A retrospective description of a 12 month caseload at four private emergency centres in South Africa

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Acknowledgements

To my Mom and Dad, thank you for your sacrifices to make me where I am today.

To my wife Emily thank you for your continued support.

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Abbreviations

ATS Australian Triage System

CATS Canadian Triage and Acuity Scale

CMS Council for Medical Scheme

ED Emergency department *(although the term Emergency Centre is more widely used in SA, we have chosen to use this term to avoid confusion with Eastern Cape (EC)*

ETAT Emergency Triage and Treatment

HIV Human Immunodeficiency Virus

KDH Khayelistsha District Hospital

MPH Mitchells Plain Hospital

MTS Manchester Triage System

NHI National Health Insurance

NHS National Health Service

NSH New Somerset Hospital

PCHC Primary Community Health Clinics

PMB Prescribed Minimum Benefits

SATS South Africa Triage Scale

TB Tuberculosis

Part A: Literature Review

Introduction

Emergency medicine is a relatively new discipline in Africa, with consensus statements made to roadmap the development of healthcare to meet the emergent needs of the continent[1,2] as well as South Africa (SA).[3] In part, SA has developed the South African Triage Scale (SATS) to help triage patients requiring emergency care.[4] Further complicating the SA context, are the co-existing nature of two healthcare systems working independently from one another, namely the publicly funded national healthcare system funded by taxpayers, and the private sector funded by voluntary medical aid contributions and private finances.[5]

Therefore, this review aims to explore: 1) international healthcare systems as compared to South Africa, 2) different international triage scores and the development of SATS, 3) systemic ways to decreased emergency department (ED) demand with particular focus on 4) non-urgent case presentations to ED and 5) detailing common presentations to ED.

1. Healthcare systems - international

A variety of healthcare organisation models existing throughout the world.[6] High-income countries such as the US, UK and Sweden have often been examined. The US has three systems namely, private medical insurance for anyone that can afford it, Medicaid for those who cannot afford private medical insurance, and a public veteran health administration for military personnel.[6] In contrast, the UK has a single National Healthcare Service (NHS) which covers all citizens and is funded by the taxpayer.[7] In between, Sweden has a hybrid model where mandatory national healthcare insurance is provided by profit or non-profit providers who operate within the margins of Sweden legislation. Swedish citizens who wish to have additional care can apply for voluntary private insurance.[8]

In middle and low-income countries, the public sector generally provides the majority of healthcare services.[6] There are variable roles for private healthcare to partake, however they do so in a fragmented manner as seen in India, Nigeria and Uganda.[9]

1.1 Healthcare systems – South Africa

SA falls in-between with a large voluntary private healthcare system operating such as in the US but limited by SA medical aid legislation, and a universal public system similar to the UK but limited in scope and resources.[5,10,11] Such separation is based on financial affordability,

with the private sector consuming the highest health expenditure but serving the smallest population.[12] Many attempts have been drawn to curb private healthcare using price setting legislation,[13] or developing public-private partnerships;[14] both with mixed outcomes. Recently the National Health Insurance (NHI) has been proposed to form a financial model similar to Swedish healthcare, with private insurance providing additional coverage not covered by the public.[14]

One of the strengths of the private healthcare system is that of strong governance.[15,16] Due to efficient electronic record collection, access to ED data is easy and accurate, as compared to many public systems which remain predominantly paper based. The private sector record keeping rivals that of high-income countries, yet there is little research or analysis on this sector. Only via the Council for Medical Schemes annual audit are the public aware of some of the operations of the private sector. That imitation is mainly restricted to financial information, with little relevance to clinical information other than ranking the prescribed minimum benefits (PMB – a list of conditions required to be covered regardless of the benefit option selected) as required by law.[17]

2. Triage scores - international expertise

Many countries face an overburden of patients arriving at EDs[18] with high-income countries such as the UK and Australia feeling the pressure to admit patients within four hours.[19] Low to middle-income countries have a disease burden that outstrips the capacity of the system.[20] Thus triage systems have been developed to efficiently manage the influx of patients by prioritising their care and attending to them timeously.[21]

Triage systems vary due to regional specificity, initially developed from local consensus, and refined over the years by either urgency and/or severity criteria.[21] Common international triage systems include the Australian Triage System, Canadian Triage and Acuity Scale, Emergency Severity Index in the USA, and the Manchester Triage System in the UK and Europe.[21] South Africa utilises the South African Triage Scale (SATS) which has been refined and validated since 2006 and is now well accepted across SA public and private healthcare sectors.[22]

The Australian Triage System (ATS) was initially developed from the Ipswich Triage Scale (1980), then the National Triage Scale (1994), followed by ATS (2000). The initial development of this score was based on observation of nurses and how they initially managed patients, placed them in the queue to be seen by doctors, or deferring them to another institution. The addition of physiological parameters resulted in the development of ATS.[23]

The Canadian Triage and Acuity Scale (CATS) was developed from ATS. Developed in 1999, CATS has undergone major revisions every four years as agreed upon by their professional bodies, to systematically improve the external validation to the entire Canadian population, which esulted in the additional modifiers for chest pain and psychiatric conditions.[24] Similarly, Paediatric CATS has also been developed and systematically reviewed.[25]

The Manchester Triage System (MTS) was developed in 1994 and inspired by ATS. In comparison to Australia, MTS is less reliant on physiological measurements but more reliant on patient's presenting complaints and history of illness.[26] Since its development, MTS has undergone three iterations all in hopes of reducing the amount of under and over-triage,[27,28] including the paediatric version.[29] MTS has been successfully adapted to other countries including Portugal, Spain, Germany, Brazil and lastly, South Africa.[30,31]

2.1 Triage scores – local development of SATS

SATS was based on the MTS and initially called the Cape Triage Score in 2006.[32,33] SATS was designed to be applied by a nursing assistant on entry to the hospital using a brief history and vital signs supported by minimal bedside investigations.[33] SATS uses a triage early warning score (TEWS) which is the addition of physiological parameters and a list of possible clinical discriminators. The TEWS score assigns priority of patient care either as red (immediate), orange (very urgent), yellow (urgent) or green (non-urgent).[34]

SATS validation in trauma patients has shown a reduction of inappropriate under-triage by 50%[22,35] with no difference found when compared to Injury Severity Score (ISS) or Trauma and Injury Severity Score (TISS) or Kampala Trauma Score (KTS) or Revised Trauma Score with gunshot injuries.[36]

In children, the paediatric SATS use of different age-appropriate discriminators (incorporated from WHO Emergency Triage Assessment and Treatment - ETAT) and physiological vitals (from SATS TEWS), has improved admission rates for urgent (5%) and non-urgent cases (73%),[37] with an over-triage rate of 46%.[31] A repeat validation study showed a sensitivity of 91%, specificity of 56%, over-triage of 46% and under-triage of 9%.[37] Hence, paediatric SATS fares favourably in comparison to ETAT (which uses clinical signs only and a basic list of presenting symptoms) as compared to the comprehensive discriminating list for paediatric SATS.[37–39]

In general adult or mixed ED use, the under and over-triage rates have been validated in a rural district hospital (Zithulele Hospital in Eastern Cape) at 9% and 49% respectively.[40] Mosvold Hospital in Kwazulu Natal has reported similar rates at 14% and 67% respectively.[41] Using a consensus-based reference vignettes on SATS, the over-triage of 12% and under-

triage of 14% were considered average as compared to international accepted guidelines for over and under-triage.[42]

SATS has little validation data to support the triage scores as indicative of whether patients would be admitted or not.[21] In Wentworth Hospital in Durban, the percentage of admission per triage colour were as follows: red (75%), orange (29%), yellow (23%) and green (19%).[41] In comparison, at New Somerset Hospital in Cape Town, the percentage of admission per triage colour were: red (1%), orange (12%), yellow (11%) and green (1%).[43] Such disparity shows that triage status is highly independent of admission status and is dependent on the clinical setting.

However, in comparison to other well validated international triage scoring systems, SATS does not have outcome or mortality data following admission or discharge.[21] The reason for lacking such data is communicable

the use of paper records which prevent the longitudinal study of following up on patients 30 or 60 or 90 days post-discharge and their outcomes.[21]

Nevertheless, SATS has been adapted to many other low and middle-income countries given South Africa's greater similarity to these countries than other high-income countries.[44] The reasons likely include the ever rising of non-communicable diseases[45] together with the pre-existing trauma and communicable diseases such as human immunodeficiency virus (HIV) and tuberculosis (TB).[11] Countries that have adopted SATS include Botswana,[46,47] Malawi,[48] Ghana,[49] Kenya,[50] Pakistan,[51] Afghanistan, Sierra Leone[52,53] and Haiti.[54]

With such widespread use, hopefully future validation of SATS in low to middle-income countries will continue to occur. However, validation of SATS in the South African private sector is unknown since the private sector is presumed to have less trauma and communicable diseases such as TB or HIV.

3. Systemic ways to decrease emergency department demand

An increasing number of patients are using EDs for non-urgent consultations due to their 24-hour convenience and in some countries, due to their four hour mandated throughput rate.[55] While many studies have focused on non-urgent case presentations and reasons for why patients may present, some studies have looked at enhancing the entire healthcare system.[55]

Internationally, the use of patient education to make people more self-sufficient in their clinical management has not been shown to decrease ED demand as it is supplementary to other system changes.[56] Coordination of care for recurrent users of ED, like asthma or chronic obstructive pulmonary disease patients, would seem to induce a marked decrease in the

patient's presentations, but overall ED use is unchanged as often they do not represent the greatest proportion of patients at the ED.[55]

In the US, cost sharing or upfront co-payments have been used as means to decrease ED demand. As a result, Medicaid (public sector provided) patients will rather present to an ED versus private insurance patients who tend to go to urgent care centres.[57] Whether the decrease in ED demand results in increased system efficiency or clinical harm has yet to be determined.[58] In contrast, the use of gatekeeping or preauthorisation of medical expenditure as required by some private medical insurances has not been shown to decrease ED demand.[55] The use of US urgent care centres does decrease ED demand however urgent care centres are more likely to attract patients with higher income and higher levels of private insurance.[59] Urgent care centres within five miles from an ED have been shown to reduce demand for pharyngitis or bronchitis treatment, and overall admission rates.[60]

The UK has tried the route of employing prehospital practitioners who can treat on scene and divert patients to a general practitioner (GP) the following day or to discharge directly. [61] Albeit there was a decrease in ED demand, such practitioners did not change the rate of subsequent ED attendance, weakening the effectiveness of the initial deferral. UK telephone triage reduces demand, provided that the call centre has emergency physicians to guide the junior staff.[62] Junior staff should ideally be medically trained as they are aided by computer diagnostic algorithms, which then advise patients to either visit the ED or their GP. Although there was patient dissatisfaction, there was decreased ED utilisation and also a decrease in consultation time with the GP.[63]

Despite these attempts to manage the system and referral of patients between different levels of care, the most promising solution is that of walk-in centres staffed by GPs (see 3.2).

3.1 Systemic ways to decreasing emergency demand in South Africa

The SA public healthcare system is based on primary community health clinics (PCHC) as a means to address patient healthcare issues. The use of intersectoral collaboration, community participation and health promotion are advised to strengthen the PCHC.[64] However, there are often long waiting times, dysfunctional clinics, a shortage of medications at clinics, and limited operating hours.[65] These factors often result in frustrated patients who choose to consult a hospital ED instead thus resulting in many hospitals with overloaded EDs and overcrowd out-patient departments.[65]

In response to the demands within public sector and the need to appropriately manage them, some departments such as dermatology and burns have established using messaging

systems such as WhatsApp as a means to telephonically co-ordinate care between PCHC level and at tertiary hospitals.[66] Such efforts have been assisted by technology such as the VULA mobile app as a secure means to refer patients for a non-urgent consultation for dermatology, burns, orthopaedics and psychiatry to name but a few.[67,68]

In contrast to the public sector, the private healthcare industry imposes financial constraints on clients depending on their level of medical insurance cover. More expensive plans allow patients to present to any hospital whereas cheaper plans encourage patients to attend only certain hospitals and if not, a penalty is imposed.[69,70] However, public data is not available to comment on the effectiveness of such referral pathways, notwithstanding their clinical impact on their clients.

In South Africa, there is a lack of co-ordinated care and referrals between private hospitals and primary care level, since each private hospital group operates independently. Also, primary care doctors have been reluctant to adopt unified integrative systems that bias or lock them into certain private hospital groups.

3.2 Non-urgent case presentations to emergency department

Non-urgent cases that present to EDs have been well studied internationally, aiming to understand what are the initial presenting complaints and why they present.[71–73] Thus future plans to mitigate their impact on busy EDs can be made.

In Sweden, 52% of the non-urgent patients presenting to the ED predominantly had either digestive, musculoskeletal, or traumatic symptoms, while 35% had previously been hospitalised and may have had a greater perception of severity of their symptoms.[71] In Italy and UK, 20% and 15% of case presentations were non-urgent, with a greater likelihood that the patients were younger and presenting after hours (and more females in Italy).[72,73] In Iran, 65% of ED presentations were non-urgent as they were seeking prompt service (37%) and less cost (36%).[74] In Africa, only regional studies have been done in some SA public sector EDs. In Paarl Hospital, non-urgent cases accounted for 14% of all presentations.[75] A 2012 study at George Hospital,[76] found that SATS green coded patients arrived at an ED because they believed that medication from clinics was not helping (28%), perception that superior treatment was on offer at hospital versus clinic (24%) and clinic waiting times were too long (14%).[76] In 2017, the same hospital showed that non-urgent patients presented with unresolved pain, or with the belief that the clinics could not tell what was going on inside the body, or that nursing sisters at the clinic could not examine properly. Lastly, there were family members urging patients to go to the hospital rather and skip the local clinics.[77] A 2009 study at New Somerset Hospital in Cape Town,[43] found non-urgent cases accounted for 23% of

adult and 16% of paediatric presentations. Unfortunately, little is known about the reason for those non-urgent cases to present to New Somerset Hospital.[43]

In the SA private sector there is no research into why patients present to private EDs, nor are we are aware of what type of clinical presentations present as non-urgent. Thus further research is required if one is to mitigate the presentation of non-urgent cases.

3.3 Successful measures to decrease emergency department demand

A successful decrease in ED demand has been demonstrated in GP cooperatives or walk-in centres.[78,79] The former relies on GPs that are co-located nearby to a hospital based ED. Specifically GPs outside of the ED and not inside the ED are used, and not staffed by nurse primary care professionals, as the latter have not been shown to alleviate ED load in a Cochrane review.[78] Use of GP cooperatives have decreased ED utilisation by 8% and 13% in the UK and Netherlands respectively.[79]

Similar to GP cooperatives are walk-in centres, which can either be nurse or GP staffed. UK walk-in centres have shown a decrease in ED utilisation because patients cite increased convenience, no appointments required, extended opening hours, an expectation of shorter treatment times and minor problems to be addressed.[80] Also patients have an improved experience and satisfaction with walk-in centres.[81] In contrast, patients who presented to walk-in centres co-located next to an ED thought that the severity of their condition warranted a possible ED visit.[82] Such has been the success of walk in centres, that further expansion in the UK as a future policy has been explored recently.[83]

In the light of such success, a leading private hospital group in South Africa has advocated for non-urgent cases to be reviewed by GPs rather than ED as a cost reduction manoeuvre.[84] However, there has been a paucity of data to determine if and how such interventions have been successful in the private sector.

4. Common case presentations to the emergency department

Many countries at a national level keep statistics of how many patients arrive at ED, their various levels of severity, how was it financed and the rate of admission or discharge.[85–87] Such statistics provide their government information for system policy planning. However these key statistics are lacking in South African government and not publicly available from the private healthcare industry.

Several countries such as the US,[85] UK[86] and Australia[87] have analysed their most common ED presentations (Table 1) with abdominal pain, chest pain, upper respiratory symptoms, viral-like illness and back pain being common. The UK NHS does not show the acuity levels of patients that present to the ED. The US and Australia have remarkably similar acuity levels (Table 2). Disposal of patients whether admitted or not are surprisingly dissimilar across all three countries and there are other local factors at play (Table 3). Interestingly, the US is the only country to record the method of payment for the ED visit, with private insurance at 32%, Medicaid at 59%, no insurance at 8% and workers compensation at 1%.[85] The disparity between presenting complaint, presenting complaint category and final diagnosis are very heterogeneous, despite many attempts to link these data points together as suggested by the International Health Terminology Standards Development Organisation.[88]

Table 1: Comparison of top 10 list of common presentations to the emergency department in their respective countries (% of ED presentations)

	US[1]	UK[2]	Australia[3]
1	Abdominal Pain (9)	Diagnosis not classifiable (20)	Abdominal pain (4)
2	Chest pain (5)	Dislocation / Fracture / Joint injury (7)	Painful throat (4)
3	Fever (4)	Respiratory conditions (6)	Viral infection (2)
4	Shortness of breath (3)	Gastrointestinal conditions (6)	Cellulitis (2)
5	Nonspecific pain (3)	Sprain (5)	Dorsalgia (2)
6	Headache (3)	Laceration (5)	Injury of unspecified region (1)
7	Back symptoms (2)	Soft tissue inflammation (5)	Gastroenteritis (1)
8	Vomiting (2)	Nothing abnormal detected (4)	Open wound of head (1)
9	Throat symptoms (2)	Contusion / abrasion (4)	Acute upper respiratory infection (1)
10	Other (64)	Cardiac condition (4)	Other (68)

[1] Rui P, Kang K. National Hospital Ambulatory Medical Care Survey: 2017 emergency department summary tables [Internet]. Atlanta: National Centre for Health Statistics; 2017 [cited 2020 Oct 18]. 67 p. Available from: https://www.cdc.gov/nchs/data/nhamcs/web_tables/2017_ed_web_tables-508.pdf

[2] Gair D. Hospital Accident and Emergency Activity - 2017-18 [Internet]. Surrey: National Health Service; 2018 [cited 2020 Oct 18]. 4 p. Available from: https://files.digital.nhs.uk/D3/CCB4FE/AE1718_ Annual Summary.pdf

[3] *Australian Institute of Health and Welfare. Emergency department care 2017-18 [Internet]. Canberra: Australian hospital statistics; 2018 [cited 2020 Sept 19]. Available from: https://www.aihw.gov.au/reports/hse/223/emergency-dept-care-2017-18/data*

Table 2: Triage scores of patients presenting to US and Australian emergency departments (%)

	US[1]	Australia[2]
Immediate	1	1
Emergent	10	13
Urgent	34	37
Semi-urgent	24	39
Non-urgent	4	9

[1] *Rui P, Kang K. National Hospital Ambulatory Medical Care Survey: 2017 emergency department summary tables [Internet]. Atlanta: National Centre for Health Statistics; 2017 [cited 2020 Oct 18]. 67 p. Available from: https://www.cdc.gov/nchs/data/nhamcs/web_tables/2017_ed_web_tables-508.pdf*

[2] *Australian Institute of Health and Welfare. Emergency department care 2017-18 [Internet]. Canberra: Australian hospital statistics; 2018 [cited 2020 Sept 19]. Available from: https://www.aihw.gov.au/reports/hse/223/emergency-dept-care-2017-18/data*

Table 3: Disposal of emergency department patients from three countries (%)

	US[1]	UK[2]	Australia[3]
Admitted	14	19	30
Discharged	78	57	60
Transferred	1	3	-
Left without being seen	1	3	1

[1] Rui P, Kang K. National Hospital Ambulatory Medical Care Survey: 2017 emergency department summary tables [Internet]. Atlanta: National Centre for Health Statistics; 2017 [cited 2020 Oct 18]. 67 p. Available from: https://www.cdc.gov/nchs/data/nhamcs/web_tables/2017_ed_web_tables-508.pdf

[2] Gair D. Hospital Accident and Emergency Activity - 2017-18 [Internet]. Surrey: National Health Service; 2018 [cited 2020 Oct 18]. 4 p. Available from: https://files.digital.nhs.uk/D3/CCB4FE/AE1718_ Annual Summary.pdf

[3] Australian Institute of Health and Welfare. Emergency department care 2017-18 [Internet]. Canberra: Australian hospital statistics; 2018 [cited 2020 Sept 19]. Available from: https://www.aihw.gov.au/reports/hse/223/emergency-dept-care-2017-18/data

Within SA public facilities, available data such as the top 10 list of common presentations are in stark contrast to international data, with more trauma and pulmonary TB (Table 4).[43,75,89,90] These public facilities include New Somerset Hospital (NSH) in Cape Town (2007), Paarl Hospital (2008) and from more recent thesis from Khayelitsha Hospital (KDH) and Mitchells Plain Hospital (MPH) in 2015.[43,75,89,90]

Table 4: Top 10 common presentations in public emergency departments (%)

	NSH[1]	MPH[2]	KDH[3]	Paarl[4]
1	Head Injury (4)	Trauma (10)	Trauma (10)	Trauma (36)
2	Abdominal pain (4)	Abdominal Pain (9)	Pain (10)	Gastrointestinal (22)
3	Pulmonary TB (3)	Pain (7)	Shortness of Breath (9)	Respiratory tract (12)
4	Dyspnoea (3)	Oedema (7)	Abdominal Pain (7)	Nervous system (8)
5	Stab chest (3)	Shortness of Breath (6)	Oedema (7)	Musculoskeletal (7)
6	Lower limb injury (2)	Chest Pain (6)	Cough (6)	Systemic or Metabolic (7)
7	Gastroenteritis (2)	Vomiting (4)	Diarrhoea (5)	Cardiovascular (5)
8	Chest pain (2)	Strange Behaviour (4)	Seizures (4)	Genitourinary tract (4)
9	Incomplete miscarriage (2)	Seizures (4)	Strange Behaviour (4)	Ear Nose Throat (4)
10	Upper limb injury (2)	General weakness (3)	Vomiting (4)	General weakness (4)

[1] Hodkinson PW, Wallis LA. Cross-sectional survey of patients presenting to a South African urban emergency centre. Emerg Med J. 2009 Sep;26(9):635-40.

[2] Naidoo AV. Describing the most common presenting complaints, their priority and corresponding diagnoses at Mitchell's Plain Emergency Centre [master's thesis]. Cape Town: University of Cape Town; 2019. 66 p.

[3] Naidoo AV. Describing the most common presenting complaints, their priority and corresponding diagnoses at Khayelitsha Emergency Centre [master's thesis]. Cape Town: University of Cape Town; 2019. 57 p.

[4] Hanewinckel R, Jongman HP, Wallis LA, Mulligan TM. Emergency medicine in Paarl, South Africa: A cross-sectional descriptive study. Int J Emerg Med. 2010 Sep;3(3):143-50.

Table 5: Triage scores of emergency department or community health centers (%)

%	NSH[1]	MPH[2]	KDH[3]	Paarl[4]	CHC[5]
Red	2	4	4	5	35
Orange	27	33	26	14	
Yellow	48	41	34	67	36
Green	23	14	28	14	30

[1] *New Somerset Hospital: Hodkinson PW, Wallis LA. Cross-sectional survey of patients presenting to a South African urban emergency centre. Emerg Med J. 2009 Sep;26(9):635-40.*

[2] *Mitchells Plain Hospital: Naidoo AV. Describing the most common presenting complaints, their priority and corresponding diagnoses at Mitchell's Plain Emergency Centre [master's thesis]. Cape Town: University of Cape Town; 2019. 66 p.*

[3] *Khayelitsha District Hospital: Naidoo AV. Describing the most common presenting complaints, their priority and corresponding diagnoses at Khayelitsha Emergency Centre [master's thesis]. Cape Town: University of Cape Town; 2019. 57 p.*

[4] *Paarl Hospital: Hanewinckel R, Jongman HP, Wallis LA, Mulligan TM. Emergency medicine in Paarl, South Africa: A cross-sectional descriptive study. Int J Emerg Med. 2010 Sep;3(3):143-50.*

[5] *Wallis LA, Twomey M. Workload and casemix in Cape Town emergency departments. South African Med J. 2007 Dec;97(12):1276-80.*

Similar triage scores were seen across the SA facilities, including at community health clinics (CHC) although the latter combined red (immediate) and orange (emergency) codes (Table 5).[91] Disposal destinations were similar in the NSH and Paarl hospitals, as compared to the CHC which operate at a primary care level.[91] NSH had an admission rate of 25%, referred to another hospital (2%), discharged directly home (20%), or discharged but to follow-up at the hospital (11%) or clinic (15%).[43] Paarl hospital had an admission rate of 16.5%, referred to another hospital (8.3%), left without being seen (25.8%), left against medical advice (9.6%) and 0.6% died.[75] In comparison, the CHC did not admit patients, but discharged (91.5%) or referred to another institution (6.9%) or died (0.8%).[91]

Using publicly available data from the SA private healthcare sector as reported by the 2017 Council of Medical Schemes (CMS) audit, the most common diagnoses from the PMB list were emergency conditions (17%), pregnancy (16%), psychiatric disorders (13%), acute and

subacute ischaemic heart disease (12%), pneumonia (9%), closed fractures (8%), cataracts (7%), respiratory conditions in newborns (7%), metastatic conditions and septicaemia (6%), and treatable breast cancer (6%). Note that these figures were combined with treatment costs, as the CMS audit is mainly financially orientated. The CMS does not rank patient presenting complaints to the ED but lists claims submitted to medical aid for reimbursement whether in or out of hospital.[17] Also, the PMB list is not comparable to other countries as the PMB list is unique to South Africa medical aid legislation detailing medical conditions that are mandatorily covered by medical schemes independent of the amount of financial contribution.[92]

Thus in SA, there is a lack of any data for direct comparison between public facilities and private facilities regarding common ED presentations. Given that the private sector serves a patient population with greater financial resources[11] and less trauma, HIV and TB, it is likely that the private sector list will mirror the international list of common presentations.

Conclusion

With possible changes and amalgamations to the SA healthcare system, more information is required to elucidate the number and the severity of medical conditions that present to South African EDs. The private healthcare sector has pre-existing data collections which can help elucidate this problem and characterise the patients that present to private EDs.

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Part B: Manuscript in article format

(Prepared for African Journal of Emergency Medicine)

A retrospective description of a 12 month caseload at four private emergency centres in South Africa

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A retrospective description of a 12 month caseload at four private emergency centres in South Africa

Abstract

Introduction

In South Africa, private emergency departments (ED) are often the first port of call for a substantial proportion of the population served by the private healthcare sector. This study aims to describe the number, acuity and chief complaint of patients that presented to a sample of urban private EDs within South Africa.

Methods

A retrospective review of patient data from January 2018 to December 2018 was performed for four private facilities from a large private healthcare group. Data collected include demographics, time of arrival, disposal, triage score and presenting complaint.

Results

A total of 71079 patients presented to the four facilities. The South African Triage Scale (SATS) scores were as follows: red (5%), orange (11%), yellow (65%) and green (19%). Patients arrived mostly during the day (08:00-17:00 (54%)), evening (17:00-22:00 (27%)) and night (22:00-08:00 (19%)). Disposal of patients included admission (14%), discharge (77%), transfer to another facility (2%) and those who left without being seen (3%). The most frequent presenting complaints included gastrointestinal complaints, falls, respiratory issues, fever, traffic accidents and chest pain.

Conclusion

This study is the first description of the caseload and case mix in private EDs in South Africa. The most common presenting complaints were gastrointestinal and respiratory, with chest pain being the commonest red triaged complaint. Such complaints are similar to international data. In contrast, trauma related to assault is ranked 20th in private as opposed to 1st in the public sector. Admission rates are in keeping with US data, but lower than SA public, UK and Australia. Lastly, many green patients are follow ups which likely relates to the fee-for-service nature of the private sector and continuum of care fulfilled by ED doctors.

Keywords

Triage, emergency department, Africa, private sector

African relevance

- South Africa (SA) has a dual healthcare system; emergency care presentations to the private sector are more in line with those seen in high-income countries, as opposed to the SA public sector which likely has more similarities to other African countries. As SA moves towards a National Health Insurance system, public and private sectors will need to work together to address these different needs.

A retrospective description of a 12 month caseload at four private emergency centres in South Africa

Introduction

South Africa (SA) has a dual healthcare system, a public sector funded by the state and a private sector funded by medical schemes or insurance (the former is a subset of general insurance that is highly regulated within healthcare specific insurance).[1] The public sector encourages patients to seek primary health care first and thereafter to be referred to specialists as appropriate. However within the private sector, there is a perceived lack of comprehensive primary health care with many patients going directly to specialists and or hospitals.[2] Thus patients often arrive at private hospital emergency departments (ED) as the first port of call for a spectrum of healthcare needs.

Currently there is no published research to describe the case mix of patients seen in private EDs in South Africa.[3] Nor of the acuity or severity of the conditions that present to these centres. Such information will be useful for future planning of healthcare services, especially since the National Health Insurance (NHI) has been proposed to be a national health financing system that will compel private sector to integrate into public sector thus providing access to quality health care irrespective of socio-economic status. As a result, the NHI will dynamically change the future case mix of patients arriving at private EDs.[4]

Acuity of emergency presentations in SA are triaged using the South African Triage Scale (SATS) with target times to be seen for each: red as immediate (<1 min), orange as very urgent (<10 min), yellow as urgent (<1 hour) and green (< 4 hours) as non-urgent cases.[5,6] Identifying non-urgent presentations has been identified as a means to unload emergency departments and curb use as a 24-hour convenience centre rather than for real emergency cases.[7] An example includes the use of co-locating a general practioner run, walk-in centres to see non-urgent cases.[8]

This study will be the first to describe the demographic, acuity and presenting complaints of patients attending a sample of private EDs in South Africa.

Methods

A retrospective database review was performed on four private hospitals from a single private hospital group for the period 1 January 2018 to 31 December 2018. Each site was selected (one per province) in major economic centres in SA, as a convenience based sample with the

knowledge that each ED had a similar number of patients, and a similar range of facilities and specialities in the associated hospital. The hospitals (ranging in size from 200 – 350 inpatient bed capacity) were located in Gauteng, Kwazulu Natal (KZN), Eastern Cape (EC) and the Western Cape (WC).[9,10]

Each site was located in an urban location, with a substantial private healthcare sector client population and comparable numbers of patients presenting across the four sites (approximately 1500 – 2000 patients per month). All four hospitals (identified here by province only) offered similar services (cardiology catheter lab, CT, MRI, onsite blood laboratories, all major specialities and an intensive care unit). No in-patient psychiatric services were offered by any of the sites selected. All four sites were operated by the same group network of ED doctors and the hospitals were operated by a single company.

An existing database from the hospital group was used to provide date and time of presentation, age, gender, presenting complaint, SATS score and disposal from the ED which are routinely collected. All data were collected by a triage nurse at the time of presentation, with the method of disposal completed as they left the ED. Each patient record was routinely double-checked by a nursing manager to ensure data integrity (data was collected primarily for monthly statistics reported to head office).

All patients that presented to the ED during the time period were included. The presenting complaint was selected by each triage nurse from a prepopulated list to which they approximated the patient's main complaint. The final SATS score was auto-calculated from vital signs and presentation by the database system.

Data were analysed using standard descriptive statistical methods with Microsoft Excel for non-parametric data such as the demographics and acuity of the triage scores. Presenting complaint data was categorised according to general systems, but allowing for categorization of high morbidity presenting complaints such as chest pain and stroke. The data were presented as numbers and percentages as appropriate. The study was approved by the University of Cape Town's Human Research Ethics Committee (ref: HREC 637/2019) and the private hospital group involved.

Results

A total of 71079 patients were seen across the four hospitals in the study period. The main characteristics of the patients arriving at each of the EDs and their acuity and outcome are shown in Table 1.

Table 1: Main characteristics of patients presenting to four private emergency departments in 2018.

N (%)	Gauteng	WC[1]	KZN[2]	EC[3]	Overall
Gender Male	10897 (47)	12062 (53)	8468 (49)	4169 (50)	35596 (50)
Age (years)					
≤12	6227 (27)	4069 (18)	3655 (22)	1437 (17)	15388 (22)
12 - 18	874 (4)	873 (4)	735 (4)	371 (4)	2853 (4)
18 - 65	13231 (58)	15443 (68)	10632 (63)	5093 (61)	44399 (63)
≥ 65	2656 (12)	2351 (10)	1992 (12)	1462 (18)	8461 (12)
Time					
08:00 - 17:00	11353 (49)	13658 (60)	8887 (52)	4330 (52)	38228 (54)
17:00 - 22:00	7013 (31)	5344 (24)	4604 (28)	2152 (26)	19113 (27)
22:00 - 08:00	4608 (20)	3727 (16)	3510 (21)	1870 (22)	13715 (19)
Triage (SATS[4])					
Red	255 (1)	276 (1)	377 (2)	2646 (32)	3554 (5)
Orange	2796 (12)	1752 (7)	2209 (13)	691 (8)	7448 (11)
Yellow	15318 (67)	14590 (64)	12785 (75)	3345 (40)	46038 (65)
Green	4336 (19)	6100 (27)	1588 (9)	1597 (19)	13621 (19)
Disposal					
Admitted	2525 (11)	2846 (13)	3154 (19)	1616 (19)	10141 (14)
Discharged	18372 (80)	17942 (79)	12214 (72)	6120 (73)	54648 (77)
Transfer	463 (2)	311 (1)	209 (1)	136 (2)	1119 (2)
Unseen[5]	565 (2)	863 (2)	650 (4)	160 (2)	2238 (3)
Total	22989 (32)	22737 (32)	17015 (24)	8364 (12)	71079 (100)

[1]WC, Western Cape; [2]KZN, Kwazulu Natal; [3]EC, Eastern Cape; [4]SATS, South African Triage Scale; [5]Unseen, patients left without being seen by doctor.

The Eastern Cape ED had 32% patients triaged red, as compared to others having 1%. Further investigations revealed that there was a high prevalence of chest pain in this cohort (10% versus 3%) as well as more elderly patients (18% versus 11%). Presentations of

respiratory complaints (11%) and GIT (gastrointestinal) (9%) thereafter were of similar rank as compared to other EDs.

Unseen patients predominately come during the day (55%) with very few during the night (16%), and consisted of those triaged yellow (70%) and green (26%). The main complaints for these unseen patients were GIT (12%), unspecified pain (10%), fall (9%), respiratory (6%) and follow up (5%).

Overall patient presentations to the ED for all four hospitals are shown in Figures 1 and 2 for the time of presentation as broken down by triage category and day of the week.

Figure 1: Number of patients presenting for each time period and triage category

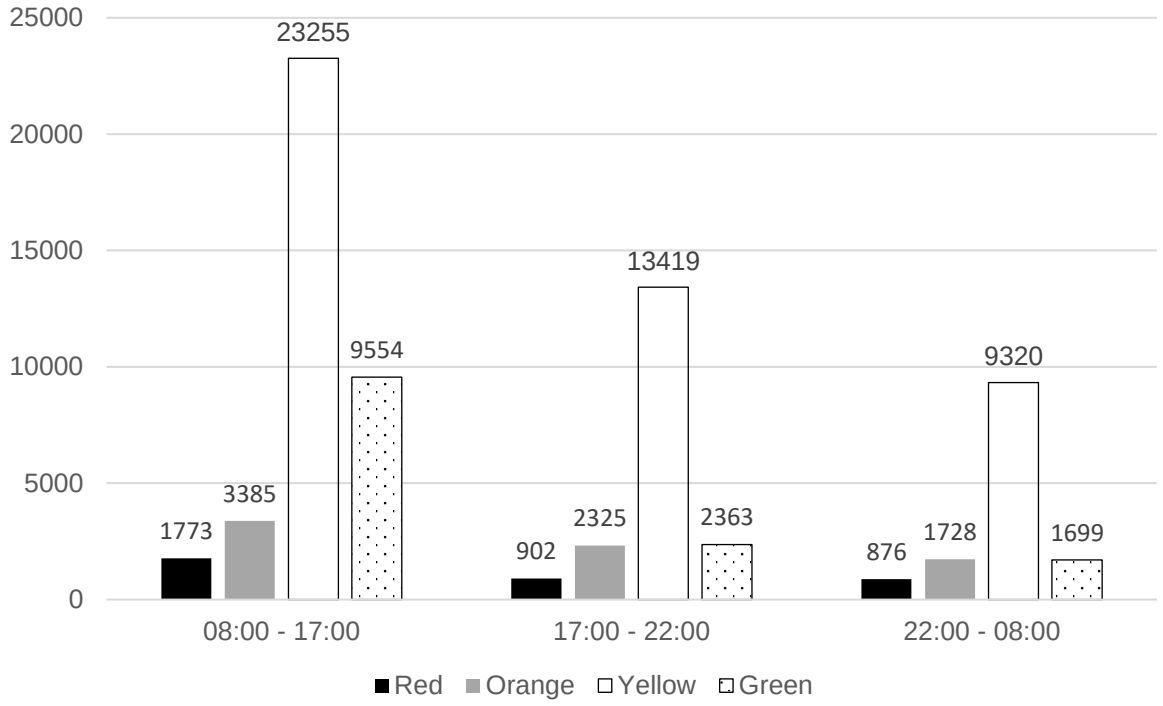
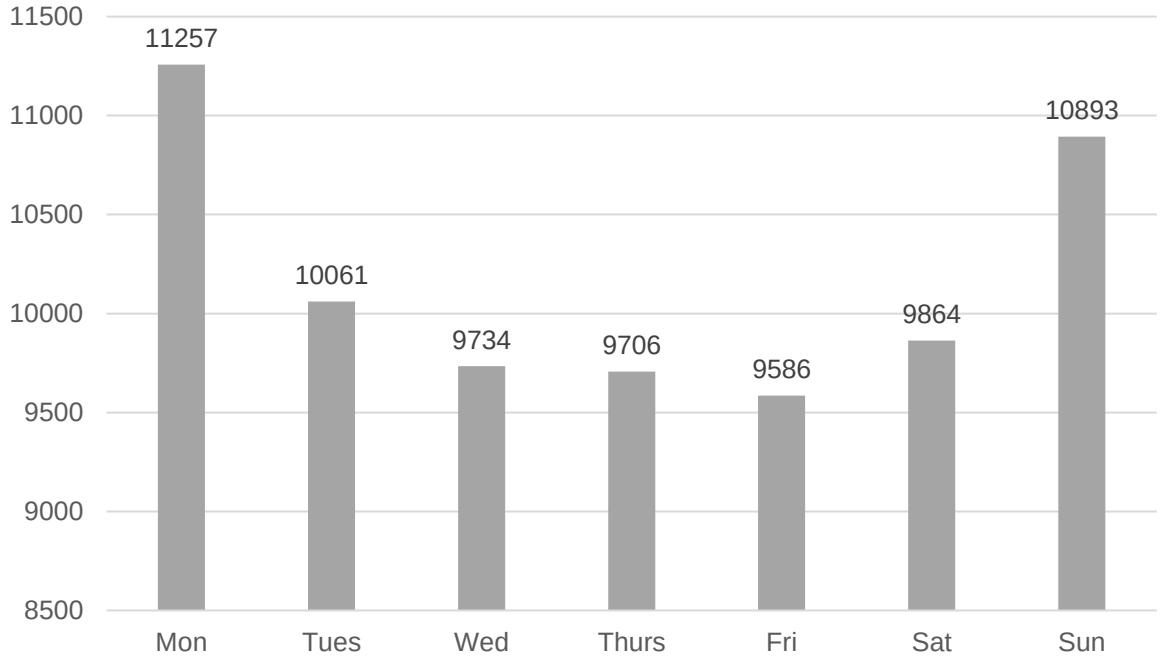


Figure 2: Number of patients presenting per day of the week

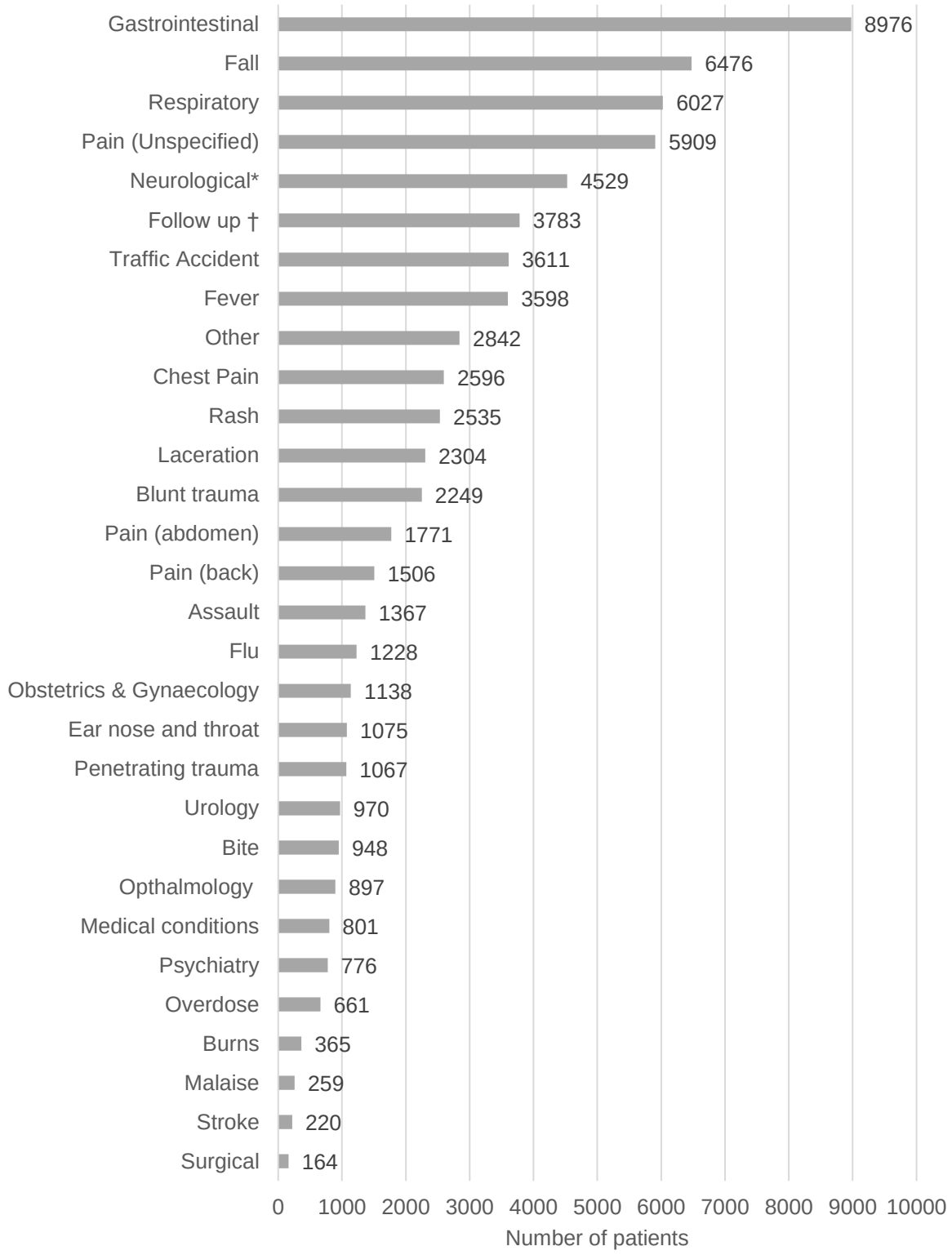


The most frequent presenting complaints of the four hospitals and their triage categories are shown in Table 2 and Figure 3. Detailed data on presentations and the categorisation system used is shown in Supplementary Table 1. Since presentations were largely similar across the four hospitals, the data is shown for the overall sample.

Table 2: Top 10 presenting complaints in different triage categories (N (%))

	Red	Orange	Yellow	Green
1	Chest pain	Chest Pain	Gastrointestinal	Follow up
	914 (26)	1286 (17)	7856 (17)	3152 (23)
2	Respiratory	Respiratory	Fall	Other
	631 (18)	1196 (16)	4892 (11)	1899 (14)
3	Neurological	Fever	Pain (unspecified)	Respiratory
	529 (15)	821 (11)	4607 (10)	1141 (8)
4	Fall	Fall	Respiratory	Pain (Unspecified)
	218 (6)	717 (10)	3009 (7)	886 (7)
5	Stroke	Neurological	Neurological	Rash
	188 (5)	470 (6)	2637 (6)	741 (5)
6	Medical conditions	Gastrointestinal	Traffic accident	Traffic accident
	181 (5)	524 (7)	2258 (6)	620 (5)
7	Overdose	Overdose	Fever	Fall
	138 (4)	346 (5)	2391 (5)	587 (4)
8	Gastrointestinal	Traffic accident	Laceration	Blunt trauma
	125 (4)	294 (4)	2099 (5)	569 (4)
9	Traffic accident	Pain (Unspecified)	Rash	Flu
	107 (3)	284 (4)	1618 (4)	564 (4)
10	Pain (Unspecified)	Medical conditions	Blunt trauma	Gastrointestinal
	101 (3)	247 (3)	1593 (3)	415 (3)

Figure 3: Most frequent presenting categories to all emergency departments



** Neurological includes all neurological complaints excluding stroke*

† Follow up includes wound review, stitch removal, medication and blood result review amongst others (see appendix 1 for further details)

Discussion

The results describe the patient population that presents to private EDs, with many appearing during the day, on Monday and Sunday's in particular. Chest pain presents most frequently as a red SATS category, with green patients as follow up patients. Furthermore, the most frequent presenting complaint categories are gastrointestinal, fall and respiratory complaints.

Such results are difficult to interpret in context as there has been no previous published data from SA private EDs. Therefore only by comparing to international and public sector EDs, can we identify the context in which private EDs operate. Such comparisons will be useful for NHI, which as the national health financing system will dictate how private sector integrates into the public sector thus changing the demographic of patients arriving at private EDs in the future.[1]

Private sector EDs currently work within a competitive environment, offering services that may or may not be on offer from other nearby hospitals. Also, private patients are not restricted by distance to attend a specific ED and will often travel to well-known reputable hospitals. Thus, often private ED patient demographics may reflect the gamut of services offered by their respective hospital only. For example, a trauma focused ED will see more trauma than a general ED.[1] In comparison, public sector EDs are limited in seeing patients from immediate surrounding drainage areas and offer a complimentary host of services so that if one hospital lacks a speciality, an inter-hospital transfer is arranged after stabilisation of the patient. International comparisons are useful as the UK and Australian registries likely reflect the final outcome of the NHI once fully implemented as a single health financing system.

Public sector ED's comparisons are made from four individual Cape Town facilities: New Somerset Hospital (NSH) (2007),[11] Paarl (2010),[12] Mitchells Plain Hospital (MPH) (2015)[13] and Khayelitsha District Hospital (KDH) (2015).[14] The latter two are unpublished thesis manuscripts but represent recent literature. Unfortunately, these four research papers represent the only published research for general public EDs in South Africa.

International comparisons were made to national data from the US National Survey (2017),[15] UK National Health Service (2017-2018),[16] and Australian Institute of Health and Welfare (2017-2018).[17] Age was limited to under 12 in the SA private sector as compared to the US which was less than 15, with the UK and Australia at less than 14. Whilst these may differ from their legal definitions, pragmatically these are how the patients are captured on the database. For the sake of comparison between the SATS four-tier triage model versus the international five-tier models, the urgent and semi-urgent triage categories were collapsed into one category. The results of all these comparisons are shown in Table 4.

Table 4: Summary of results in comparison to public and international data (%)

%	Private	Public				International		
		NSH[1]	MPH[2]	KDH[3]	Paarl[4]	USA[5]	UK[6]	Australia[7]
Age								
Paediatric*	22	15	21	18	-	20	20	21
Geriatric (≥65)	12	12	-	-	-	16	21	22
Arrival time								
Day	54	47	48	49	39	-	63	46
Afternoon	27	32	22	33	43	-	24	33
Evening	19	15	23	19	17	-	13	17
Day of week								
Monday	16	17	16	16	-	-	16	15
Tuesday	14	16	16	13	-	-	14	14
Wednesday	14	13	14	13	-	-	14	14
Thursday	14	12	15	15	-	-	14	14
Friday	13	14	15	15	-	-	14	14
Saturday	14	14	15	14	-	-	14	14
Sunday	15	14	8	14	-	-	14	15
Disposal								
Admission	14	25	-	-	17	14	19	30
Discharge	77	46	-	-	47	77	57	60
Unseen	3	-	-	-	10	1	3	1
Triage								
Red	1	2	4	4	5	1	-	1
Orange	11	29	33	26	14	11	-	13
Yellow	65	24	41	34	67	58†	-	76†
Green	19	12	14	28	14	4	-	9

** delineated as less than 12 in South Africa, less than 14 in the UK and Australia, and less than 15 in the USA.*

† International yellow cases are actually comprised of two tiers (urgent and semi-urgent categories) to enable comparative purposes to yellow cases in South Africa.

[1] New Somerset Hospital: Hodkinson PW, Wallis LA. Cross-sectional survey of patients presenting to a South African urban emergency centre. Emerg Med J. 2009 Sep;26(9):635-40.

[2] Mitchells Plain Hospital: Naidoo AV. Describing the most common presenting complaints, their priority and corresponding diagnoses at Mitchell's Plain Emergency Centre [master's thesis]. Cape Town: University of Cape Town; 2019. 66 p.

[3] Khayelitsha District Hospital: Naidoo AV. Describing the most common presenting complaints, their priority and corresponding diagnoses at Khayelitsha Emergency Centre [master's thesis]. Cape Town: University of Cape Town; 2019. 57 p.

[4] Paarl Hospital: Hanewinckel R, Jongman HP, Wallis LA, Mulligan TM. Emergency medicine in Paarl, South Africa: A cross-sectional descriptive study. Int J Emerg Med. 2010 Sep;3(3):143-50.

[5] Rui P, Kang K. National Hospital Ambulatory Medical Care Survey: 2017 emergency department summary tables [Internet]. Atlanta: National Centre for Health Statistics; 2017 [cited 2020 Oct 18]. 67 p. Available from: https://www.cdc.gov/nchs/data/nhamcs/web_tables/2017_ed_web_tables-508.pdf

6 Gair D. Hospital Accident and Emergency Activity - 2017-18 [Internet]. Surrey: National Health Service; 2018 [cited 2020 Oct 18]. 4 p. Available from: https://files.digital.nhs.uk/D3/CCB4FE/AE1718_ Annual Summary.pdf

[7] Australian Institute of Health and Welfare. Emergency department care 2017-18 [Internet]. Canberra: Australian hospital statistics; 2018 [cited 2020 Sept 19]. Available from: https://www.aihw.gov.au/reports/hse/223/emergency-dept-care-2017-18/data

Triage categories describe the acuity of presentations. The range of triage scores mirrored closely with international data as opposed to public sector which had a higher number of red and orange cases (predominantly due to trauma).[13,14,18] The number of red cases in private however, was skewed by the Eastern Cape ED which revealed a high prevalence of chest pain presentations and could reflect a difference in coding or real presentations of myocardial infarction. Unfortunately, due to the lack of final International Classification of Disease (ICD-10) diagnosis, we are unable to comment further. Also, such an increase in red cases may be attributable to several old age homes in the vicinity with the result that more elderly patients attend the Eastern Cape ED (personal communication).

The proportion of green triaged cases in private was counterintuitively more similar to public sector rather than international data. In private, a large number of green cases are follow ups (23%) which reflects the fee-for-service nature of the private sector. Hence if a suture is placed at the ED, then the same doctor(s) from the same group practice removes the sutures or inspects the wound. Such follow ups are also reflected in US data with a similar proportion.[15] In the public sector, a large number of green cases present with long term back pain or abdominal pain for example, whereas suture removal or wound inspection are deferred to follow-up at their local clinic.[19]

Other common green triaged cases seen in private, such as unspecified pain, rash and traffic accidents are likely presenting to the ED because patients don't know where else to seek

healthcare or are unsure if their injuries need immediate attention or not.[21] In contrast, public patients triaged green, present because of diagnostic uncertainty from primary care level or societal encouragement to visit a hospital rather than the clinic.[20]

Table 5 shows the comparisons between local and international data and while our data does correlate with international data regarding GIT complaints, the public sector sees a higher burden of trauma. [13,14] Trauma in the private sector is mainly in the form of traffic accidents (7th overall), while the public sector trauma tends to be more penetrating trauma due to gunshots and stab wounds,[18] which was ranked 20th in private. Blunt trauma such as sport injuries and lifting injuries was ranked 13th, reflecting how recreational activities affect the type of trauma presenting in private.

Table 5. Top 5 presenting complaint category (%)

	Private	Public				International		
		NSH[1]	MPH[2]	KDH[3]	Paarl[4]	USA[5]	UK[6]	Australia[7]
1	GIT[8]	Head Injury	Trauma	Trauma	Trauma	Pain (abdomen)	Unclassified diagnosis	Pain (abdomen)
2	Fall	Pain (abdomen)	Pain (abdomen)	Pain	GIT	Chest Pain	Orthopaedic	Painful throat
3	Respiratory	PTB	Pain	Dyspnoea	Respiratory	Fever	Respiratory	Viral infection
4	Pain	Dyspnoea	Swelling	Pain (abdomen)	Neurological	Dyspnoea	Sprain	Pain (back)
5	Neurological	Stab chest	Dyspnoea	Swelling	Soft tissue	Headache	Laceration	Injury (unspecified)

[1] New Somerset Hospital: Hodkinson PW, Wallis LA. Cross-sectional survey of patients presenting to a South African urban emergency centre. Emerg Med J. 2009 Sep;26(9):635-40.

[2] Mitchells Plain Hospital: Naidoo AV. Describing the most common presenting complaints, their priority and corresponding diagnoses at Mitchell's Plain Emergency Centre [master's thesis]. Cape Town: University of Cape Town; 2019. 66 p.

[3] Khayelitsha District Hospital: Naidoo AV. Describing the most common presenting complaints, their priority and corresponding diagnoses at Khayelitsha Emergency Centre [master's thesis]. Cape Town: University of Cape Town; 2019. 57 p.

[4] Paarl Hospital: Hanewinckel R, Jongman HP, Wallis LA, Mulligan TM. Emergency medicine in Paarl, South Africa: A cross-sectional descriptive study. Int J Emerg Med. 2010 Sep;3(3):143-50.

[5] Rui P, Kang K. National Hospital Ambulatory Medical Care Survey: 2017 emergency department summary tables [Internet]. Atlanta: National Centre for Health Statistics; 2017 [cited 2020 Oct 18]. 67 p. Available from: https://www.cdc.gov/nchs/data/nhamcs/web_tables/2017_ed_web_tables-508.pdf

[6] *Gair D. Hospital Accident and Emergency Activity - 2017-18 [Internet]. Surrey: National Health Service; 2018 [cited 2020 Oct 18]. 4 p. Available from: https://files.digital.nhs.uk/D3/CCB4FE/AE1718_ Annual Summary.pdf*

[7] *Australian Institute of Health and Welfare. Emergency department care 2017-18 [Internet]. Canberra: Australian hospital statistics; 2018 [cited 2020 Sept 19]. Available from: https://www.aihw.gov.au/reports/hse/223/emergency-dept-care-2017-18/data*

[8] *Gastrointestinal*

Arrival time of patients are important for EDs to plan for adequate human resources to ensure optimal healthcare delivery. In private, the patients presented mainly during the day, with more seen on Sundays and Mondays. Mondays are consistently shown to be busier in public sector and internationally. UK data demonstrates that patients with medical problems will wait for Monday as they are aware that weekends have reduced staff and can skip waiting for planned GP appointments in several days and be seen on the same day in the ED.[22] In contrast, SA public sector data demonstrate that EDs are filled with trauma, with over half of all trauma cases for the week appearing over the weekends alone in some EDs.[18]

Patients also arrived consistently more during the day, followed by the afternoon and then evening (Figure 1). Importantly the triage code or severity of patient conditions did not change during the different time periods which were the same locally and internationally.[13,1415,17] Thus the evidence does not support the often held belief that higher acuity cases present in the evenings.

Lastly, the disposal of ED patients is an indicator of severity of conditions and the appropriateness of ED utilisation. There is a perception of unnecessary admissions in the private sector (perhaps driven by hospital profit incentives, or by complex medical insurance processes which only pay for admissions) .[1] Nonetheless, our data has shown that the admission rates from private ED were low, similar to US data.[15] UK, Australia and the SA public sector had higher admission rates. Admission status is not only determined by disease severity but also by socioeconomic status (SES) as the latter often determines whether patients can manage at home post-discharge from the ED.[23]

The limitations of this study include not having a link to the final ICD-10 diagnosis to correlate with presenting complaint categories. Unfortunately this information was spread between two independent databases that were difficult to link given the large dataset, yet the presenting complaint is the immediate information from the patient and reflects daily practice at any ED. Secondly, there was some variation between the sampled EDs despite our best attempts prior to match the sample. These include prior communication with emergency doctors working in those respective ED and selecting those ED with a comparable number of patients, yet we still believe that seen together this is a representative perspective of SA private ED case mix. Thirdly, presenting complaints were not categorised according to standard reporting standards developed by the International Health Terminology Standards Development Organisation[24] or numerous other chief complaint classification systems.[25] Such systems are not supported with the current software but other non-electronic consensus classification settings work equally well in low-income settings.[26,27]

Conclusion

The results of this study demonstrate that SA private EDs see similar demographics as international and public sector EDs regarding age and time to presentation. However, the presenting complaint categories and their triage scores in more in keeping with international EDs with medical gastrointestinal and respiratory complaints, with chest pain being the commonest high acuity presentation. Trauma is only the seventh most common presentation in private EDs as compared to first in public sector ED. Admission rates of private EDs follow international EDs however many patients follow-up at private EDs as compared to internationally. Future research should assess final ICD-10 diagnosis to refine which types of patients present to EDs and which patients get admitted. Importantly, research should focus on developing possible referral pathways to primary care, thus reducing follow ups at ED and develop a collaborative healthcare system in which private sector emulates public sector.

Dissemination of results

Results from this study will be shared with the private hospital research committee, and disseminated through emergency medicine forums including conferences, and peer reviewed publication.

Author's contribution

Authors contributed as follow to the conception or design of the work; the acquisition, analysis, or interpretation of data for the work; and drafting the work or revising it critically for important intellectual content:

JK contributed 80% and PH 20%;

All authors approved the version to be published and agreed to be accountable for all aspects of the work.

Declaration of competing interests

The authors declared no conflicts of interest.

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Supplementary Data

Suppl Table 1: Breakdown of presenting complaint categories and their constituents (N (%))

Assault	1367 (2)	Assault	887 (65)
		Struck	220 (16)
		Stab	176 (13)
		Gunshot	84 (6)
Bite	948 (1)	Dog	428 (45)
		Other	190 (20)
		Insect	139 (15)
		Spider	55 (6)
		Cat	54 (6)
		Venomous animal	45 (5)
		Human	37 (4)
Blunt trauma	2249 (3)	Sport related injury	865 (39)
		Lifting	688 (31)
		Collision	642 (29)
		Explosion	17 (1)
Follow up	3783 (5)	Check up	1868 (49)
		Dressing	830 (22)
		Removal of sutures	548 (14)
		Follow up	235 (6)
		Blood tests	176 (5)
		Prescription	68 (2)
		Post exposure prophylaxis	55 (1)
		Wound check	3 (0)
Gastrointestinal	8976 (13)	Diarrhoea	3360 (37)
		Nausea + Vomiting	2804 (31)
		Nausea + Vomiting + Diarrhoea	1580 (18)

		Gastrointestinal unspecified	1232 (14)
Medical conditions	801 (1)	Cardiac condition	270 (34)
		Hypertension	266 (33)
		Diabetes	265 (33)
Neurological	4529 (6)	Headache	1942 (43)
		Dizziness	1188 (26)
		Unspecified	766 (17)
		Seizure	553 (12)
		Unconscious	80 (2)
Obstetrics & Gynaecology	1138 (2)	Gynaecological	953 (84)
		Obstetrical and abdominal pain	185 (16)
Penetrating trauma	1067 (2)	Foreign body entering skin	544 (52)
		Accidental cut	411 (39)
		Fell onto sharp object	77 (7)
		Trolley	14 (1)
		Electrocution	9 (1)
Psychiatry	776 (1)	Anxiety	573 (74)
		Psychiatry (unspecified)	211 (27)
Overdose	661 (1)	Overdose	522 (79)
		Poisoning	139 (21)
Other	2842 (4)	Other	2454 (86)
		Epistaxis	205 (7)
		Syncope	159 (6)
		Exposure to sunlight	3 (0)
		Drowning	18 (1)
Respiratory	6027 (8)	Respiratory unspecified	3844 (64)
		Coughing	2183 (36)
		Shortness of breath	1879 (31)
Surgical	164 (0)	Surgical	92 (56)

		Malena stools	72 (44)
Traffic accident	3611 (5)	Motor vehicle accident	1895 (55)
		Crush injury	1349 (39)
		Motor bike accident	223 (6)
		Bicycle	144 (4)
Urology	970 (1)	Urinary tract infection	343 (35)
		Dysuria	234 (24)
		Urology unspecified	206 (21)
		Haematuria	120 (12)
		Frequency	67 (7)

Categorisation of individual presenting complaints followed the broad interpretation by the International Health Terminology Standards Development Organisation[24] except the 'other' or miscellaneous category. Hence, Table 2 only includes categories that were not self-explanatory or consisted a mixture of symptoms that approximated the group category. Hence, the category for chest pain consisted solely of patients complaining of chest pain whereas bite consisted of bites from humans, dogs and cats etc. In particular, the category 'neurological' includes all complaints including headache, dizziness and unconsciousness except complaints relating to possible stroke.

Part C: Addenda

Appendix 1: Author guidance for African Journal of Emergency Medicine

The author guidelines for the African Journal of Emergency Medicine can be found at (accessed 29 October 2020):

https://www.elsevier.com/journals/african-journal-of-emergency-medicine/2211-419X/guide-for-authors

Appendix 2: Research protocol

A retrospective description of a 12 month caseload at four private emergency centres in South Africa

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Background

Within the private health care sector, the private emergency departments (EDs) are often the first port of call as there is a perceived lack of comprehensive primary health care with many patients going directly to specialists or hospitals. Thus many non-urgent presentations present themselves as urgent to emergency centres. Such a pattern of seeking health care is seen in other countries but yet to be validated in South Africa (SA).[1]

There has been no prior background research to describe what caseload and case mix of patients that arrive in private EDs in SA.[2] Also, there is no knowledge of the acuity or severity of these conditions that present to these centres. The above information will be useful for future healthcare planning services, especially since the National Health Insurance (NHI) has been proposed to be a national health financing system that will compel private sector to integrate into public sector thus providing access to quality health care irrespective of socio-economic status. As a result, the NHI will dynamically change the future case mix of patients arriving at private EDs.[3]

As experienced from previous public-private partnerships, often the private partner has better developed systems to administer systems with excellent record keeping.[4] A private hospital group operates an internal database system, Medibank which tracks patient demographics, acuity of their presenting condition, and final diagnosis amongst other information as part of their electronic health record system.

Patient demographics include age and gender but also funding status such as paying via medical aid, insurer, cash or injury on duty. It is well known that the latter pays only for trauma injuries sustained at work, whereas other funding statuses will include medical conditions as well.

In private ED, acuity of emergency conditions are classified by the South African Triage Scale.[5] Arrival via ambulance is recorded as it relates to the acuity of the condition and hence likelihood of admission.[6] The final diagnosis whether admitted or discharge is coded according to the International Classification of Diseases (ICD) 10 with relevant modifier codes applied to trauma for example, due to a motor vehicle accident as a driver etc. Importantly the frequency of the most common diagnoses will enable better health care planning.[7] Furthermore, identifying non-urgent diagnoses can enable future planning to depressurise EDs and curb abuse as a 24-hour convenience centre rather than an ED.[8]

Therefore there is a need to determine which patient demographic present to private EDs, are their diagnoses urgent or non-urgent and how common these diagnoses are. This information would prove invaluable when doing an impact assessment for private EDs in SA and the overall change once the NHI has been implemented.

Research Question

What are the demographics, acuity and frequency of common diagnoses in private emergency departments located in major South African urban areas in 2018?

Objectives

1. Describe the demographics of patients presenting to private emergency departments
2. Describe the acuity of patients presenting to private emergency departments
3. Describe the most common diagnoses in private emergency departments

Methodology

A retrospective review of the electronic database as operated by a private hospital group from January 2018 to December 2018. The expected sample size is 70 000.

The private hospital group operates an internal clinical database called Medibank in which every patient is captured by the treating nursing sister, re-checked by an additional sister at the same unit onsite and a monthly review is conducted by the nursing sister in charge of the ED before final submission to head office. At head office, the head of emergency services employs a Medibank employee to maintain the database and ensure its integrity for monthly reporting to executives. Access to Medibank via the central dashboard is only restricted to senior management and via their research division with permission after research approval. All electronic data handling is required to be password protected.

Information captured by Medibank forms part of their patient electronic health records, thus fields such as age, sex, date of birth, vitals, presenting complaint and final ICD-10 diagnoses are captured on the system. A summary of the data fields specifically extracted from Medibank are presented in Appendix 1.

Study Design

A retrospective review of the electronic database capturing patients presenting to private EDs.

Study setting and population

Patients included in this study will be all patients that present to private EDs from January 2018 till December 2018.

Four sites have been selected, one per province in major economic centres in South Africa, as a convenience based sampling together since the principal investigator has had experience in working in some of the units, together with the co-supervisor having extensive experience in working with the majority of the units. The following hospital sites have been selected: Olivedale (Gauteng), Umhlanga (Kwazulu Natal), Greenacres (Eastern Cape) and N1 City (Western Cape).

Each site is located in a similar urban location, in which the surrounding patient population is adequate to support the private emergency centres with a sufficient number of patients that are comparable across the four sites (approximately 1500 – 2000 patients per month) and each hospital offers similar services (such as cardiology catheter lab, CT, MRI, onsite blood laboratories, all major specialities and ICU).

Research procedures and data collection methods

After relevant Human Research Ethics committee approval by the University of Cape Town and the private hospital group, a specific list of data fields will be requested from Medibank. A complete list of data fields requested can be seen in Appendix 1. All data fields will be managed via a Microsoft Excel document. All data extraction and data capturing will be done by the principal investigator.

Data safety and monitoring

All data will be kept in a password protected file on a password protected computer only accessible to the principal investigator. No paper copies will be kept. The electronic data will be kept for a five year period. Data will be backed up to a password protected Dropbox folder.

No identifiable patient information will be recorded on the primary data source extracted from Medibank.

Data analysis

The data will be analysed using standard descriptive statistical methods for non-parametric data such as the demographics, acuity of the triage score and final ICD-10 diagnoses. The

data will be presented as numbers, means, medians, standard deviations and frequency as appropriate. The statistical package STATA 13 will be used in conjunction with a statistician for support.

Ethical Considerations

Following the Declaration of Helsinki 2013, the research is classified as minimal risk research. All identifiable patient information will not be requested from Medibank such that the primary data source for this research will contain anonymous data. Research, as defined by the private hospital's research operations committee is "any academic research conducted by a researcher as part of a requirement for obtaining an academic qualification at a recognised institution". Thus, the private hospital group does not restrict research of Medibank data as part of their electronic health records, nor does it restrict research on any other internal database.

Furthermore, such academic research is defined as being collected under section 4 "Why we collect and use personal information" in the terms and conditions statement signed by every patient entering a private hospital group's healthcare facility. As such, the private hospital group's research operations committee will explicitly review this proposal after ethics approval has been sought from the Human Research Ethics Committee (HREC) of the University of Cape Town.

Confidentiality will be ensured and no disclosure given other than between the principle investigator and supervisors. There is no foreseeable risk or danger to the participants as confidentiality will be ensured.

The research will be self-funded by the principle investigator.

Description of risks, benefits and limitations

The risk is that the database is published from a single hospital group and competing hospital groups may wish to gather information on their competitors. Furthermore, with the advent of the NHI and auditing of the private sector, the public sector may use the information for political gain. As part of the private hospital group's research operations committee oversight, they will review this research application to see what extent the information is publishable in a transparent way without explicitly naming the hospital group involved.

The benefit will be that this research will be the first to describe the case load and case mix of a sample of private emergency centres in SA, located in major economic hubs of certain

provinces. The description of the case load presentations will enable a better understanding of the private sector in SA.

Limitations include that the sites selected may not be comparable and do not represent the demographics of the entire private sector for all provinces and all hospital groups. Hence external validity of the study is limited given the restraints from the underlying site selections.

Dissemination of findings

The findings will be written up in the format of a journal article with submission to a suitable international journal.

The findings of the research will be reported to the private hospital group as well.

The data will be presented at an appropriate conference either as a poster or oral presentation.

Project Timeline

	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Literature Review											
Preparing Protocol											
Ethics Application											
Collecting Data											
Data Analysis											
Writing up – thesis											
Writing up – paper											

Resource utilisation

The study is self-funded and thus limited with by available funds. The use of Medibank is routine for private hospital group as part of their daily operations and thus no additional cost to their organisation.

Budget

Item	Description	Unit cost	Number of units	Total (ZAR)
Paper	Printing documents	500	1	500
Internet	Cell C	500 for 10G	1	500
Statistician	Assist with data analysis	R500/hour	4	2000
Total				3000

References

1. Penson R, Coleman P, Mason S, Nicholl J. Why do patients with minor or moderate conditions that could be managed in other settings attend the emergency department? Emerg Med J. 2012 Jun;29(6):487-91.
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4. Whyle EB, Olivier J. Models of public-private engagement for health services delivery and financing in Southern Africa: A systematic review. Health Policy Planning. 2016 Dec;31(10):1515-1529.
5. Western Cape Government Health. The South African Triage Scale (SATS) [Internet]. Cape Town: Western Cape Government Health; 2012 [cited 2020 Oct 5]; 21 p. Available from: http://emssa.org.za/wp-content/uploads/2011/04/SATS-Manual-A5-LR-spreads.pdf
6. Burch VC, Tarr G, Morroni C. Modified early warning score predicts the need for hospital admission and inhospital mortality. Emerg Med J. 2008 Oct;25(10):674-8.
7. Ko M, Lee Y, Chen C, Chou P, Chu D. Prevalence of and predictors for frequent utilization of emergency department: A population-based study. Med (Baltimore). 2015 Jul;94(29):e1205.
8. O'Keeffe C, Mason S, Jacques R, Nicholl J. Characterising non-urgent users of the emergency department (ED): A retrospective analysis of routine ED data. PLoS One. 2018 Feb;13(2):1-14.

Appendix 1: Data Collection Tool

Item	Descriptor
Hospital Name	Olivedale / Umhlanga / Greenacres / N1 City
Hospital Number	Folder number
Demographics	
Age	Years
Sex	Male / Female
Date Presenting	DD/MM/YY
Time Presenting at Triage	24:00 Format
Payment method	medical aid / insurance / cash / injury on duty
Method of referral	Self / pharmacy / general practioner / specialist
Type of presentation	First presentation / follow up / failed discharge
Index complaint	Chest pain / shortness of breath / twisted ankle etc. as described by the concern or complaint of the patient
Acuity	
Triage Score	Composite score of vitals
Final TEWS score	Vitals plus presenting complaint with urgent signs
Diagnosis at Discharge from EC	
ICD-10 diagnosis	Final diagnosis as defined either at discharge from the emergency centre or discharged by treating specialist e.g. appendicitis/acute myocardial infarction. Relevant external code also applied, for example incision due to trauma that is self-inflicted.

Admitted/discharged	If admitted, under which doctor/speciality and where (ward/ICU/cath lab) or transferred to another hospital specialist (e.g neurosurgeon).
	Name of specialist / specialist type
	Ward / ICU / Theatre / Cath Lab / Transferred Out

Appendix 3: Ethics Approval Letter

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

Room E53-46 Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6626
Email: olivia.langenhoven@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/forms

20 September 2019

HREC REF NO: 637/2019

A/Prof P. Hodkinson
Division of Emergency Medicine
F51
OMB

Dear A/Prof Hodkinson

PROJECT TITLE: ***DESCRIPTION OF PATIENTS ARRIVING AT PRIVATE EMERGENCY CENTRES IN SOUTH AFRICA: A RETROSPECTIVE REVIEW OF FOUR EMERGENCY CENTRES IN 2018 (MMED DEGREE - DR J C KING)***

Thank you for submitting your new study to the Faculty of Health Sciences Human Research Ethics Committee.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year until the 30 September 2020.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

We acknowledge that the student: Dr J C King will also be involved in this study.

Please quote the HREC REF in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval, where necessary, before the research may occur.

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE
Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB00001938