THE IMPACT OF THE COVID-19 PANDEMIC ON ORTHOPAEDIC TRAUMA ADMISSIONS IN A CENTRAL ACADEMIC HOSPITAL IN JOHANNESBURG

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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 Medicine

Johannesburg, 2021

Declaration

I, Matthew Foster declare that this research report in the format of a "submissible" paper is my own, unaided work. It is being submitted for the Degree of Master of Medicine in the branch of Orthopaedic Surgery at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.

.....

(Signature of candidate)

09 day of NOVEMBER 2021 in Johannesburg

Student and co-author(s) declaration

Declaration: Student's contribution to article(s) and agreement of co-author(s)

I, Matthew Foster, student number: **0701624X**, declare that this research report is my own work and that I contributed adequately towards research findings published in the article(s) stated below which are included in my research report.

Signature of Student

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Name of Primary Supervisor

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Signature of Primary Supervisor

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Agreement by co-authors: By signing this declaration, the co-authors listed below agree to the use of the article(s) by the student as part of his research report. In cases where the student is not the 1st author of a published article, the primary supervisor must explain (under comments) why the student is entitled to use the paper for his degree purposes.

Article 1:

Title: The impact of the COVID-19 pandemic on orthopaedic trauma admissions in a central academic hospital in Johannesburg.

Journal name, year, volume and page numbers: .....

.....

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Dedication

In memory of my uncle

Solomon Almeleh

27 May 1943 – 19 February 2021

Presentations and publications arising from the research project

Podium presentation at the South African Orthopaedic Association Congress in Cape Town scheduled for 30 August – 02 September 2021.

Acknowledgements

- I want to extend my gratitude to Dr Jurek Pietrzak, Dr Jason Du Plessis and Dr Maxwell Jingo for all their help in assisting me with this research report. Their advice and guidance have been invaluable.

- I would also like to thank the following the people in assisting me in the completion of this research report: Dr Marike Jansen van Vuuren and Dr Khaled Ebrahim.

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Nomenclature

AAOS	AMERICAN ACADEMY OF ORTHOPAEDIC SURGEONS
CEO	CHIEF EXECUTIVE OFFICER
CI	CONFIDENCE INTERVAL
CMJAH	CHARLOTTE MAXEKE JOHANNESBURG ACADEMIC HOSPITAL
COVID-19	NOVEL CORONAVIRUS (SARS-CoV-2)
FFH	FALL FROM HEIGHT
FFSH	FALL FROM STANDING HEIGHT
GDP	GROSS DOMESTIC PRODUCT
HREC	HUMAN RESEARCH ETHICS COMMITTEE
MBA	MOTOR BIKE ACCIDENT
MOI	MECHANISM OF INJURY
MVA	MOTOR VEHICLE ACCIDENT
NICD	NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES
PCR	POLYMERASE CHAIN REACTION
PVA	PAEDISTRIAN VEHICLE ACCIDENT
PPE	PERSONAL PROTECTIVE EQUIPMENT
RNA	RIBONUCLEIC ACID
RSA	REPUBLIC OF SOUTH AFRICA
SES	SOCIO-ECONOMIC STATUS
UK	UNITED KINGDOM
USA	UNITED STATES OF AMERICA
WHO	WORLD HEALTH ORGANISATION

"Submissible" format of a paper

THE IMPACT OF THE COVID-19 PANDEMIC ON ORTHOPAEDIC TRAUMA ADMISSIONS IN A CENTRAL ACADEMIC HOSPITAL IN JOHANNESBURG

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Abstract

Background: The Novel Coronavirus (SARS-CoV-2), commonly known as COVID-19, has caused a global economic and healthcare crisis. In response, many countries tried to curb the spread of the virus with the introduction of various lockdown alert levels to restrict transmission and prepare health care systems for an increase in COVID-19 admissions. The Republic of South Africa (RSA) implemented an alcohol ban as one of the lockdown restrictions.

Objectives: To describe the effect of the lockdown alert levels and alcohol availability on orthopaedic trauma admissions, compared to the preceding two years.

Patients and methods: A retrospective review of clinical records was conducted. The data collected included orthopaedic trauma admissions for the six-month time-period in a quaternary facility in Johannesburg from 01 March to 31 August in the years: 2018, 2019 and 2020, respectively. Lock down alert levels were categorised according to the Department of Health which included the ban, re-introduction and re-banning of alcohol consumption. Data collected for 2018, 2019 and 2020 included demographics of sex and age, as well as fracture location, open or closed injuries, polytrauma patients and those who suffered gun-shot wounds.

Results: Overall, 785, 718 and 556 patients were admitted in 2018, 2019 and 2020, respectively. There was a significant decrease of 22.56% of orthopaedic trauma admissions during the five-month lockdown time-period in 2020 compared to 2019 (p-value = 0.01) and 29.17% from 2020 compared to 2018 (p-value = 0.011). In 2020, admissions increased by 112% (n = 82) from alert level 4, when alcohol was banned, to alert level 3 (3a), when alcohol was reintroduced. Admissions decreased by 32.9% (n = 51) from alert level 3 (3a) to alert level

3 (3b), when alcohol was re-banned. Patients were 1.27 times more likely to be admitted in alert level 3 (3a) than alert level 3 (3b) (95% CI: 0.99, 1.65). Motor vehicle accidents (MVAs) were the commonest cause of admissions in alert level 3 (3a), accounting for 40.6% (n = 56) whereas in alert level 3 (3b), MVAs decreased to 12.4% (n = 12). COVID-19 tests were positive in 10.18% (n = 34) of the 346 tests performed on orthopaedic trauma admissions.

Conclusion: Our study showed the decrease in orthopaedic trauma admissions due to the COVID-19 lockdown regulations. Furthermore, our study demonstrated the impact of alcohol availability on orthopaedic trauma admissions in a central academic hospital in Johannesburg.

Introduction

The Novel Coronavirus (SARS-CoV-2), commonly known as COVID-19, was declared a pandemic in March 2020 by the World Health Organisation (WHO) and has caused a global health crisis. [1] In December 2019, many cases of a highly infectious, unidentified viral illness presenting as a viral pneumonia were recorded in Wuhan, Hubei, China. The virus was identified as a ribonucleic acid (RNA) virus belonging to the family Coronaviridiae, and subsequently named 2019 Novel-Coronavirus. [2] The virus has spread rapidly worldwide spanning 223 countries up to date with more than 200 million cases diagnosed and more than 4 265 672 deaths. [1] At the time of writing, in RSA, 2 511 013 amount of cases have been diagnosed with 74 311 number of deaths. [1]

On 15 March 2020, in response to escalating number of infections, President Cyril Ramaphosa declared a national state of disaster in RSA. [3] The RSA government made the decision to implement a nationwide lockdown in line with other countries in order to 'flatten the curve' and prepare an under resourced healthcare system for the inevitable outbreak. [4] The lockdown consisted of five alert levels, decreasing in stringency on restrictions of freedom of movement and accessibility to alcohol, with alert level 5 implemented on the 27 March 2020, and at the time of writing, we are still under lockdown (Table 1). A number of unique restrictions were enforced in South Africa that differed to the rest of the world. One such restriction was the prohibition of selling and distributing of alcohol (Appendix A). [3,5,6] The hope was to decrease the amount of trauma admissions and to create surplus beds for patients with COVID-19 if necessary.

Trauma related injuries claimed 4.9 million lives in 2016 in which 29% of them were a result of road traffic accidents. [7] RSA is higher than the global average with a mortality rate of 29.4

per 100 000 population compared to a global rate of 18.8 per 100 000. [7,8] The leading cause of death between the ages of five and forty-five years in low to middle income countries was injury, which is consistent in RSA, as trauma-related orthopaedic injuries currently remain the largest burden on orthopaedic departments across government hospitals. [9] Alcohol is a significant contributing factor for trauma related injuries. The WHO predicts three million deaths worldwide are attributed to alcohol representing 5.3% of all deaths and is a causal factor in over two hundred conditions including injury. [10] In RSA, over 29.9 litres of alcohol are consumed between both sexes per capita annually and the WHO estimates over five years of life are lost due to alcohol as a result. [11] Adolescents are also large contributors of alcohol abuse, accounting for up to 50% of emergency department trauma admissions. [12] The devastating socioeconomic and health care sector impact caused by the burden of alcohol in RSA is well documented, with 62 300 adults dying from alcohol attributed deaths in 2015. [11,13] The tangible financial cost of harmful alcohol use in RSA is estimated at R37.9 billion or 1.6% of the GDP. [14]

Worldwide, the impact of lockdown levels on orthopaedic trauma admissions has been widely documented (Table 2). Waseem *et al.* reviewed over 665 studies noting a decrease in trauma admission rates ranging from 20.3% up to 84.6%. [15] Many studies from Europe, Asia, Australasia and the United States of America have all shown varying degrees of a decrease in orthopaedic trauma admissions (Table 2). [16–23]

Therefore, the aim of this study is to determine the impact of lockdown restrictions and subsequent alcohol prohibition imposed in response to the COVID-19 pandemic on orthopaedic trauma admissions at a central academic hospital in Johannesburg, compared to the preceding two years.

Methods

Our study was a retrospective review of all patients admitted to a central academic hospital in Johannesburg with a trauma orthopaedic injury for the six-month time-period from 01 March to 31 August in the years: 2018, 2019 and 2020, respectively. All research data were collected after approval from both the hospital board and University of the Witwatersrand Human research ethics committee (HREC) (Clearance number: **M200877**).

Our study defined acute orthopaedic trauma injuries as: fractures or dislocations of the upper and lower limbs, traumatic joint injuries, soft tissue injuries to the lower limbs, pelvis injuries and polytrauma patients. These were included in the study population. The legal age for alcohol consumption in South Africa is 18 years; therefore, only patients above 18 years were included in this study. All patients with chronic orthopaedic injuries, musculoskeletal infection, hand fractures distal to the carpus, upper limb tendon injuries, spine fractures as well as paediatric patients, were excluded as they were attended to by different specialist units.

Admission data were collected from a variety of sources including: trauma admission data sheets collected by the orthopaedic department daily, orthopaedic trauma admission books, clinical audits compiled by the orthopaedic departments six-monthly as well as morbidity and mortality meeting statistics. Patients names were utilised in data collection to minimise duplication of data. Confidentiality was maintained as all data were collected by the principal investigator (Dr M Foster), and the results were collated using Microsoft Excel (Microsoft, Seattle, Washington).

Patients' data were categorised into a variety of groups: demographics, fracture location and morphology, polytrauma, open or closed injuries and mechanism of injury. Demographic data included the patients' sex and age groups, which were divided into those patients younger than

30 years, 31 – 50 years, 51 – 70 years and older than 70 years old. Fracture location was divided into upper limb, lower limb, pelvis and acetabulum, and polytrauma patients. Upper limb injuries are defined from the clavicle down to carpal bones; lower limb injuries are defined as femoral head to phalanges of the foot; pelvis is defined as injuries to the ischium, ileum and pubis. Hand injuries distal to the carpus and tendon injuries to the upper limb were excluded as they are managed by plastic surgery in our facility. Upper limb injuries were further categorised into the location of injury, which included: clavicle, proximal humerus, midshaft humerus, distal humerus, proximal forearm, radius and ulna midshaft, distal radius and ulna, carpal injuries and other upper limb injuries not specified. Lower limb injuries included were per trochanteric, femoral shaft, distal femur, patella, proximal tibia, tibia shaft, pilon and ankle, foot and other lower limb injuries not specified. Pelvis injuries included injuries to the pelvic ring and acetabular fractures. Polytrauma was categorised into more than two long bone fractures, a long bone with a pelvis injury and a long bone with other injury. Open or closed injuries were defined as whether the associated fracture had an associated breach of skin resulting in an open fracture or an open traumatic joint injury. Gun-shot wounds were recorded in 2018, 2019, 2020, but other mechanisms of injury (MOI) were only recorded for 2020. These included a fall from standing height (FFSH), fall from height (recorded as a fall greater than one step)(FFH), motor vehicle/motor bike accident (MVA/MBA), paedestrian vehicle accidents (PVA) and not otherwise not specified. COVID-19 results were recorded in 2020 and this is defined if the patient tested positive for COVID-19 on a Polymerase Chain Reaction (PCR) nasal swab.

The time-periods were categorised according to the months and lockdown alert levels in 2020, corresponding to the same time-periods in 2018 and 2019. Lockdown levels included alert level 5 which commenced on 27 March 2020 and lasted until 30 April 2020. Restrictions included,

but not limited to: a complete ban of alcohol sales, a curfew, work from home except for essential workers with forced closure of all take away outlets and restaurants (Table 1). Alert level 4 commenced on 01 May 2020 until 31 May 2020 with a slight ease of restrictions, including allowing for take away outlets to operate but maintaining the alcohol prohibition (Table 1). Alert level 3 (3a) began on 01 June 2020 until 12 July whereby alcohol sales were permitted, however, subject to specific restrictions (Table 1). Revised alert level 3 (3b) was from 13 July until 17 August 2020 which did not allow alcohol sales or distribution. Alert level 2 commenced on 18 August until 31 August 2020 with near normal freedom of movement with a limited curfew and alcohol sales permitted subject to specific conditions (Table 1).

Data Analysis

Categorical variables were described using counts and percentages. Two categorical variables were compared using Chi-square test or Fisher's Exact test when appropriate. Logistic regression was used to determine associations between binary outcomes (e.g. hospitalisations in 2019 *versus* 2020 and hospitalisations in alert level 3 (3a) *versus* 3 (3b) and age, gender, MOI and site. Incidence rates were calculated as the number of events divided by the number of days in the given period. Incidence rates were compared using an Exact Poisson test.

Results

Overall, 785 patients were admitted in 2018, 718 admitted in 2019 and 556 in 2020, during the five month time-period from 01 March until 31 August (Table 3). There was a significant decrease of admissions by 22.56% between 2019 and 2020 (p-value = 0.01) and 29.17% between 2018 and 2020 (p-value = 0.011)(Fig. 1).

Patients between the ages of 30 and 50 years accounted for 49 – 53% of admissions over all three years. In 2018, 236 patients were below 30 years compared to 189 in 2019 and 153 in

2020, whereas, patients above 70 years accounted for 50 patients in both 2018 and 2019, and 40 patients in 2020 (Fig. 2). Males accounted for 66.4%, 65.3% and 65.8% of total admissions in 2018, 2019 and 2020, respectively.

In 2018, ankle and pilon fractures accounted for 20.8% (*n* = 163) of fractures, whereas in 2020, they only accounted for 17.1% (*n* = 94) of fractures, indicating a 42.33% decline in incidence (*p*-value = 0.077). Distal radius and ulna fractures were the second most common fracture pattern seen in 2020 accounting for 10.9% (*n* = 60) of fractures whereas in 2018 and 2019, tibial shaft fractures were the second commonest fracture pattern seen accounting for 15.2% (*n* = 119) and 13.9% (*n* = 99), respectively. Distal radius and ulna fractures decreased by 33% from 2018 to 2020 (*p*-value = 0.004) and tibia shaft fractures decreased by 57% from 2018 to 2020 (*p*-value < 001). Femoral shaft fractures accounted for 7% (*n* = 55) of fractures in 2018 and 2019 (*n* = 50), but in 2020 it decreased disproportionately to 4.5% of fractures (*n* = 25) (*p*-value = 0.289). Foot fractures increased significantly from 3.7% (*n* = 26) to 7.4% (*n* = 41) in 2019 to 2020 (*p*-value = 0.001). There was a statistically significant increase in proximal humerus fractures by 50% in 2020 *(n* = 12) compared to 2019 (*n* = 6) (*p*-value = 0.029) and a significant decrease of midshaft humerus fractures by 55% (*n* = 22) from 2018 (*n* = 40*)* to 2020 (*n* = 18)(*p*-value < 001). Open fractures accounted for 15.9% and closed fractures accounted for 84.1% of the admissions in 2018, whereas in 2020, the proportion of open fractures increased to 18.3% (*p*-value = 0.157) and closed fractures decreased to 81.7%, respectively (*p*-value = 0.010). Polytrauma patients decreased by 10% (*n* = 9) in 2020 (*n* = 81) compared to 2019 (*n* = 90) (*p*-value = 0.06) (Fig. 3).

A total of 465 patients were admitted in 2020 for the duration of alert level 5 lockdown, in comparison to 621 in 2019 and 672 in 2018 for the corresponding period. There was a decrease in total admissions over the entire lockdown period by 25.1% in 2019 (*p*-value = 0.02) and

30.8% in 2018 (*p*-value = 0.01) compared to 2020. In alert level 5 lockdown, 81 patients were admitted in comparison to 116 in 2019 and 145 in 2018 over the same time-period. In alert level 4 lockdown, admissions decreased by 42% from 126 in 2019 to 73 patients in 2020 (*p*-value = 0.0002).

There were 73 admissions in alert level 4, 155 admissions in alert level 3 (3a) and 104 admissions in alert level 3 (3b). Admissions increased by 112% (*n* = 82) in alert level 3 (3a) from level 4, followed by a decrease of admissions by 32.9% (*n* = 51) in alert level 3 (3b) from level 3 (3a) (*p*-value = 0.05). The incidence rate (IR) of admissions during alert level 3 (3a) *versus* 3 (3b) is 1.27 (95% CI: 0.99, 1.65). During alert level 3 (3a), patients < 30 years accounted for 33.5% of admissions compared to 20.2% in level 3 (3b). Patients admitted in the 30 – 50 year age group were 2.16 times more likely than patients < 30 years to be admitted in alert level 3 (3b) compared to alert level 3 (3a) (*p*-value = 0.02) (Table 3).

From initiation of mandatory testing of all orthopaedic admissions from 19 May 2020, 346 COVID-19 tests were performed on orthopaedic trauma admissions, of which 10.18% were positive (*n* = 34)(*p*-value = 0.001). Patients < 30 years of age accounted for 29.4% (*n* = 10) of positive cases whereas patients between 31 – 50 years accounted for 52.9% (*n* = 18) (Fig. 4). Of the 34 positive patients, 70.6% (*n* = 24) of patients were male (*p*-value = 0.001). COVID-19 positive patients sustained 61.8% (*n* = 21) of lower limb fractures compared to 14.7% (*n* = 5) of upper limb fractures. No patients that were COVID-19 positive sustained gunshot wounds and 2.9% (*n* = 1) of COVID-19 positive patients sustained an open fracture (*p*-value < 0.001).

During alert level 5, FFSH were the commonest MOI accounting for 42.4% (*n* = 28) of admissions. MVAs were the commonest cause of admissions in alert level 3 (3a), accounting for 40.6% (*n* = 56) whereas in alert level 3 (3b), MVAs decreased to 12.4% (*n* = 12) (*p*-value

= 0.001). In alert level 3 (3b), FFSH was again the MOI which attributed to the most admissions at 39.2% (n = 38). The odds of admission during alert level 3 (3b) were 81% lower in MVAs compared to gunshot wounds (p-value = 0.006). Gunshot wounds remained constant through all alert levels of lockdown ranging from 10.6% (n = 7) of admissions in alert level 5, up to 16.3% (n = 8) in alert level 2 (Fig. 5).

Table 1: Summary of lockdown alert levels.

	Level 5	Level 4	Level 3(3a)	Level 3(3b)	Level 2
Alcohol availability	Banned.	Banned.	Sales permitted with conditions.	Banned.	Sales permitted with conditions.
Movement	Compulsory mask wearing. No inter-provincial travel. Only allowed to leave home to get essential goods or for healthcare.	Compulsory mask wearing. No inter-provincial travel except for returning home or exceptional conditions (Eg: funerals). Walking/ jogging allowed from 06:00-09:00 am.	Compulsory mask wearing. No inter-provincial travel except for special circumstances: work travel, moving homes, funerals, obtaining medical therapy	Compulsory mask wearing. No inter-provincial travel except for special circumstances: work travel, moving homes, funerals, obtaining medical therapy.	Compulsory mask wearing. Inter-provincial travel allowed.
Sectors permitted	Only essential services are permitted.	All essential services, limited number of sectors with high economic value.	All economic activity is permitted except where rate of transmission is high.	All economic activity is permitted except where rate of transmission is high.	All economic activity is permitted except where rate of transmission is high.
Retail	Only essential goods are permitted including food, medical supplies and hygiene products.	As per level 5, education supplies and stationary. Restaurants and take aways only for delivery.	All retail permitted with strict health precautions & limitations of people.	All retail permitted with strict health precautions & limitations of people.	All retail permitted with strict health precautions & limitations of people.
Gatherings	All public gatherings prohibited.	All public gatherings prohibited	All public gatherings prohibited.	6 people indoor and 15 people outdoor.	Limited to 50 people.
Curfew	No persons allowed to leave home.	8pm – 5am except essential workers.	10pm – 4am.	9pm – 4am.	10pm – 4am.
Public transport	Taxis and buses to transport essential workers, limited hours & capacity restrictions.	Passenger rail, taxis and buses may operate subject to restrictions.	Passenger rail, taxis and buses may operate subject to restrictions.	All allowed at 50% capacity.	No restrictions.

Table 2: Global decrease of orthopaedic trauma admissions.

Author	Country of research report	Decrease in orthopaedic trauma admissions during lockdown policies
Hampton *et al.*	UK	53.7%
Wong *et al.*	Hong Kong	41.2%
Carteci *et al.*	Turkey	81.8%
Mac Donald *et al.*	Scotland	26.6%
Luceri *et al.*	Italy	73.8%
Di Fazio*et al.*	USA	44.9%
Christey *et al.*	New Zealand	43%
Jacob *et al.*	Australia	23 – 34%

Table 3: Total number of orthopaedic admissions in 2018, 2019 and 2020.

		Overall	2018	2019	2020	P-value 2020 vs 2018	P-value 2020 vs 2019
Admissions		2059	785	718	556	0.011	0.010
Age	**<30**	578 (28.1%)	236 (30.1%)	189 (26.3%)	153 (27.5%)	0.001	0.087
	30-50	1041 (50.6%)	385 (49%)	359 (50%)	297 (53.4%)	0.089	0.007
	51-70	300 (14.6%)	114 (14.5%)	120 (16.7%)	66 (11.9%)	0.002	0.231
	>70	140 (6.8%)	50 (6.4%)	50 (7%)	40 (7.2%)	0.089	0.392
Gender	**Female**	703 (34.1%)	264 (33.6%)	249 (34.7%)	190 (34.2%)	0.023	0.173
	Male	1356 (65.9%)	521 (66.4%)	469 (65.3%)	366 (65.8%)	0.010	0.029
Fracture location	**Clavicle**	47 (2.3%)	19 (2.4%)	16 (2.3%)	12 (2.2%)	0.019	0.848
	Proximal humerus	30 (1.5%)	12 (1.5%)	6 (0.8%)	12 (2.2%)	>0.999	0.029
	Midshaft humerus	91 (4.4%)	40 (5.1%)	33 (4.6%)	18 (3.3%)	<0.001	0.568
	Distal humerus	12 (0.6%)	6 (0.8%)	4 (0.6%)	2 (0.4%)	<0.001	>0.999
	Proximal forearm	42 (2.1%)	15 (1.9%)	15 (2.1%)	12 (2.2%)	0.089	0.696
	Radius/ ulna shaft	50 (2.4%)	21 (2.7%)	18 (2.5%)	11 (2%)	<0.001	0.852
	Distal radius/ ulna	213 (10.4%)	89 (11.4%)	64 (9%)	60 (10.9%)	0.004	0.067
	Carpus	7 (0.3%)	3 (0.4%)	1 (0.1%)	3 (0.5%)	>0.999	0.309
	Other upper limb	42 (2.1%)	23 (2.9%)	12 (1.7%)	7 (1.3%)	<0.001	0.820
	Per trochanteric	146 (7.1%)	49 (6.2%)	52 (7.3%)	45 (8.2%)	0.571	0.214
	Femur shaft	130 (6.4%)	55 (7%)	50 (7%)	25 (4.5%)	<0.001	0.289
	Distal femur	19 (0.9%)	6 (0.8%)	4 (0.6%)	9 (1.6%)	0.004	0.045
	Patella	44 (2.2%)	14 (1.8%)	20 (2.8%)	10 (1.8%)	0.023	0.577
	Proximal Tibia	67 (3.3%)	19 (2.4%)	21 (3%)	27 (4.9%)	0.010	0.027
	Tibia shaft	269 (13.1%)	119 (15.2%)	99 (13.9%)	51 (9.3%)	<0.001	0.134
	Pilon & ankle	412 (20.1%)	163 (20.8%)	155 (21.8%)	94 (17.1%)	0.077	0.477
	Foot	121 (5.9%)	54 (6.9%)	26 (3.7%)	41 (7.4%)	0.023	0.001
	Other lower limb	58 (2.8%)	21 (2.7%)	24 (3.4%)	13 (2.4%)	0.019	0.617
	Pelvis/ Acetabulum	48 (2.3%)	18 (2.3%)	9 (1.3%)	21 (3.8%)	0.257	0.001
Polytrauma	**2 long bones**	132 (6.5%)	29 (3.7%)	58 (8.2%)	45 (8.2%)	<0.001	0.482
	Long bone + pelvis	42 (2.1%)	8 (1%)	20 (2.8%)	14 (2.5%)	0.001	>0.999
	Long bone + other	24 (1.2%)	1 (0.1%)	4 (0.6%)	19 (3.4%)	<0.001	<0.001
Open injury	**Open**	346 (16.8%)	125 (15.9%)	119 (16.6%)	102 (18.3%)	0.157	0.074
	Closed	1713 (83.2%)	660 (84.1%)	599 (83.4%)	454 (81.7%)	0.010	0.044
Injury site	**Lower limb**	1270 (61.7%)	500 (63.7%)	454 (63.2%)	316 (56.8%)	0.001	0.581
	Upper limb	528 (25.6%)	228 (29%)	165 (23%)	135 (24.3%)	0.002	0.087
	Pelvis/ acetabulum	51 (2.5%)	18 (2.3%)	9 (1.3%)	24 (4.3%)	0.047	<0.001
	Polytrauma	210 (10.2%)	39 (5%)	90 (12.5%)	81 (14.6%)	<0.001	0.061

Table 4. Comparison between demographics, mechanism of injury, open injury and fracture site during lock down levels 2020.

		Overall	Level 5	Level 4	Level 3 (3a)	Level 3 (3b)	Level 2
Admissions		465	81	73	155	104	52
Age	<30	132 (28.4%)	24 (29.6%)	12 (16.4%)	52 (33.5%)	21 (20.2%)	23 (44.2%)
	30-50	243 (52.3%)	40 (49.4%)	46 (63%)	75 (48.4%)	58 (55.8%)	24 (46.2%)
	51-70	56 (12%)	9 (11.1%)	12 (16.4%)	16 (10.3%)	15 (14.4%)	4 (7.7%)
	>70	34 (7.3%)	8 (9.9%)	3 (4.1%)	12 (7.7%)	10 (9.6%)	1 (1.9%)
Gender	Female	157 (33.8%)	34 (42%)	26 (35.6%)	52 (33.5%)	32 (30.8%)	13 (25%)
	Male	308 (66.2%)	47 (58%)	47 (64.4%)	103 (66.5%)	72 (69.2%)	39 (75%)
Mechanism of injury	GSW	44 (10.6%)	7 (10.6%)	9 (13.6%)	11 (8%)	9 (9.3%)	8 (16.3%)
	MVA	116 (27.9%)	11 (16.7%)	24 (36.4%)	56 (40.6%)	12 (12.4%)	13 (26.5%)
	PVA	78 (18.8%)	12 (18.2%)	7 (10.6%)	22 (15.9%)	28 (28.9%)	9 (18.4%)
	FFH	44 (10.6%)	8 (12.1%)	5 (7.6%)	14 (10.1%)	10 (10.3%)	7 (14.3%)
	FFSH	134 (32.2%)	28 (42.4%)	21 (31.8%)	35 (25.4%)	38 (39.2%)	12 (24.5%)
Open injury	Open	83 (17.8%)	9 (11.1%)	15 (20.5%)	29 (18.7%)	15 (14.4%)	15 (28.8%)
	Closed	382 (82.2%)	72 (88.9%)	58 (79.5%)	126 (81.3%)	89 (85.6%)	37 (71.2%)
Injury site	Lower limb	272 (58.5%)	49 (60.5%)	48 (65.8%)	90 (58.1%)	53 (51%)	32 (61.5%)
	Upper limb	111 (23.9%)	25 (30.9%)	17 (23.3%)	32 (20.6%)	28 (26.9%)	9 (17.3%)
	Pelvis/ acetabulum	20 (4.3%)	1 (1.2%)	3 (4.1%)	8 (5.2%)	7 (6.7%)	1 (1.9%)
	Polytrauma	62 (13.3%)	6 (7.4%)	5 (6.8%)	25 (16.1%)	16 (15.4%)	10 (19.2%)

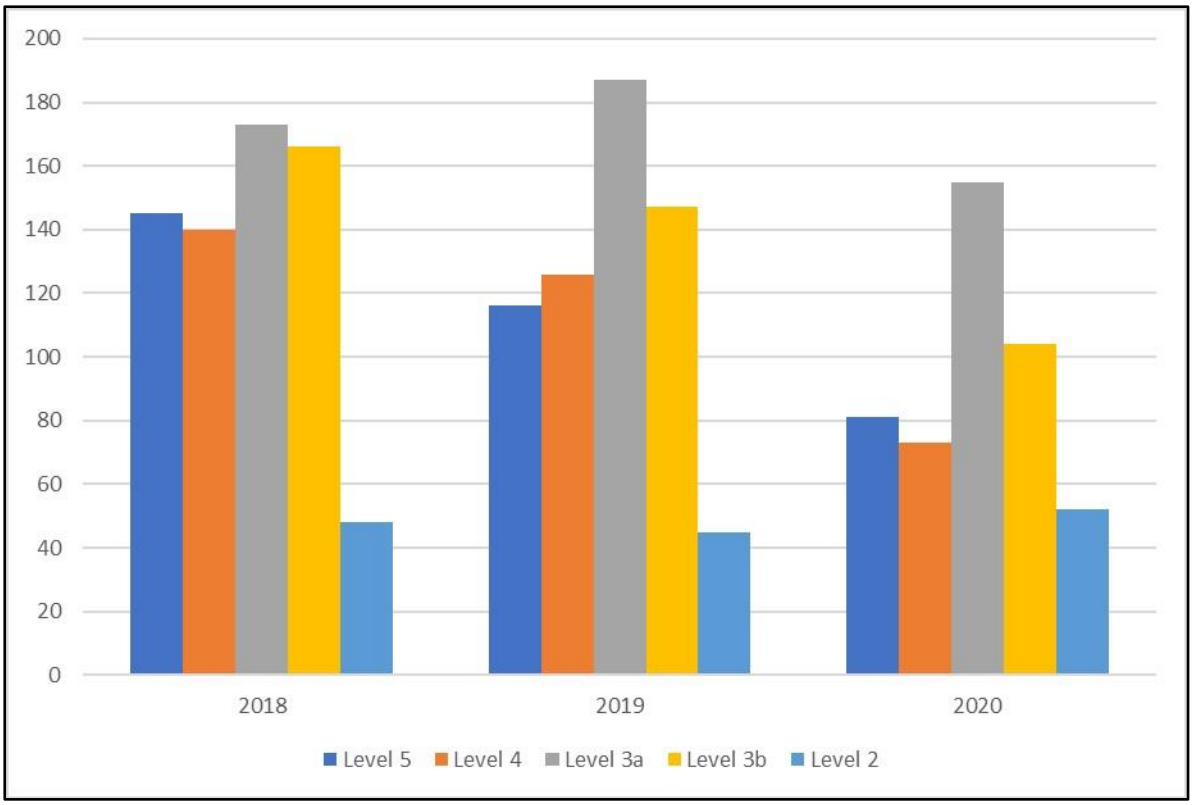

Fig. 1: Orthopaedic trauma admissions during lockdown alert levels in 2020 and corresponding time periods in 2018 and 2019.

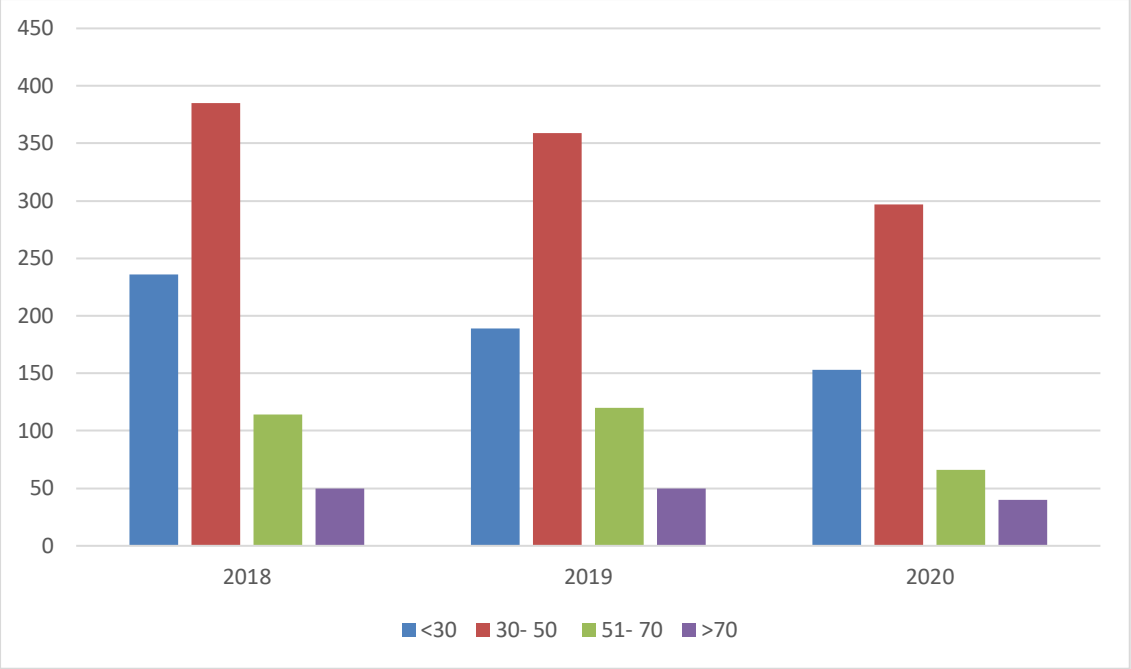

Fig. 2: Age distribution of patients admitted in 2018, 2019 and 2020.

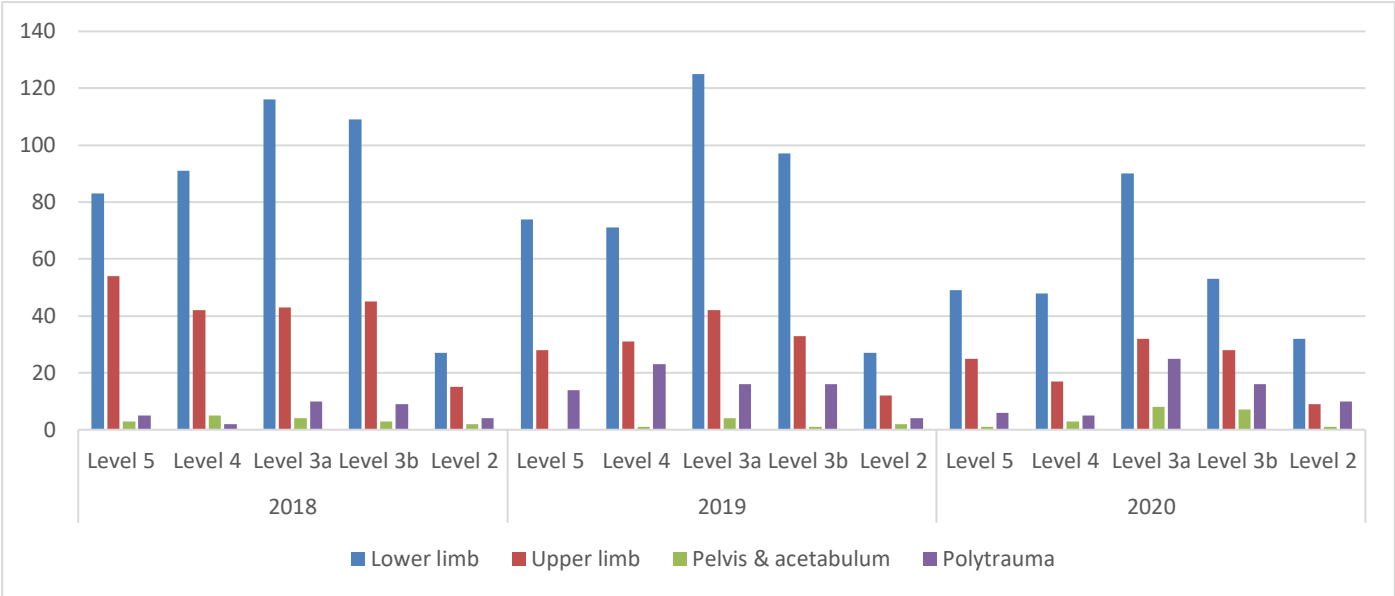

Fig. 3: Site of injuries according to lockdown alert levels in 2018, 2019 and 2020.

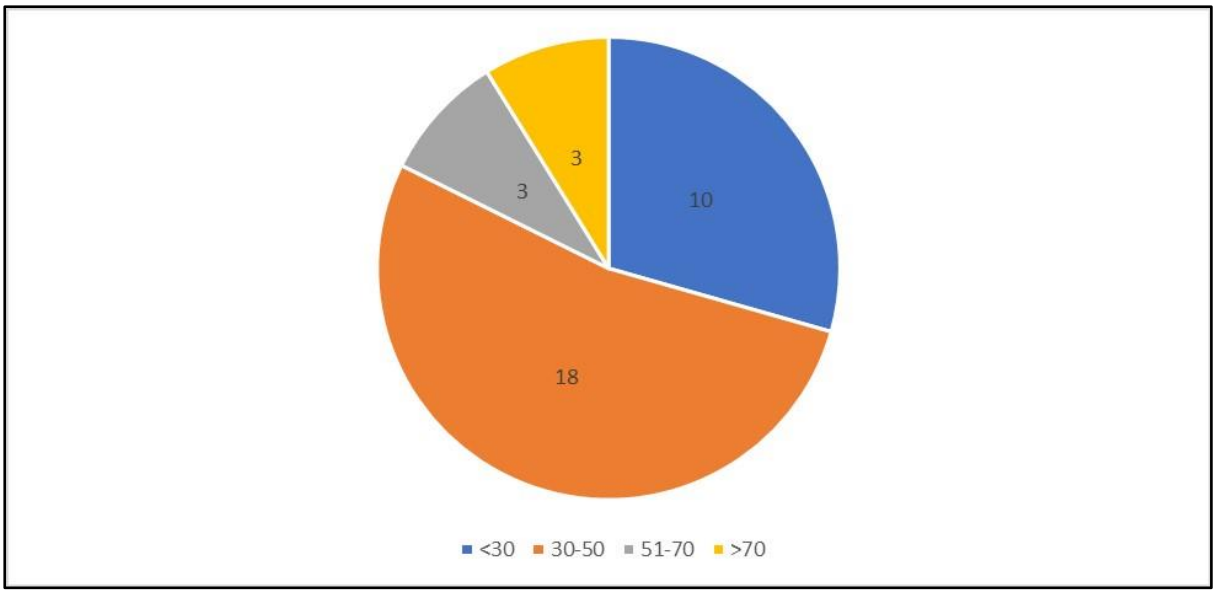

Fig. 4: Age distribution of COVID positive patients.

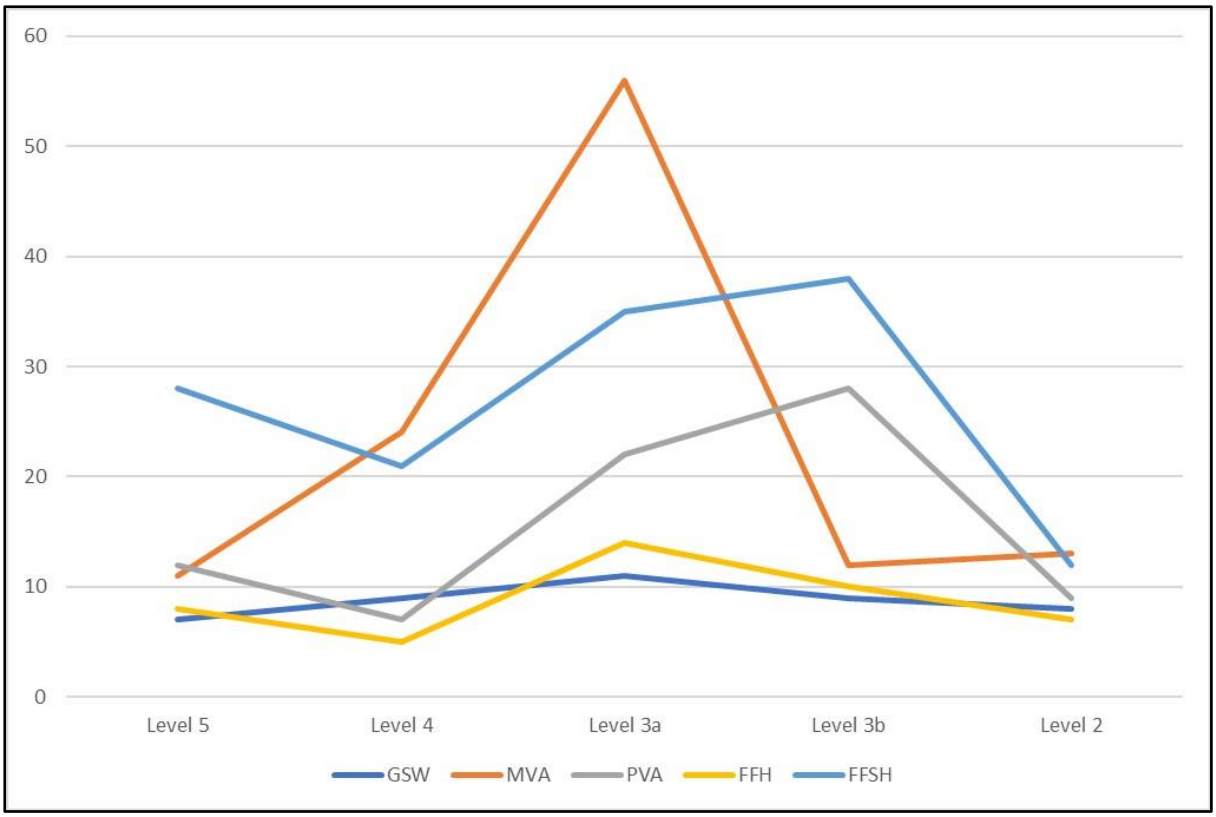

Fig. 5: Mechanism of injury during lockdown alert levels in 2020.

Discussion

Our study showed that there was a decrease of 30.8% and 25.1% in orthopaedic trauma admissions from the initiation of lockdown compared to 2018 and 2019, respectively. Global reports have shown similar trends, however, many of these were conducted over a short time-period whereas this study has a longer time period to compare data. Hampton *et al*. showed a decrease of 53.7% of orthopaedic trauma admissions in a United Kingdom (UK) hospital from a two-week pre-lockdown time-period to a two-week lockdown time-period, and compared these rates to 2019. [16] Christey *et al*. noted a decrease of 43% of admissions in a New Zealand facility and Di Fazio *et al* showed a 44.9% decrease in a USA facility, for a two week time-period pre and post lockdown, but without the 2019 comparison [16,17,22]. The most likely reason for the larger decline seen in these countries in comparison to ours is the degree of lockdown restrictions. If we compare the combination of alert levels 4 and 5, referred to as the hard lockdown, to 2019, the decrease in admissions was 36.36% which was more consistent with international data.

RSA has a higher burden of trauma relating to interpersonal violence in comparison to developed nations, where the majority of injuries in developed nations are caused by MVAs or falls, and much less violence. [24] A reasonable assumption can be made for the decrease in trauma admissions during the lockdown time-period. This was due to policies enforced by government such as: the closure of schools, non-essential service employees working from home, increased police presence, closure of restaurants and take-away outlets and a ban on alcohol and cigarettes. This would result in less MVA/PVAs, interpersonal violence, crime and sporting injuries. All of the above would be further decreased without the exaggerated harmful effects of intoxication, as alcohol has been proven in RSA to have a severe negative impact on society. [13] In RSA, Moustakis *et al*. looked at all surgical admissions in the North West in alert

level 5, noting a 53% reduction in trauma related conditions. [25] Navsaria *et al*. noted similar results with a decrease of 53% decrease of all surgical trauma admissions during the hard lockdown in Cape Town. [26] Waters *et al*. specifically looked at the reduction of orthopaedic services from 01 January – 30 April at Groote Schuur hospital to compare pre-lockdown and lockdown admission rates, noting a decrease of orthopaedic admissions by 40% in April. Our data was consistent with our colleagues in Cape Town, comparing a tertiary hospital in Cape Town to one in Johannesburg, however, our study further looked at the availability and prohibition of alcohol, and the effects thereof. [27] Worldwide, lockdown measures were implemented to decrease hospital capacity in the event that there was a surge in COVID-19 cases requiring hospitalisation, and in RSA, it successfully achieved that.

Our study showed a significant increase of admissions by 112% from when alcohol was banned in alert level 4, to when it was available in alert level 3 (3a). A globally unique component of the RSA lockdown was the prohibition of alcohol. No other studies are available comparing the direct effect of orthopaedic trauma admissions when alcohol was allowed and when it was prohibited. The change in admissions between alert levels 4, 3 (3a) and 3 (3b), clearly shows the effect alcohol has on orthopaedic trauma. Reuter *et al*. stated that 62 300 South Africans die of alcohol attributable causes annually and noted a sharp reduction in unnatural related deaths from pre-lockdown of 800 – 1000 per week to a rate of 400 per week during lockdown. [28] Furthermore, there was a 45% decrease in orthopaedic admissions from two weeks pre-lock down to the first two weeks of lockdown from the hospital in George where Reuter *et al*. conducted their research. [13,28] The decrease in admissions due to MVA's from 40.6% in alert level 3 (3a) to 12.6% in alert level 3 (3b) identified the significant impact alcohol availability had on MVAs. The association between alcohol and MVA's are consistent with global trends as Papalimiperi *et al*. identified 40.7% of all MVAs over a seven-year time-period were alcohol

related, in a study conducted out of Athens University. [29] Shneider *et al*. looked at the burden of disease attributed to alcohol in RSA, noting that interpersonal violence and road traffic accidents contributed significantly to disability adjusted life years clearly illustrating the harmful effects of alcohol on RSA society. [13,30]

When comparing 2018, 2019 and 2020, males have consistently accounted for almost two thirds of admissions. Our study showed no difference in this trend during lockdown which is in keeping with global literature, as we know, males are more prone to trauma related injuries due to increased risk taking behaviour and higher levels of interpersonal violence. [10,31] The most common age group accounting for the highest number of admissions over the three-year time-period was between 31 and 50 years old. Those aged over 70 accounted for similar trends in admission over the years, perhaps as in this age group, the reason for admission is low energy falls at home, unrelated to lock down restrictions. When alcohol became available, the 31 – 50 year old age group accounted for 48.4% of admissions but increased to 55.8% when alcohol was prohibited. When alcohol was allowed in alert level 3 (3a), the age group younger than 30 years accounted for 33.5% of admissions compared to 16.4% percent from alert level 4, when alcohol was banned. This illustrated the impact alcohol has on those younger than 30 years old, which was consistent with Caamano-Isorna *et al* results', which showed the increase in alcohol associated injuries in college students in Spain. [32]

The incidence of COVID-19 was 10.18% of all orthopaedic trauma admissions during the period of mandatory testing. COVID-19 testing of all patients was not present during the early lockdown alert levels so this incidence was during our peak time-period. Pillai *et al* concluded that the amount of COVID-19 positive patients increased with the easing of lockdown regulations to level 3 in the Gauteng province, which is consistent with our data. [33] In the

COVID-19 positive population, demographics, fracture pattern and mechanism of injury were similar to that of COVID-19 negative patients.

Globally, the socioeconomic impact of orthopaedic trauma and alcohol is immense. In the USA, an estimated $53.1 billion is spent annually to treat musculoskeletal injuries, with over a million hospital discharges recorded for fractures. [34] Probst *et al*. identified the socioeconomic effect of alcohol on the South African population, noting that 60% of deaths due to alcohol occur in patients within the low socio-economic status group. [13] Martin *et al*. calculated that the cost of treating an orthopaedic trauma patient secondary to a GSW in RSA cost $2940 (R24 945 at the time), three hours of theatre time with an average stay of 9.75 days. [35] The combination of financing healthcare costs, acute and chronic disability of patients, hospital stay and rehabilitation, as well as the time off work, places severe strain on our economy. Alcohol is a major contributing factor, as demonstrated by this report, and the effects of which, can be minimised. The WHO has led an initiative in order to decrease alcohol associated harm. The initiative is called the 'SAFER' package, an acronym used to explain its goals. SAFER refers: Strengthen restrictions on alcohol; Advance and enforce drinking and driving counter measure; Facilitate access to screening, brief interventions and treatment; Enforce bans or comprehensive restrictions on alcohol advertising, sponsorship and promotion; Raise the price of alcohol through taxes and pricing policies. [36]

COVID-19 and the effects of the lockdown policies have demonstrated significant associations between alcohol and orthopaedic trauma admissions. The data collected during this time-period can be utilised to guide government policies in limiting the harmful effects of alcohol on our society. Within the realm of orthopaedics, one can clearly see the major devastating effect alcohol has on orthopaedic trauma.

Study limitations

Data collection at our health institution was not uniform and multiple sources were recorded to obtain data to get a global perspective. No mechanisms of injury were recorded in the previous years' other than gunshot wounds, therefore, we were unable to assess the impact of COVID-19 lockdown restrictions, on the mechanisms of injury. Additional limitations included government lockdown bias. With the re-introduction of the alcohol ban on 12 July 2020, there was also an associated curfew which was introduced from 21:00 pm – 04:00 am. This may contribute to diminished orthopaedic trauma admissions in conjunction with no alcohol availability. Moultrie *et al* review concluded that the complete prohibition of alcohol had a significant reduction in unnatural deaths regardless of the length of the curfew. [37] Mandatory COVID-19 PCR testing of all patients admitted to CMJAH was not present over the entire lockdown time-period so we may have missed early asymptomatic patients that may have been infected with COVID-19. Lastly, another potential limitation was the anticipated re-introduction of alcohol restrictions may have allowed people to stockpile alcohol, making it available to them during the time of repeat restrictions. Had all patients had ethanol levels tested during the hard lockdown, as well as when alcohol was available again, we would have been able to more accurately prove how many patients were intoxicated at the time of injury.

Recommendations

The following recommendations incorporate the SAFER initiative from the WHO, as well amendment of current interventions identified by the WHO review of South African alcohol patterns. [10,11,36]

- Increase the legal drinking age to 21 years.
- Increase the tax on alcohol significantly, in order to increase the price per unit to make accessibility for difficult.
- Decrease opening times for alcohol distributors from Monday – Thursday.
- Enforce maximum blood alcohol level to zero for drivers.
- Ban advertising of alcohol containing products and decrease sponsorship by alcoholic products or companies.
- Increase harmful labels on alcoholic beverages.
- Improved identification of intoxicated drivers with harsher sentencing.

The goal of these recommendations would significantly decrease the burden that orthopaedic trauma places on our healthcare system and most certainly would decrease the trauma burden across all specialities.

Conclusion

COVID-19 and the lockdown policies enforced by governments worldwide has had a significant effect on decreasing orthopaedic trauma admissions, with RSA consistent with global trends. Alcohol availability clearly has a major impact on orthopaedic trauma admissions which, through correct legislation, can be minimised. Our study will hopefully allow government and policy makers to rethink the current legislature around alcohol availability and consider enforcing further regulations limiting alcohol access and the consequence thereof on our health care system.

Author contributions: Dr Foster: substantial contributions to the conception and design of the work, and the acquisition, analysis and interpretation of data for the work, drafting the work and revising it critically for important intellectual content. Drs Pietrzak and Du Plessis: substantial contributions to the conception and design of the work, and the acquisition, analysis and interpretation of data for the work and revising it critically for important intellectual content. Dr Jingo: substantial contributions to scientific input and revising it critically for important intellectual content.

Funding: None

Conflict of interest: None

Ethics statement

Ethics clearance has been obtained from the Human Research Ethics Committee (HREC)(Medical), University of the Witwatersrand. Permission from the CMJAH Chief Executive Officer (CEO) was granted. All the data collected were anonymous. The principal investigator (Dr M Foster) and biostatistician (Alane Izu) were the primary evaluators of the data. No patient names, identification numbers or folder numbers were utilised in the data collection tools. This ensured that patient confidentiality and anonymity were maintained.

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Appendices

Appendix A: Government lockdown regulations

Appendix B: Data collection sheet

Appendix C: Ethics clearance certificate

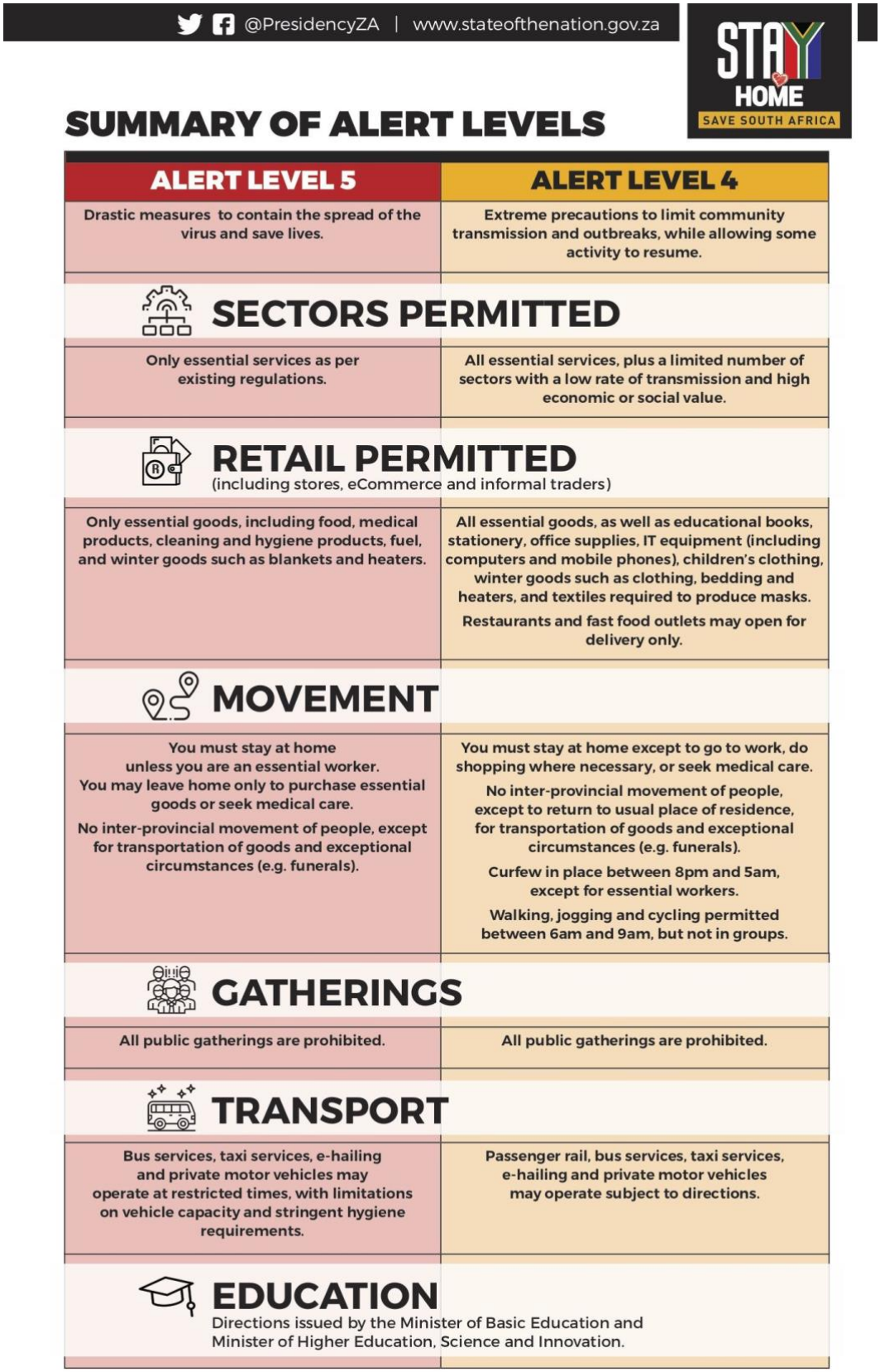
Appendix D: CEO permission letter

Appendix E: Journal guidelines

Appendix F: Student's contribution to the research and writing of the "submissible" paper

Appendix G: Research protocol

Appendix A: Government lockdown regulations



STAY SAFE
SAVE SOUTH AFRICA

SUMMARY OF ALERT LEVELS

ALERT LEVEL 4	ALERT LEVEL 3
Extreme precautions to limit community transmission and outbreaks, while allowing some activity to resume.	Strict precautions to keep transmission low, and additional measures to contain outbreaks in hotspots.
SECTORS PERMITTED	
All essential services, plus a limited number of sectors with a low rate of transmission and high economic or social value.	All economic activity is permitted, with a few exceptions where the risk of transmission is high.
RETAIL PERMITTED (including stores, eCommerce and informal traders)	
All essential goods, as well as educational books, stationery, office supplies, IT equipment (including computers and mobile phones), children's clothing, winter goods such as clothing, bedding and heaters, and textiles required to produce masks. Restaurants and fast food outlets may open for delivery only.	All retail permitted, with strict health protocols in place. Alcohol will be sold under strict conditions and on specified days.
MOVEMENT	
You must remain at home except to go to work, do shopping where necessary, or seek medical care. No inter-provincial movement of people, except to return to usual place of residence, for transportation of goods and exceptional circumstances (e.g. funerals). Curfew in place between 8pm and 5am, except for essential workers. Walking, jogging and cycling permitted between 6am and 9am, but not in groups.	You must remain at home, except to travel to work, purchase goods, seek medical care or attend schools and universities when these reopen. Additional restrictions on movement apply in hotspot areas. There is no curfew on the movement of people. Exercise permitted at any time during the day, but not in groups.
GATHERINGS	
All public gatherings are prohibited.	All public gatherings are prohibited.
TRANSPORT	
Passenger rail, bus services, taxi services, e-hailing and private motor vehicles may operate subject to directions.	All public transport may operate subject to directions, as well as limited domestic air travel for work purposes.
EDUCATION Directions issued by the Minister of Basic Education and Minister of Higher Education, Science and Innovation.	

Appendix B: Data collection sheet

STUDY NUMBER							
DATE							
AGE							
GENDER							
OPEN OR CLOSED FRACTURE							
FRACTURE SITE							
POLYTRAUMA OR SINGLE INJURY							
COVID STATUS							
MECHANISM OF INJURY							

FRACTURE SITE: Upper limb trauma (UL), Lower limb trauma (LL), spinal trauma (S), pelvis trauma (P).

MECHANISM OF INJURY: Pedestrian Vehicle accidents (PVA), motor vehicle accidents (MVA), gun-shot wounds (GSW), assault (ASSAULT), fall from height (FFH), trauma not otherwise specified (OTHER)

Appendix C: Wits HREC clearance certificate

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

R14/49 Dr M Foster

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M200877

NAME: (Principal Investigator)	Dr M Foster
DEPARTMENT:	School of Clinical Medicine Department of Surgery Division of Orthopaedic Surgery Medical School University
PROJECT TITLE:	The impact of the covid-19 pandemic on orthopaedic trauma admissions in a level one hospital in Johannesburg
DATE CONSIDERED:	2020/08/28
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Drs J du Plessis and J Pietrzak
APPROVED BY:	Dr CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	2020/11/06

This clearance certificate is valid for 5 years from the date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary on the 3rd Floor, Phillip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.
I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to submit details to the Committee. **I agree to submit a yearly progress report**. When a funder requires annual re-certification, the application date will be one year after the date when the study was initially reviewed. In this case, the study was initially reviewed in **August** and will therefore reports and re-certification will be due early in the month of **August** each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature

2020/11/11
Date

Appendix D: CEO permission letter

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

CHARLOTTE MAXEKE JOHANNESBURG ACADEMIC HOSPITAL (CMJAH)
OFFICE OF THE SENIOR CLINICAL MANAGER

Enquiries: *Ms. TT Mahlangu*
Email: Thandi.Mahlangu4@gauteng.gov.za
Tel: *011 488 3365*

Ref: *1/7/2*
Date: 26/04/26

GP_202011__075

To: Dr. M Foster

RE: FINAL APPROVAL OF RESEACH STUDY

TITLE: THE IMPACT OF THE COVID-19 ON ORTHOPAEDIC TRAUMA ADMISSIONS IN A CENTRAL ACADEMIC HOSPITAL IN JOHANNESBURG

Permission is granted for you to conduct the above-mentioned study as described in your request provided:

1. Charlotte Maxeke Johannesburg Academic Hospital will not in any way incur or inherit costs as a result of the said study.
2. Your study shall not disrupt services at the study sites.
3. Strict confidentiality shall always be observed.
4. Informed consent shall be solicited from patients participating in your study.

Please liaise with the HOD and Unit Manager or Sister in charge to agree on the dates and time that would suit all parties.

Kindly forward this office with the results of your study on completion of the research.

Supported/Not Supported
Signed by:Jayshina Punwasi
Signed at:2021-05-20 21:13:19 +02:00
Reason:Witnessing Jayshina Punwasi

Dr J. Punwasi
Clinical Director

Approved/Not Approved
Signed by:Gladys Magugudi Bogoshi
Signed at:2021-05-21 03:38:26 +02:00
Reason:Witnessing Gladys Magugudi Bo

Ms. G Bogoshi
Chief Executive Officer

Appendix E: Journal guidelines

Research

Guideline word limit: 4 000 words

Research articles describe the background, methods, results and conclusions of an original research study. The article should contain the following sections: introduction, methods, results, discussion and conclusion, and should include a structured abstract (see below). The introduction should be concise – no more than three paragraphs – on the background to the research question, and must include references to other relevant published studies that clearly lay out the rationale for conducting the study. Some common reasons for conducting a study are: to fill a gap in the literature, a logical extension of previous work, or to answer an important clinical question. If other papers related to the same study have been published previously, please make sure to refer to them specifically. Describe the study methods in as much detail as possible so that others would be able to replicate the study should they need to. Results should describe the study sample as well as the findings from the study itself, but all interpretation of findings must be kept in the discussion section, which should consider primary outcomes first before any secondary or tertiary findings or post-hoc analyses. The conclusion should briefly summarise the main message of the paper and provide recommendations for further study.

Select figures and tables for your paper carefully and sparingly. Use only those figures that provided added value to the paper, over and above what is written in the text.

Do not replicate data in tables and in text .

Structured abstract

- This should be 250-400 words, with the following recommended headings:
  - **Background:** why the study is being done and how it relates to other published work.
  - **Objectives:** what the study intends to find out
  - **Methods:** must include study design, number of participants, description of the intervention, primary and secondary outcomes, any specific analyses that were done on the data.
  - **Results:** first sentence must be brief population and sample description; outline the results according to the methods described. Primary outcomes must be described first, even if they are not the most significant findings of the study.
  - **Conclusion:** must be supported by the data, include recommendations for further study/actions.
- Please ensure that the structured abstract is complete, accurate and clear and has been approved by all authors.
- Do not include any references in the abstracts.

Here is an example of a good abstract.

Main article

All articles are to include the following main sections: Introduction/Background, Methods, Results, Discussion, Conclusions.

The following are additional heading or section options that may appear within these:

- Objectives (within Introduction/Background): a clear statement of the main aim of the study and the major hypothesis tested or research question posed
- Design (within Methods): including factors such as prospective, randomisation, blinding, placebo control, case control, crossover, criterion standards for diagnostic tests, etc.
- Setting (within Methods): level of care, e.g. primary, secondary, number of participating centres.
- Participants (instead of patients or subjects; within Methods): numbers entering and completing the study, sex, age and any other biological, behavioural, social or cultural factors (e.g. smoking status, socioeconomic group, educational attainment, co-existing disease indicators, etc)that may have an impact on the study results. Clearly define how participants were enrolled, and describe selection and exclusion criteria.
- Interventions (within Methods): what, how, when and for how long. Typically for randomised controlled trials, crossover trials, and before and after studies.
- Main outcome measures (within Methods): those as planned in the protocol, and those ultimately measured. Explain differences, if any.

Results

- Start with description of the population and sample. Include key characteristics of comparison groups.
- Main results with (for quantitative studies) 95% confidence intervals and, where appropriate, the exact level of statistical significance and the number need to treat/harm. Whenever possible, state absolute rather than relative risks.
- Do not replicate data in tables and in text.
- If presenting mean and standard deviations, specify this clearly. Our house style is to present this as follows:
- E.g.: The mean (SD) birth weight was 2 500 (1 210) g. Do not use the ± symbol for mean (SD).
- Leave interpretation to the Discussion section. The Results section should just report the findings as per the Methods section.

Discussion

Please ensure that the discussion is concise and follows this overall structure – sub-headings are not needed:

- Statement of principal findings
- Strengths and weaknesses of the study
- Contribution to the body of knowledge
- Strengths and weaknesses in relation to other studies
- The meaning of the study – e.g. what this study means to clinicians and policymakers
- Unanswered questions and recommendations for future research

Conclusions

This may be the only section readers look at, therefore write it carefully. Include primary conclusions and their implications, suggesting areas for further research if appropriate. Do not go beyond the data in the article.

Editorials

Guideline word limit: 1 000 words

These opinion or comment articles are usually commissioned but we are happy to consider and peer review unsolicited editorials. Editorials should be accessible and interesting to readers without specialist knowledge of the subject under discussion and should have an element of topicality (why is a comment on this issue relevant now?) There should be a clear message to the piece, supported by evidence.

Please make clear the type of evidence that supports each key statement, e.g.:

- expert opinion
- personal clinical experience
- observational studies
- trials
- systematic reviews.

CME (by invite only)

CME is intended to provide readers with practical, up-to-date information on medical and related matters. It is aimed at those who are not specialists in the field.

From January 2016, all CME articles will be printed in full in the *SAMJ*. Please try to adhere strictly to the guidelines on word count as we have a page limit for the print issue of the *SAMJ*. We reserve the right to place some tables and reference lists online if this is necessary for space.

In practice, this means that each CME topic usually covers two issues of the print issue of the *SAMJ*.

The guest editor, in consultation with the editor, is responsible for convening a team of authors, deciding on the subjects to be covered and for reviewing the manuscripts submitted. The suggestion is for 4 - 5 articles, although there is some room for flexibility contingent on discussions with the editor.

For queries about these guidelines please feel free to contact the CME editor, Dr Bridget Farham, by email (ugqirha@iafrica.com) or telephone (+27 (0)82 452 2860)

Review process

The guest editor reviews the articles and returns them to the CME editor for review and final approval.

Guest editorials

Guideline word limit: 1 000 words

- Include the guest editor's personal details (qualifications, positions, affiliation, e-mail address, and a short personal profile (50words)).
- If possible, include a photograph of the author(s) at high enough resolution for print. It is preferable to provide two guest editorials, one for each issue, so that the content of the articles in each issue is covered.

Articles

Guideline word limit: 2 000 - 3 000 words

- Each article requires an abstract of ±200 words.
- The editor reserves the right to shorten articles but will send a substantially shortened article back for author approval.

Personal details

Please supply: Your qualifications, position and affiliations and MP number (used for CPD points); Address, telephone number and fax number, and your e-mail address; and a short personal profile (50words)and a few words about your current fields of interest.

In Practice

Guideline word limit: 2 000 - 3 000words

This section includes articles that would previously have been accepted into the Forum section, and case reports.

In practice articles are those that draw attention to specific issues of clinical, economic or political interest regarding medicine and healthcare in southern Africa. They are assigned to a topic:

Case report
Clinical practice
Clinical alert
Issues in medicine
Issues in public health
Healthcare delivery
Medicine and the environment
Medicine and the law
Cochrane corner

An In Practice article should follow the following format – sub-headings are not necessary, but may be used for clarity:

- Author affiliations and qualifications: to be the same as for Research. Provide all authors' names and initials, qualifications and full affiliations, and corresponding author.
- Short abstract: does not need to be structured, but should capture the essential features of the article
- Introduction: the reason for the article and the issue being addressed
- Recent research, discussion, local policy around the issue – include your own research where appropriate
- All statements should be referenced and, if opinion only, this should be stated
- Discussion: how this article adds to the discussion around a particular topic
- If a clinical practice or policy point is at issue, this needs to be emphasised, using a box with highlights if appropriate.

Essentially In practice is an opportunity for a more discursive approach to topics of clinical, economic or political importance in southern African health systems. It is not an opportunity to put forward unsubstantiated opinions!

Case reports

The *SAMJ* has recently started to accept case reports. The cases must come from Africa, preferably southern Africa unless the condition is common to all African countries, and must be either a completely new description of a clinical condition or result (use Google!) or a case that highlights important practice or management issues.

Please use the following format for case reports:

- Title of case: do not include the words 'a case report' in the title
- Summary/abstract: up to 150 words summarising the case presentation and outcome
- Background: why is this case important and why did you write it up?
- Case presentation: presenting features, medical, social, family history as appropriate
- Case management: should be according to best practice, and if not, please explain why
- Investigations, if relevant: save space by simply saying 'normal' if, for example, renal function was completely normal, rather than listing normal results, highlight the abnormal – or indeed the normal if this is clinically significant
- Differential diagnosis, if relevant
- Treatment, if relevant
- Outcome and follow-up
- Discussion – a VERY BRIEF review of similar published cases
- Teaching points: 3 - 5 bullet points
- References: as per the *SAMJ* house style
- Tables and figures: keep to a minimum. Use clinical images where relevant – we need hi-res versions for print, and identifiable persons must have a consent form
- Patient consent: please include a statement about patient consent to a written case report. This should be uploaded as a supplementary file.

Clinical trials

Guideline word limit: 4000 words

As per the recommendations published by the International Committee of Medical Journal Editors (ICMJE), clinical trial research is any research that assigns individuals to an intervention, with or without a concurrent comparison/control group to study the cause-and-effect relationship between the intervention and health outcomes. All clinical trials should be registered with the appropriate national clinical trial registry (or any international primary register, if relevant), and the trial registration number should be cited at the end of the abstract. Since 1st December 2005, all clinical trials conducted in South Africa have been required to be registered in the South African National Clinical Trials Register.
The *SAMJ* therefore requires that clinical trials be registered in the relevant public trials registry at or before the time of first patient enrolment as a condition for publication. The trial registry name and registration number must be included in the manuscript.

Please refer to the general guidelines for all papers at the top of this article for additional requirements with respect to ethics approval, funding, author contributions, etc. The format of original research articles should be followed for reporting of clinical trial results.

Review articles

Guideline word limit: 4 000 words

These are welcome, but should be either commissioned or discussed with the Editor before submission. A review article should provide a clear, up-to-date account of the topic and be aimed at non-specialist hospital doctors and general practitioners.

Please ensure that your article includes:

- Abstract: unstructured, of about 100-150 words, explaining the review and why it is important
- Methods: Outline the sources and selection methods, including search strategy and keywords used for identifying references from online bibliographic databases. Discuss the quality of evidence.
- When writing: clarify the evidence you used for key statements and the strength of the evidence. Do not present statements or opinions without such evidence, or if you have to, say that there is little or no evidence and that this is opinion. Avoid specialist jargon and abbreviations, and provide advice specific to southern Africa.
- Personal details: Please supply your qualifications, position and affiliations and MP number (used for CPD points); address, telephone number and fax number, and your e-mail address; and a short personal profile (50 words) and a few words about your current fields of interest.

Correspondence (Letters to the Editor)

Guideline word limit: 500 words

Letters to the editor should relate either to a paper or article published by the SAMJ or to a topical issue of particular relevance to the journal's readership

- May include only one illustration or table
- Must include a correspondence address.

Book reviews

Guideline word limit: 400 words

Should be about 400 words and must be accompanied by the publication details of the book. Provide a hi-res image of the cover if possible (with permission from the copyright holder).

Obituaries

Guideline word limit: 400 words

Should be offered within the first year of the practitioner's death, and may be accompanied by a photograph.

Guidelines

Guidelines should always be discussed with the Editor prior to submission.

Because of the intensive review process required to ensure Guidelines are independent, evidence-based and free from commercial bias, they are usually published as a supplement to the *SAMJ*, the costs of which must be covered by sponsorship, advertising or payment by the guideline authors/association. We will provide a quote based on the expected length of the guideline and whether it is to appear online only, or in print, which must be accepted by the body putting the guidelines together before submitting the work to the SAMJ.

The Editor reserves the right to determine the scheduling of supplements. Understandably, a delay in publication must be anticipated dependent upon editorial workflow.

All guidelines should include a clear, transparent statement about all sources of funding and an explicit, clear statement of conflicts of interest of any of the participants in the guidelines about industry funding for lectures, research, conference participation etc.

All guidelines should be structured according to Agree II.

Please access this website before putting the guidelines together, download the Agree 11 instrument and use this to put the guidelines together.

All submitted guidelines will be sent to the local Agree II appraisal committee for review and must be endorsed by an appropriate body prior to consideration and all conflicts of interest expressed.

A structured abstract not exceeding 400 words (recommended sub-headings: *Background, Recommendations, Conclusion*) is required. Sections and sub-sections must be numbered consecutively (e.g. 1. Introduction; 1.1 Definitions; 2.etc.) and summarised in a Table of Contents.

Illustrations/photos/scans

- If illustrations submitted have been published elsewhere, the author(s) should provide consent to republication obtained from the copyright holder.
- Figures must be numbered in Arabic numerals and referred to in the text e.g. '(Fig. 1)'.
- Each figure must have a caption/legend: Fig. 1. Description (any abbreviations in full).
- All images must be of high enough resolution/quality for print.
- All illustrations (graphs, diagrams, charts, etc.) must be in PDF or jpeg form.
- Ensure all graph axes are labelled appropriately, with a heading/description and units (as necessary) indicated. Do not include decimal places if not necessary e.g. 0; 1.0; 2.0; 3.0; 4.0 etc.
- Scans/photos showing a specific feature e.g. *Intermediate magnification micrograph of a low malignant potential (LMP) mucinous ovarian tumour. (H&E stain).* –include an arrow to show the tumour.
- Each image must be attached individually as a 'supplementary file' upon submission (not solely embedded in the accompanying manuscript) and named Fig. 1, Fig. 2, etc.

Tables

- Tables should be constructed carefully and simply for intelligible data representation. Unnecessarily complicated tables are strongly discouraged.
- Large tables will generally not be accepted for publication in their entirety. Please consider shortening and using the text to highlight specific important sections, or offer a large table as an addendum to the publication, but available in full on request from the author
- Embed/include each table in the manuscript Word file - do not provide separately as supplementary files.
- Number each table in Arabic numerals (Table 1, Table 2, etc.) and refer to consecutively in the text.
- Tables must be cell-based (i.e. not constructed with text boxes or tabs) and editable.
- Ensure each table has a concise title and column headings, and include units where necessary.
- Footnotes must be indicated with consecutive use of the following symbols: * † ‡ § ¶ || then ** †† ‡‡ etc.

Do not: Use [Enter] within a row to make ‘new rows’:

Rather:

Each row of data must have its own proper row:

Do not: use separate columns for *n* and %:

Rather:

Combine into one column, *n* (%):

Do not: have overlapping categories, e.g.:

Rather:

References

NB: *Only complete, correctly formatted reference lists in Vancouver style will be accepted. Reference lists must be generated manually and not with the use of reference manager software. Endnotes must* ***not*** *be used.*

- Authors must verify references from original sources.
- Citations should be inserted in the text as superscript numbers between square brackets, e.g. These regulations are endorsed by the World Health Organization,[2] and others.[3,4-6]
- All references should be listed at the end of the article in numerical order of appearance in the Vancouver style (not alphabetical order).
- Approved abbreviations of journal titles must be used; see the List of Journals in Index Medicus.
- Names and initials of all authors should be given; if there are more than six authors, the first three names should be given followed by et al.
- Volume and issue numbers should be given.
- First and last page, in full, should be given e.g.: 1215-1217 **not** 1215-17.
- Wherever possible, references must be accompanied by a digital object identifier (DOI) link). Authors are encouraged to use the DOI lookup service offered by CrossRef:
  - On the Crossref homepage, paste the article title into the 'Metadata search' box.
  - Look for the correct, matching article in the list of results.
  - Click Actions > Cite
  - Alongside 'url =' copy the URL between { }.
  - Provide as follows, e.g.: https://doi.org/10.7196/07294.937.98x

Appendix F: Student's contribution to the research and writing of the "submissible" paper

Division of Orthopaedic Surgery

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23 June 2021

Faculty of Health Sciences, University of the Witwatersrand

RE: MATTHEW FOSTER'S CONTRIBUTION TO THE RESEARCH AND WRITING OF THE "SUBMISSIBLE" PAPER

To whom it may concern,

This letter serves to confirm that the co-authors of the " submissible" research paper have agreed to its use by Matthew Foster student number: **0701624X** as part of his MMed research report. Matthew Foster made a substantial contribution to conducting the research study and writing the manuscript.

Yours sincerely,

.....
Jurek Pietrzak
Primary Supervisor

.....
Matthew Foster
MMed Candidate

Appendix G: Research protocol

THE IMPACT OF THE COVID-19 PANDEMIC ON ORTHOPAEDIC TRAUMA ADMISSIONS IN A CENTRAL ACADEMIC HOSPITAL IN JOHANNESBURG

Dr Matthew Foster MBChB (UCT)

0701624X

MMED PROTOCOL

Supervisors

J Du Plessis MBChB (UCT), MMed (Wits), FC Ortho (SA)

J Pietrzak MBBCh (Wits), FC Ortho (SA)

M Jingo, PhD (Wits)

Charlotte Maxeke Johannesburg Academic Hospital, University of the Witswaterstrand

Table of contents

Nomenclature

AAOS	AMERICAN ACADEMY OF ORTHOPAEDIC SURGEONS
CEO	CHIEF EXECUTIVE OFFICER
CMJAH	CHARLOTTE MAXEKE JOHANNESBURG ACADEMIC HOSPITAL
COVID-19	NOVEL CORONAVIRUS (SARS-CoV-2)
GDP	GROSS DOMESTIC PRODUCT
NICD	NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES
PCR	POLYMERASE CHAIN REACTION
PPE	PERSONAL PROTECTIVE EQUIPMENT
RNA	RIBONUCLEIC ACID
RSA	REPUBLIC OF SOUTH AFRICA
SES	SOCIO-ECONOMIC STATUS
WHO	WORLD HEALTH ORGANISATION

1. INTRODUCTION

Worldwide trauma related injuries place a significant toll on global health care systems. Injuries claimed 4.9 million lives in 2016 in which 29% of them were a result of road traffic accidents (1). Lower income countries, such as the Republic of South Africa (RSA), have the highest mortality rate due to road traffic injuries at 29.4 per 100 000 population compared to a global rate of 18.8 (1). The leading cause of death in 2001 between the ages of five and forty-five in low to middle income countries was injury (2). Trauma-related orthopaedic injuries currently remain the largest burden on orthopaedic departments across government hospitals within RSA (3). All South African government hospitals have high volumes of trauma related orthopaedic injuries and the complications thereof. Lutge *et al.* showed that a combination of orthopaedic related injuries sustained from gunshot wounds, motor vehicle accidents and assault accounted for 62.91% of the orthopaedic operations performed at a secondary level hospital in Durban (3). It is estimated that 127 000 firearm victims seek medical help in RSA every year (1) and Martin *et al.* determined the impact of gun-shot wounds in orthopaedics within RSA and estimated each orthopaedic gunshot victim had an average hospital stay of 9.75 days, 3 hours of surgical time at a cost of $2940 (4). It is clear the trauma burden on orthopaedic departments across RSA is severe.

Alcohol consumption globally results in significant morbidity and mortality worldwide. The harmful effects of alcohol are often ignored and the WHO predict alcohol causes three million deaths annually worldwide, representing 5.3% of all deaths (5). It is also noted that alcohol is a causal factor in more than 200 disease or injury conditions with approximately 13.5% of deaths attributed to alcohol (5). In RSA, alcohol is easily accessible, and very often, abused (6). In 2016, it was noted that males over the age of 15 years consumed 37.5 litres of alcohol

per capita, in comparison to females who consumed 13.7 litres of alcohol per capita (6). The health consequences of alcohol are that alcohol-attributable deaths for both sexes are 3466 per 100 000 for liver cirrhosis, 2673 per 100 000 for cancer and 3614 per 100 000 for road traffic injuries (6). Adolescents are not immune to the devastating effects of alcohol, where worldwide adolescents are known to begin drinking before the legal age (7). Prevalence of alcohol use in adolescents being treated in emergency departments is around 5%, however, increases to one half of adolescent trauma admissions (7). Binge drinking is a growing problem in both developed and developing countries and has been linked to more medical problems than chronic alcohol use, as well as an increased prevalence of trauma (8). In the Western Cape, low socio-economic status (SES) was associated with a higher mortality rate from alcohol attributable causes of death and alcohol related complications were greatly elevated in the lower and middle-income groups as compared to higher income groups (9). However, it was noted that this was only the case in males, while in females these trends were not observed and, in some cases, higher income females consumed more than lower income females (9).

The Novel Coronavirus (SARS-CoV-2), commonly known as COVID-19, was declared a pandemic in March 2020 by the World Health Organisation (WHO) and has caused a global health crisis (10). Pandemics in general are a major burden on healthcare, however they also have a detrimental effect on the global economy (11). In December 2019, many cases of an unidentified viral illness presenting as a viral pneumonia were recorded in Wuhan, Hubei, China. It is suspected that the COVID-19 outbreak was first identified in a seafood market in Huanan and the market was subsequently closed on the 01 January 2020. After taking multiple specimens from the lower respiratory tracts of affected patients the virus was identified as a ribonucleic acid (RNA) virus belonging to the family Coronaviridiae, and subsequently named

2019 Novel-Coronavirus (12). The virus has spread rapidly worldwide spanning 216 countries up to date, with more than 12 million cases diagnosed, and more than 545 481 deaths (10).

In response to the COVID-19 pandemic, many countries worldwide initiated a country wide lockdown in order to decrease the transmission rate. Italy fast became the second epicentre for COVID-19 infections after China, and introduced a nationwide lockdown on 09 March 2020 (13). The lockdown slowed down transmission rates and slowly eased the burden on the healthcare system (14). The South African government made the decision to implement a nationwide lockdown in line with other countries in order to 'flatten the curve', to prepare an under resourced healthcare system for the inevitable outbreak (15). On 15 March 2020, President Cyril Ramaphosa declared a national state of disaster in RSA (16). With this in effect, all persons were confined to their own homes except for essential service providers and a curfew was implemented, with no alcohol or cigarettes being allowed to be sold. South Africans were only allowed to leave their homes for basic supplies or emergency services (17). The national government implemented a lockdown which was divided into five levels (See Appendix A). Alert level five commenced on 27 March 2020 and lasted until 30 April 2020. Alert level four commenced on 01 May 2020 until 31 May 2020. Alert level three began on 01 June 2020 until 17 August 2020 and alert level two commenced on 18 August which currently, at the time of writing this protocol, still remains (18). The sale of alcohol was allowed when alert level three was introduced, however, with specific requirements such as selling of alcohol was only allowed on Monday to Thursday, with no restaurants allowed to sell alcohol (17). On 12 July 2020, President Cyril Ramaphosa re-introduced an alcohol ban effective immediately at the time of his presidential address. President Ramaphosa also re-introduced a curfew from 21:00 pm – 04:00 am and the reasons for the additional regulation was due to the suspected impact alcohol was having on the healthcare system, with the assumption that trauma

admissions occupied hospital beds which otherwise would be allocated for usage by COVID-19 patients.

In RSA, the National Institute for Communicable Diseases (NICD) launched an informative website www.sacoronavirus.co.za to allow the South African public to have access to legitimate COVID-19 information provided by the South African Department of Health (15). At the time of writing the research protocol, RSA had conducted 3 674 872 tests of which 625 056 cases tested positive, with 14 028 deaths. The Western Cape was originally the epicentre of COVID-19 cases, however Gauteng has now become the epicentre with on average over 2000 cases being recorded daily at this current time (15). Currently, there is no vaccine available worldwide with many pharmacological companies currently working on developing a vaccine as soon as possible. Oxford University is leading the race to a vaccine and are working in collaboration with the University of the Witwatersrand (19). The best prevention society has against the contraction of COVID-19 is social distancing with thorough hygienic practices, and for healthcare workers, is the meticulous use of personal protective equipment (PPE) (20). It has been shown that effective and proper utilisation of PPE is extremely effective in preventing the contraction of COVID-19 (20).

Musculoskeletal conditions worldwide are a major cost to health departments. In the United States of America, it is the leading cause of disability/health care cost where it is estimated that the annual cost to the country is $980 billion (5.76% GDP) in terms of treatment and lost wages (21). Furthermore, there were 62.7 million visits to healthcare facilities for injuries, 61.8 million visits for backpain and 17 million visits for other musculoskeletal related conditions (21). As COVID-19 began to spread worldwide, many countries had to make important decisions whether elective surgery would be allowed to continue. This was both an ethical and an economic concern as continuing elective theatre may increase the usage of PPE and block

hospital beds which could be used for COVID-19 admissions. The American Academy of Orthopaedic Surgery (AAOS) released guidelines in the United States of America to encourage their members to adhere to (22). Elective surgery is described as patients with chronic problems whose surgery may be delayed with certainty that no significant harm will arise from the delay (22). Urgent surgery is described in two tiers. Firstly, urgent surgery is referred to as 'somewhat elective surgery', which includes for example: anterior cruciate ligament tears, bucket handle meniscus tears and intra-articular distal radius fractures (22). The AAOS highlighted that if possible, these cases should be done on an outpatient basis to not decrease the amount of available hospital beds. The second tier of 'urgent' cases are those that must be done, for example: pilon fractures or fracture dislocations, whereby if they are not done, they will cause significant morbidity to the patient. Lastly, 'emergency' surgery is that which is considered a life or limb emergency surgery (22).

The COVID-19 pandemic has created an extraordinary shift in our daily lives. Not only has it caused a major financial crisis that we are yet to quantify or collapsed health care systems worldwide, but it is has also been the catalyst for ingenuity and technological advancement. As regulations continue to evolve with each lockdown alert level, in particular with reference to alcohol availability, we anticipate identifying trends that impact on orthopaedic trauma admissions. Many countries in the world, such as the Middle East, have alcohol bans. However, never has there been a scenario whereby alcohol was allowed, subsequently banned, reallowed and then banned once again. This unique legislation is a first of its kind worldwide and may never happen again in RSA. This study will allow us to draw significant conclusions on the impact alcohol has on our society. The results of this study may influence policy makers, stakeholders and government about the socio-economic effect and burden that alcohol has placed on our health care system.

2. NULL HYPOTHESIS

The effects of the COVID-19 pandemic and lockdown policies enforced by government do not have an effect on orthopaedic trauma admission rates at a central academic hospital in Johannesburg, South Africa.

3. STUDY AIM

The aim of this study is to determine the impact of lockdown stages and alcohol restrictions imposed in response to the COVID-19 pandemic on orthopaedic trauma admissions at a central academic hospital in Johannesburg compared to the preceding two years.

4. OBJECTIVES

1. To describe the effect of the lockdown stages and alcohol restrictions on orthopaedic trauma admissions.
2. To assess whether the alterations in alcohol availability during alert level three lockdown had any effect on orthopaedic trauma admissions.
3. To compare the changes in orthopaedic trauma admission over the lockdown period to the preceding two years.

5. METHODS

The study design is a retrospective clinical audit. The data will be collected from the five-month period from 01 March to 31 August in the years 2018, 2019 and 2020, respectively. Data collection will only proceed once ethics has been approved. The sample size will be all orthopaedic trauma patients admitted during the above period. We will utilise a convenience sample method for data collection as our sample will be all patients admitted over a specified time period. Data will be collected from all patients' records from a variety of sources:

- Orthopaedic secretary
- Trauma orthopaedic department morbidity and mortality clinical audits
- Emergency department admission books
- Orthopaedic trauma ward admission books

Orthopaedic personnel at Charlotte Maxeke Johannesburg Academic Hospital (CMJAH) have been unchanged in the past five years. The orthopaedic department at CMJAH has created a call roster which ensures that on every day of the year there is an orthopaedic intern, registrar and consultant on call with an additional registrar and consultant on standby if needed. The personnel during the COVID-19 crises has remained unchanged and therefore the same amount of orthopaedic staff has remained the same in 2018, 2019 and 2020, respectively. As per policy at CMJAH, every patient that is admitted as an orthopaedic patient would have first initially been seen and treated by the trauma medical officer or registrar and then subsequently referred to the orthopaedic registrar on call. The orthopaedic registrar on call will make the decision to admit or discharge the patient. No other medical discipline is allowed to discharge an orthopaedic patient without permission from the orthopaedic registrar on call.

Inclusion criteria:

- Adults 18 years of age and older admitted with an acute orthopaedic trauma injury such as:
    - fractures or dislocations of the upper and lower limb, spine, pelvis and polytrauma patients.
    - traumatic tendon injuries to the lower limb and all traumatic joint injuries.

Exclusion criteria:

- Patients that were admitted by the orthopaedic registrar on call that presented with an old orthopaedic injury.
- Patients that were admitted for complications of infection requiring monitoring and/or surgery.

When we conduct our audit, we will utilise a data collection sheet to categorise all the admissions into a variety of categories. The categories included are (see Appendix B). :

- Mechanism of injury: Fall from height, motor vehicle accident, paedestrian vehicle accident; assault, gunshot wound and not specified
- Fracture/ dislocation location: Upper limb defined from the clavicle down to carpal bones; lower limb defined as femoral head down to toe phalanges; pelvis defined as injuries to the ischium, ileum and pubis; spine defined as C1 to the coccyx.
- Polytrauma or single injury: This is defined as whether the patient had two or more serious injuries in two different sites of the body or a single injury in one location.
- Open or closed injuries: This is defined as whether the associated fracture had an associated breach of skin resulting in an open fracture.
- COVID- 19 result: This is defined as if the patient tested positive for COVID-19 on a Polymerase Chain Reaction (PCR) nasal swab.

Once we have accumulated all the data, we will collate it and then proceed to interpretation of the data. We will compare the audits from 2020 to the previous years, and more specifically, the different stages of lockdown when alcohol was allowed and when it was not allowed. We will then interpret the results and describe the patterns observed. All the data will be graphically represented and appropriate statistics will be utilised. As this study is a clinical audit that draws a descriptive comparison, no interventions are required for patients.

Another important component of our data that must be clearly defined is the government lockdown alert levels and the specific implications of it. A summarised version of the various lockdown alert levels from the presidency are as follows in order from most stringent to the least (see Appendix A).

All the data that are recorded will be tabulated into the various lockdown alert levels, as well as identifying whether there are trends noticed when alcohol was allowed and when it was prohibited. We will be able to compare the trauma admissions from 27 March 2020 – 31 May 2020 when government had prohibited alcohol, with 01 June 2020 – 12 July 2020 whereby alcohol was allowed. Lastly, we will then be able to see the trend after the prohibition of alcohol was reintroduced from 13 July 2020 until present day.

6. DATA ANALYSIS

The data collected will be tabulated in Microsoft Excel (Microsoft, Seattle, Washington) and the results will be analysed using a frequency distribution. Commonly, descriptive analysis involves utilising information on the distribution of data such as the mean, mode, median and measures of dispersion. The data will then be summarised and displayed in graphs or tables in order to easily represent the results obtained. We will then look at the various alert levels in lockdown in 2020 from alert level five to level three, with and without the ban on alcohol. A

Poisson regression analysis will be conducted to assess the outcome of alcohol and lockdown alert levels (a p – value < 0.05 will be considered statistically significant). A trend analysis will also be conducted over the time periods from 2018 – 2020.

7. ETHICS

Ethics clearance has been obtained from the Human Research Ethics Committee (HREC)(Medical), University of the Witwatersrand (see Appendix C). Permission from the CMJAH Chief Executive Officer (CEO) will also be obtained. All the data that are collected will be grouped into categories such as: diagnosis and the mechanism of injury, therefore, ensuring anonymity. The primary investigator (Dr Foster) and a biostatistician will be the primary evaluators of the data. No patient names, identification numbers or folder numbers will be utilised in the data collection tools. This will ensure that patient confidentiality and anonymity is maintained.

8. TIMING

	July 2020	Aug 2020	Sep 2020	Oct 2020	Nov 2020	Dec 2020	Jan 2021	Feb 2021	Mar 2021	Apr 2021	May 2021	Jun 2021
Literature review												
Prepare protocol												
Ethics submission		07/08										
Submit protocol				07/10								
Data collection												
Data analysis												
Write up												

9. FUNDING

This will be a self-funded study. Anticipated costs for this research will be R823.20 as a preliminary budget for stationary.

Printing:

- **Ink**: 300 pages / R350 a cartridge. Cost per page is R1.20
- **Paper**: 2000 pages / R350 ream. Cost per page is R0.20
- Total cost per page is R1.40

Item	Price per page	Number of pages	Copies	Total
Protocol	R1.40	13	8	R145.60
Data collection	R1.40	84	1	R117.60
Complete report	R1.40	100	4	R560
Grand total				**R823.20**

10. PROBLEMS

At present, we anticipate three problems which we may face in conducting this study. The first is the availability of data. I am hopeful that the admission data is captured correctly from 2018-2020.

The second problem we may face is government lockdown bias. With the reintroduction of the alcohol ban on 12/07/2020, there was also an associated curfew which was introduced from 21:00 pm – 04:00 am. This may contribute to diminished orthopaedic trauma admissions in conjunction with no alcohol availability.

Thirdly, the possibility of anticipated reintroduction of alcohol restrictions may have allowed people to stockpile alcohol, making it available to them during the time of repeat restrictions.

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APPENDICES

Appendix A: Government lockdown regulations

SUMMARY OF ALERT LEVELS

ALERT LEVEL 5	ALERT LEVEL 4
Drastic measures to contain the spread of the virus and save lives.	Extreme precautions to limit community transmission and outbreaks, while allowing some activity to resume.
SECTORS PERMITTED	
Only essential services as per existing regulations.	All essential services, plus a limited number of sectors with a low rate of transmission and high economic or social value.
RETAIL PERMITTED (including stores, eCommerce and informal traders)	
Only essential goods, including food, medical products, cleaning and hygiene products, fuel, and winter goods such as blankets and heaters.	All essential goods, as well as educational books, stationery, office supplies, IT equipment (including computers and mobile phones), children's clothing, winter goods such as clothing, bedding and heaters, and textiles required to produce masks. Restaurants and fast food outlets may open for delivery only.
MOVEMENT	
You must stay at home unless you are an essential worker. You may leave home only to purchase essential goods or seek medical care. No inter-provincial movement of people, except for transportation of goods and exceptional circumstances (e.g. funerals).	You must stay at home except to go to work, do shopping where necessary, or seek medical care. No inter-provincial movement of people, except to return to usual place of residence, for transportation of goods and exceptional circumstances (e.g. funerals). Curfew in place between 8pm and 5am, except for essential workers. Walking, jogging and cycling permitted between 6am and 9am, but not in groups.
GATHERINGS	
All public gatherings are prohibited.	All public gatherings are prohibited.
TRANSPORT	
Bus services, taxi services, e-hailing and private motor vehicles may operate at restricted times, with limitations on vehicle capacity and stringent hygiene requirements.	Passenger rail, bus services, taxi services, e-hailing and private motor vehicles may operate subject to directions.
EDUCATION Directions issued by the Minister of Basic Education and Minister of Higher Education, Science and Innovation.	

STAY SAFE
SAVE SOUTH AFRICA

SUMMARY OF ALERT LEVELS

ALERT LEVEL 4	ALERT LEVEL 3
Extreme precautions to limit community transmission and outbreaks, while allowing some activity to resume.	Strict precautions to keep transmission low, and additional measures to contain outbreaks in hotspots.
SECTORS PERMITTED	
All essential services, plus a limited number of sectors with a low rate of transmission and high economic or social value.	All economic activity is permitted, with a few exceptions where the risk of transmission is high.
RETAIL PERMITTED (including stores, eCommerce and informal traders)	
All essential goods, as well as educational books, stationery, office supplies, IT equipment (including computers and mobile phones), children's clothing, winter goods such as clothing, bedding and heaters, and textiles required to produce masks. Restaurants and fast food outlets may open for delivery only.	All retail permitted, with strict health protocols in place. Alcohol will be sold under strict conditions and on specified days.
MOVEMENT	
You must remain at home except to go to work, do shopping where necessary, or seek medical care. No inter-provincial movement of people, except to return to usual place of residence, for transportation of goods and exceptional circumstances (e.g. funerals). Curfew in place between 8pm and 5am, except for essential workers. Walking, jogging and cycling permitted between 6am and 9am, but not in groups.	You must remain at home, except to travel to work, purchase goods, seek medical care or attend schools and universities when these reopen. Additional restrictions on movement apply in hotspot areas. There is no curfew on the movement of people. Exercise permitted at any time during the day, but not in groups.
GATHERINGS	
All public gatherings are prohibited.	All public gatherings are prohibited.
TRANSPORT	
Passenger rail, bus services, taxi services, e-hailing and private motor vehicles may operate subject to directions.	All public transport may operate subject to directions, as well as limited domestic air travel for work purposes.
EDUCATION Directions issued by the Minister of Basic Education and Minister of Higher Education, Science and Innovation.	

Appendix B: Data collection sheet

STUDY NUMBER							
DATE							
AGE							
GENDER							
OPEN OR CLOSED FRACTURE							
FRACTURE SITE							
POLYTRAUMA OR SINGLE INJURY							
COVID STATUS							
MECHANISM OF INJURY							

FRACTURE SITE: Upper limb trauma (UL), Lower limb trauma (LL), spinal trauma (S), pelvis trauma (P).

MECHANISM OF INJURY: Pedestrian Vehicle accidents (PVA), motor vehicle accidents (MVA), gun-shot wounds (GSW), assault (ASSAULT), fall from height (FFH), trauma not otherwise specified (OTHER)

Appendix C: Wits HREC clearance certificate

UNIVERSITY OF THE
WITWATERSRAND
JOHANNESBURG

R14/49 Dr M Foster

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M200877

NAME: (Principal Investigator)	Dr M Foster
DEPARTMENT:	School of Clinical Medicine Department of Surgery Division of Orthopaedic Surgery Medical School University
PROJECT TITLE:	The impact of the covid-19 pandemic on orthopaedic trauma admissions in a level one hospital in Johannesburg
DATE CONSIDERED:	2020/08/28
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Drs J du Plessis and J Pietrzak
APPROVED BY:	CB Penny Dr CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	2020/11/06

This clearance certificate is valid for 5 years from the date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary on the 3rd Floor, Phillip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.
I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to submit details to the Committee. **I agree to submit a yearly progress report**. When a funder requires annual re-certification, the application date will be one year after the date when the study was initially reviewed. In this case, the study was initially reviewed in **August** and will therefore reports and re-certification will be due early in the month of **August** each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature — Date: 2020/11/11