries represent a substantial proportion of the trauma burden at district emergency centres in the Western Cape. Managing patients with firearm injuries is resource intensive, as evident by their high acuity, the need for operative care, the long length of stay, the burden on EMS with interfacility transfers and the high demand for tertiary care. In addition, the quicker process times with regard to their care pathways within the facilities suggest that firearm victims are prioritised over other patients – potentially contributing to longer waits and limiting access to emergency care for other patients, especially during weekends. This study examines a large cohort of firearm injuries and provides some understanding of prevalence and burden. An impact and economic analysis from this cohort would develop a costing analysis for this injury profile.

Declaration. This study was submitted by the first author for an MMed degree from the University of Cape Town.

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