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ORIGINAL ARTICLE

A descriptive analysis of the casemix presenting to a tertiary hospital emergency centre in East London, South Africa

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ABSTRACT

Introduction: Emergency centres are most often the point of entry to the healthcare system for patients presenting with emergencies. Even though emergency medicine has developed rapidly in certain regions of South Africa, it is yet to flourish in the Eastern Cape. A paucity of data exists with regards to the demographic and disease profile of patients presenting to Eastern Cape emergency centres. This study describes the casemix presenting to a tertiary hospital emergency centre in East London in the Eastern Cape.

Methods: A retrospective descriptive study was conducted of all patients presenting to Frere Hospital emergency centre from 1st of August 2019 to 31st of October 2019. Data were manually collected from the emergency centre paper-based register for the study period and included: patient demographics, geographical location, triage category, presenting complaint, disposition, and process times. Descriptive statistics were used to describe all variables.

Results: A total of 6 204 patients presented during the study period. The median age was 31 years, with a male predominance of 56%. Lower acuity triage categories (green and yellow) represented 67% of all cases. Trauma comprised 56% of all presentations, with assault being the most prevalent mechanism of injury in the adult population (n = 1 460, 48%). Sundays (18%) and Mondays (20%) had the highest patient caseload. The majority of patients were discharged home (n = 4 257, 69%) of which 79% had lower acuity triage categories. The majority of patients lived within a 20 km radius of Frere Hospital (n = 4 689, 77%).

Conclusion: This descriptive study provides essential data that could guide further development of emergency care systems within the Eastern Cape. A high trauma burden, comprising predominantly of lower acuity presentations are described. Social and economic determinants of violence must be addressed and multisectoral interventions are required to reduce the high burden of trauma.

Introduction

Emergency centres (ECs) are most often the point of entry to the healthcare system for patients presenting with emergencies, but timely and effective emergency care is often not a reality in many low- and middle-income countries. [1,2] Delivery of quality emergency care to all is recognised as a key component of achieving universal health coverage, which forms part of the Sustainable Development Goals of the World Health Organisation. [3] Quality emergency medical care presents a cost-effective method of reducing preventable morbidity and mortality in resource constrained countries. The importance of strengthening emergency medical care systems globally is supported by the World Health Organisation, as voiced in their 72nd World Health Assembly. [2,3]

The Constitution of South Africa views emergency medical care as a basic human right. [4] An estimated 84% of South Africa's population is medically uninsured but are served by only 30% of South Africa's doctors who work in the public health sector. [5] Contrastingly, the private sector serves less than 20% of the population but consumes approximately 70% of the country's financial health resources. [6,5] This significant capacity-demand mismatch, together with inadequately trained staff, inefficient emergency care systems and widespread rural landscapes, are some of the challenges faced with regards to providing universal access to quality emergency health care in South Africa. [7]

An understanding of the workload, disease profile, patient acuity and EC resource utilisation is essential for effective service delivery planning and resource allocation. Wide socio-economic disparities in South Africa result in a large proportion of its population remaining unemployed and

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living in poverty. [8] This has allowed associations to be drawn between poverty and poor health, with the socially disadvantaged experiencing an increased morbidity and mortality. [9] Rising unemployment rates and poverty has contributed to malnourishment, overcrowded living environments and a rise in communicable diseases such as tuberculosis. [10] The prevalence of trauma and violence in South Africa, especially domestic violence, is of the highest in the world. [11,12] Rapid urbanisation of certain parts of our country has led to lifestyle changes with a concomitant increase of non-communicable diseases. [10,9,13] These inequalities, together with other social determinants of health, play a significant role in the burden of disease experienced in a specific population. [8] This is in contrast to other regions in Africa, where casemix descriptive research identified an overwhelming burden of communicable diseases and trauma. [28,29] Rising levels of poverty and unemployment has compounded our quadruple burden of disease which includes maternal and child illnesses, non-communicable diseases, HIV/AIDS, violence and trauma related injuries. [14,10]

Even though Emergency Medicine has developed rapidly in certain regions of our country, especially the Western Cape and Gauteng provinces, it is yet to flourish in the neighbouring province of the Eastern Cape. Improvements in triage, addressing overcrowding, limiting unnecessary admissions and positively impacting primary health care are some of the advantages Emergency Physician run EC's has experienced in recent years. [13] EC overcrowding, long waiting times and high proportion of non-urgent self-presenting patients presenting to the EC, are only some of the challenges faced in Eastern Cape ECs but with poor data to support anecdotal evidence, targeted improvement interventions are not sustainable, nor successful. A paucity of data exists with regards to the demographic and disease profile of patients presenting to Eastern Cape ECs. [15] Describing the casemix of patients presenting to an EC is an essential starting point to understand the demand and to consider implementing strategies to improve cost-effective emergency healthcare in the region. [16,17] The study therefore aimed to describe the casemix presenting to a tertiary hospital EC in East London in the Eastern Cape.

Methods

This study is a retrospective descriptive design of the casemix of all patients presenting to Frere Hospital EC in East London in the Eastern Cape from the 1st of August 2019 to the 31st of October 2019.

Frere Hospital is a tertiary hospital located near the East London city centre of the Buffalo City Metropolitan Municipality, with an estimated population of 755 200 people. [18] The Frere Hospital EC serves a diverse population across the entire East London, as well as surrounding rural areas - some more than 50 km away. Frere Hospital's EC is staffed by 11 medical officers with at least two working per shift, as well as 4 nursing teams consisting of approximately 14 nurses per team. The EC layout includes an area for triage, medical emergencies, trauma emergencies and admission sections for both medical and surgical referrals to other specialist disciplines. There is no regional level hospital in East London that serves the same catchment. During the day (08h00 - 16h00), most suburbs and informal settlements are served by primary healthcare (PHC) facilities or local clinics which are staffed by nurses, with limited doctor cover. The only community health centre (CHC) that is permanently staffed with doctors in East London is located 5.3 km from Frere Hospital and runs an after-hour EC manned by one doctor and nursing staff. No facility in East London or any surrounding areas, other than Frere Hospital, however, have access to after-hour radiological services, including basic X-Rays

A census sampling strategy was utilised. All patients that presented to Frere Hospital's EC, from the 1st of August 2019 to the 31st of October 2019, were eligible for inclusion. Patients with missing data were excluded from the study if the presenting complaint or provisional diagnosis were not available.

Data were manually collected from the EC register for the study period from a paper-based register and included: patient demographics, geographical location, triage category, presenting complaint, EC deposition and process times. These variables were entered manually onto a spreadsheet (Microsoft Excel, Microsoft Corporation, Redmond WA). EC nurses routinely record data into the EC register on every patient presenting to the EC. The temporary addition of all the required process times was added to the standard register entry fields for the study period. In order to minimise this period as well as missing data, three consecutive months were chosen. In-service training sessions were held with all the EC nursing staff and clerks to motivate and reinforce correct data entry into the register prior to the study period. Four in-service training sessions were held at the beginning of July 2019. This allowed all staff involved with register entries to be trained, prior to the start of the data collection period. Data were analysed with Statistical Package for the Social Sciences (SPSS) Statistics version 27.

Categorical data were described in percentages or proportions and descriptive statistics was used. Continuous variables were described by mean +/- standard deviation (SD) or median and interquartile range (IQR), depending on the characteristics of the sample. Categorical data were screened for non-random associations with the help of the Chi^2 test. Data were analysed using IBM SPSS Statistics version 27 and geospatial analysis was performed using ArcGIS software. Statistical significance was defined as $p < 0.05$.

The study was approved by the University of Cape Town Human Resource Ethics Committee (HREC REF: 837/2019) and included a waiver of informed consent. Institutional approval was obtained from Frere Hospital.

Results

A total of 6 204 patients presented to Frere Hospital EC over the 3-month study period, at an average of 2 068 per month and 67.2 per day. Of these, 61 patients (<1%) were excluded due to missing data, leaving 6 143 included in the final analysis.

The demographics and clinical characteristics of the patients are presented in Table 1. The median age of patients was 31 years (IQR 22-45) and men accounted for 56% of the study population (n = 3 468). A total of 60% of all patients were younger than 35 years old with 13% being younger than 12 years old (n = 810) and 5% being younger than 2 years of age (n = 321). A similar male predominance was noted in the paediatric population (n = 492, 61%).

Triage acuity according to the South African Triage Scale (SATS) was available in 5 359 patients (87%) and demonstrated a large proportion with lower triage acuity (green and yellow) (n = 3 593, 67%). A lower triage acuity was observed across both trauma (68%) and non-trauma presentations (57%).

EC disposition data was available in 6 132 patients (99.8%). The majority of patients were discharged from the EC (n = 4 257, 69%) of which 79% had a lower triage acuity. EC disposition per age group is outlined in Table 1.

There was no association between triage categories and the day of presentation (p=0.107). Sundays (18%) and Mondays (20%) had the highest patient caseload, with predominant trauma presentations (63% and 65% respectively). There was little variation in the total number of non-trauma presentations per day (mean=27, SD=2.4). Presentations due to trauma however varied significantly (mean=32, SD=12.3), with 44% of all trauma cases presenting on a Sunday and a Monday. (Supplementary Figure 1).

A summary of the hourly distribution of the number of presentations per presenting category (either non-trauma or trauma) over weekdays and weekends, is presented in Fig. 1. The average daily patient load for weekdays was 66 patients and for weekends, 70. Presentations on a weekday seem to follow a bimodal pattern with a peak between 08h00 and 12h00 and a second peak between 19h00 and 20h00. Between 00h00 and 08h00, a mean of 1.1 patient presented per hour dur-

Table 1
Demographics and clinical characteristics for each age category (n = 6 143).

		Paediatrics		Adults	
	Total	<2 years	2-12 years	>12 years	P
N (column%)		321 (5%)	489 (8%)	5 333 (86%)	
Gender					
Female	2 704 (44%)	135 (42%)	183 (37%)	2 386 (45%)	.025
Male	3 434 (56%)	186 (58%)	306 (63%)	2 942 (55%)	
Unknown	5 (0.1%)	0	0	5 (0.1%)	
Triage category					
Green	1 590 (30%)	50 (18%)	145 (34%)	1 395 (30%)	.000
Yellow	2 003 (37%)	110 (39%)	169 (40%)	1 724 (37%)	
Orange	1 626 (30%)	110 (39%)	103 (24%)	1 413 (30%)	
Red	109 (2%)	7 (3%)	6 (1%)	96 (2%)	
Blue	31 (1%)	6 (2%)	1 (0.2%)	24 (0.5%)	
Presenting category					
Trauma	3 431 (56%)	86 (27%)	296 (61%)	3 049 (57%)	.000
Non-Trauma	2 709 (44%)	234 (73%)	193 (40%)	2 282 (43%)	
Medical	1 508 (25%)	234 (%)	193 (%)	1 508 (28%)	.000
Surgical	477 (8%)	*	*	477 (9%)	
Obstetrics and gynaecology	223 (4%)	0	0	223 (4%)	
Psychiatry	74 (1%)	0	0	74 (1%)	
Day of presentation					
Monday	1 248 (20%)	56 (17%)	65 (13%)	1 127 (21%)	.000
Tuesday	919 (15%)	27 (8%)	67 (14%)	825 (16%)	
Wednesday	749 (12%)	44 (14%)	72 (15%)	633 (12%)	
Thursday	722 (12%)	39 (12%)	74 (15%)	609 (11%)	
Friday	698 (11%)	46 (14%)	70 (14%)	582 (11%)	
Saturday	713 (12%)	52 (16%)	68 (14%)	593 (11%)	
Sunday	1 094 (18%)	57 (18%)	73 (15%)	964 (18%)	
Weekday	4 336 (71%)	212 (66%)	348 (71%)	3 776 (71%)	.183
Weekend	1 807 (29%)	109 (34%)	141 (29%)	1 557 (29%)	
Out of office hours**	3 294 (75%)	192 (79%)	286 (79%)	2 816 (74%)	.053
Office hours	1 119 (25%)	52 (21%)	78 (21%)	989 (26%)	
Disposition					
Discharged	4 257 (69%)	225 (70%)	388 (79%)	3 644 (69%)	.000
Referred	966 (16%)	51 (16%)	59 (12%)	856 (16%)	
EC review	713 (12%)	35 (11%)	33 (7%)	645 (12%)	
RHT/Absconded***	152 (3%)	3 (1%)	8 (2%)	141 (3%)	
Died	44 (1%)	6 (2%)	1 (0.2%)	37 (1%)	

* Paediatric cases without trauma were classified as medical.
** Out of office hours is defined as 16:00-08:00 and weekends.
*** Refusal of hospital treatment (RHT).Totals may not add up to 100% due to rounding; Statistically higher proportions highlighted (p<0.05).

ing the week and 1.7 per hour during the weekend. Between 08:00 and 00:00 however, the average number of presentations per hour is 2.3 for weekdays and 2.6 for weekends. The highest patient load in the EC occurred during the weekend in the evening between 19:00 and 21:00. The trauma burden during the week and weekend was 57% and 61% of all presentations, respectively.

Details about the presenting complaint were available for 6 140 (99.95%) patients. Trauma comprised of 56% of all presentations of which 89% were in adult and 11% in paediatric patients. Assault was the most frequently occurring mechanism of injury in the adult population (n = 1 460, 48%), with blunt trauma being the most common form of assault (66%). Accidental fall was the most common mechanism of injury in the paediatric population (n=161, 42%). Table 2 depicts the mechanism of injury and trauma diagnosis for each age category.

Non-traumatic related presenting complaints were categorised into paediatric and adult groups. The adult group was further subcategorised into medical, psychiatric, surgical, and obstetric and gynaecological related complaints. The most common presenting complaints for all non-trauma cases are presented in Table 3.

Process time data was available for 63% of patients and included time from admission to triage (triage time), triage to consultation (consultation time), consultation to disposition (disposition time) and total length of EC stay. Fig. 2 outlines the average process times for triage, consultation, disposition and total length of EC stay. Patients with a higher acuity had a shorter time to triage and consultation but longer disposition times, while the total length of stay was similar in all triage categories.

Geographical location data was available in 6 124 patients (99.7%). The majority of patients lived within a 20 km radius of Frere Hospital (n = 4 689, 77%). Of these patients, 594 (13%) patients lived within communities serviced by a CHC. 1 200 (20%) patients who presented to Frere Hospital lived within a 20 – 100 km radius of Frere Hospital. Of these patients, 566 (47%) lived within towns serviced by alternative district or regional public hospitals. The remaining 235 (4%) patients lived more than a 100 km from Frere Hospital.

Discussion

Casemix descriptive research is essential to guide the development of emergency care systems and Emergency Medicine as a speciality within a region. A paucity of data currently exists with regards to the patient and disease profile presenting to Eastern Cape ECs. [15,19]

The average caseload of 2 068 patients per month appears high when compared to data from other tertiary and regional ECs in the Eastern

Table 2
Trauma mechanism of injury and trauma diagnosis per age category (n = 3 431).

N (column %)	Total	Paediatrics <2 years 86 (2%)	2-12 years 296 (9%)	Adults >12 years 3 049 (89%)
Mechanism of injury				
Accidental				
Motor vehicle crash	446 (13%)	2 (2%)	27 (9%)	417 (14%)
Pedestrian accident	202 (6%)	1 (1%)	14 (5%)	187 (6%)
Fall	684 (20%)	42 (49%)	119 (40%)	523 (17%)
Burns	71 (2%)	16 (19%)	12 (4%)	43 (1%)
Drowning	10 (0.3%)	0	2 (1%)	8 (0.3%)
Other accidental	424 (12%)	16 (19%)	76 (26%)	332 (11%)
Assault				
Penetrating	451 (13%)	1 (1%)	1 (0.3%)	449 (15%)
Blunt	1 003 (29%)	4 (5%)	31 (11%)	968 (32%)
Firearm	18 (1%)	0	0	18 (1%)
Human bite	25 (1%)	0	0	25 (1%)
Bites and stings				
Dog bite	48 (1%)	1 (1%)	13 (4%)	34 (1%)
Spider, scorpion and snake bite	18 (1%)	0	0	18 (1%)
Other				
Foreign body ingestion	16 (1%)	3 (4%)	1 (0.3%)	12(0.4%)
Needle stick injury	15 (1%)	0	0	15 (1%)
Diagnosis group				
Soft tissue injury	1 177 (34%)	37 (43%)	105 (36%)	1 035 (34%)
Head injury	509 (15%)	11 (13%)	25 (8%)	473 (16%)
Fracture	466 (14%)	7 (8%)	58 (20%)	401 (13%)
Laceration	354 (10%)	5 (6%)	51 (17%)	298 (10%)
Eye injury	106 (3%)	1 (1%)	6 (2%)	99 (3%)
Gunshot wound	18 (1%)	0	0	18 (1%)
Polytrauma	92 (3%)	0	4 (1%)	88 (3%)
Burns	73[25]	16 (19%)	12 (4%)	45 (2%)
Penetrating assault				
Abdomen	24 (1%)	0	0	24 (1%)
Chest	204 (6%)	0	1 (0.3%)	203 (7%)
Neck	32 (3%)	0	0	32 (1%)
Other penetrating assault	191 (6%)	1 (1%)	0	190 (6%)
Other	184 (5%)	8 (9%)	34 (12%)	142 (5%)

Totals may not add up to 100% due to rounding.
Statistically higher proportions highlighted ($p<0.05$).

Table 3
Most common presenting complaints for each category excluding trauma.

Medical (Adult) n=1 519		Paediatric n=429	
Shortness of breath	327 (22%)	Shortness of breath	67 (16%)
Chest pain	193 (13%)	Seizures	62 (14%)
Seizures	136 (9%)	Vomiting	58 (14%)
Body / joint pain	125 (8%)	Wheezing / Asthma	33 (8%)
Ingestion of poison / overdose	116 (7%)	Fever	31 (7%)
Vomiting	100 (7%)	Abdominal pain	28 (8%)
Headache	89 (6%)	Diarrhoea	24 (6%)
Weakness	65 (4%)	Ingestion of poison / overdose	17 (4%)
Collapsed / syncope	50 (3%)	Coughing	14 (3%)
Altered mental status / decreased LOC	47 (3%)	Stridor / Croup	8 (2%)
Diarrhoea and vomiting	34 (2%)	Epistaxis	7 (2%)
Dead on arrival	32 (2%)		7 (2%)
Other	26 (2%)		
Swollen limb	20 (1%)		
CVA / stroke	16 (1%)		
Surgical (Adult) n=480		**Obstetrics and gynaecology (Adult) n=226**	
Abdominal pain	307 (64%)	Pregnant and PV bleeding	132 (58%)
Urinary retention / blocked catheter	45 (9%)	Pregnant and lower abdominal pain	60 (27%)
Gastrointestinal bleeding	30 (6%)	PV discharge	13 (6%)
Epistaxis	25 (5%)	Pregnant and vomiting	6 (3%)
Septic wound	14 (3%)	Other	15 (7%)
Haematuria	12 (3%)		
Constipation	7 (2%)	**Psychiatry (Adult) n=75**	
Other	40 (8%)		

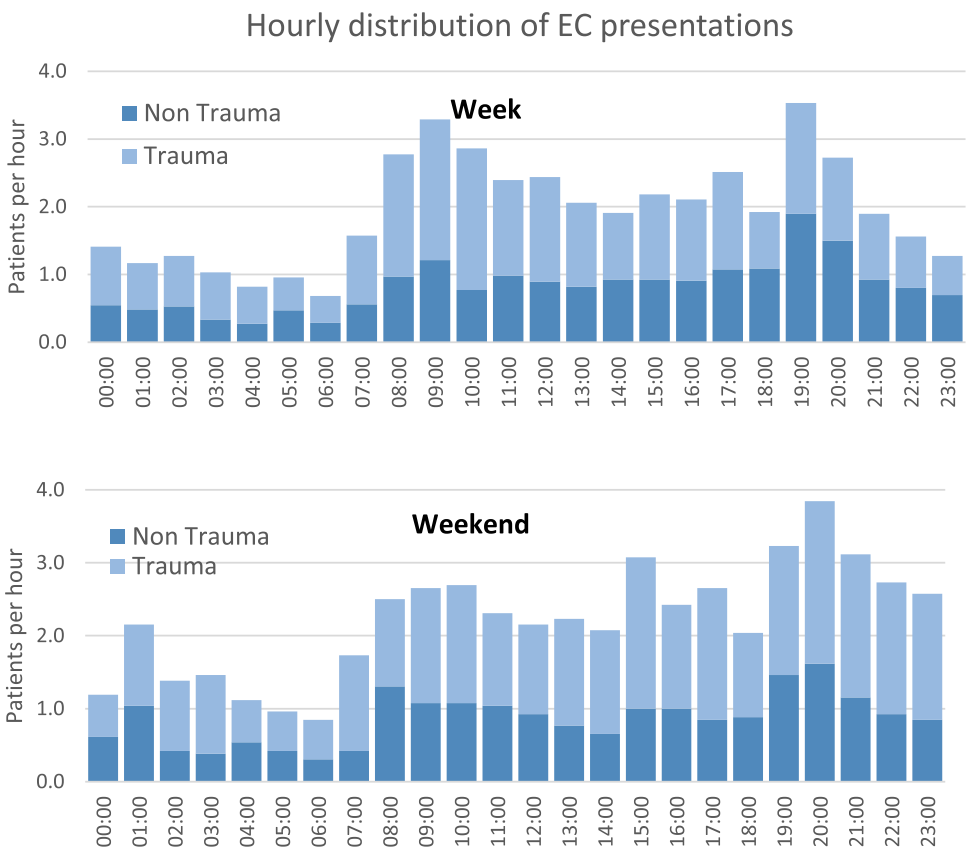

Fig. 1. The average hourly distribution of presentations per category (non-trauma or trauma) over weekdays and weekends.

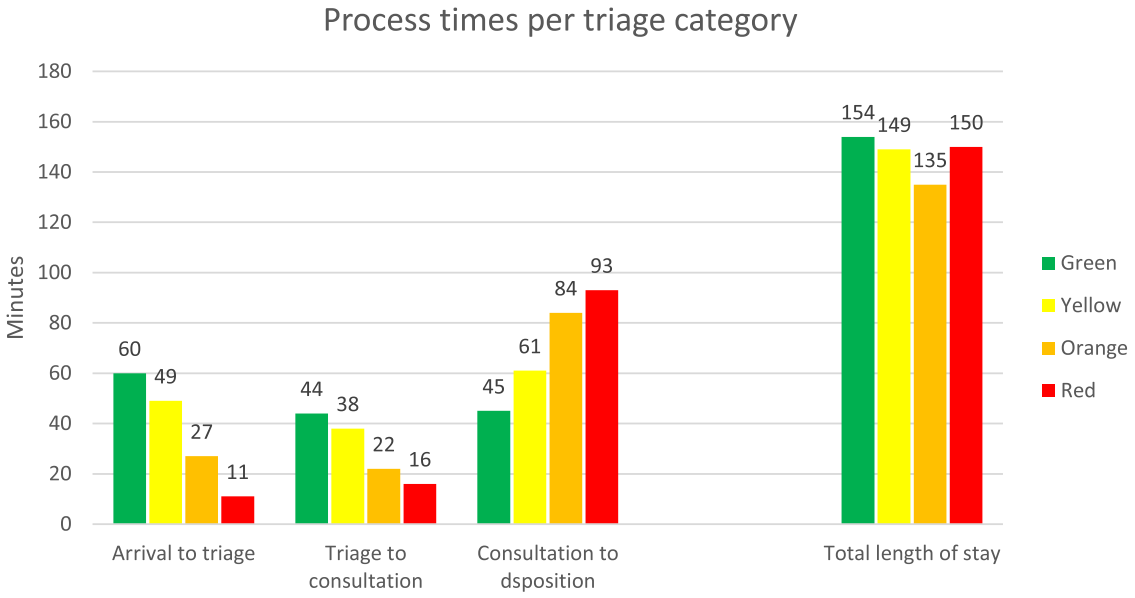

Fig. 2. Average process times for each step per triage category (minutes).

Cape. [15] It is however significantly lower than what is reported in ECs in the Western Cape. [20,17,21] Considering the estimated population size of more than 750 000, EC utilisation is lower than reported in Western Cape ECs. [17,21] Poor access to emergency care and widespread rural landscapes could contribute to this discrepancy.

Demographic data is dominated by younger age groups, with 60% of all patients younger than 35 years and 43% of patients being between 18 – 35 years old. This most likely reflects the high trauma burden, as trauma comprised 56% of all presentations, with a median age of 31 years. Despite the young age profile, only 13% of patients belonged to the paediatric population; this is significantly lower than what has been reported in other ECs across the country. [16,22] In sharp contrast to data from the Western Cape, only 7% of patients belonged to the geriatric age group (>65 years), the lowest proportion of all age groups. [17] Eastern Cape population statistics suggest 6% of the Buffalo City / East London region's population is over the age of 65 years. [18] With the high prevalence of non-communicable diseases in this population group, one would expect a much higher EC utilisation rate. This could

be due to numerous factors, but a potential lack of access to emergency care should be further assessed.

Sunday and Mondays were the busiest days with regards to both trauma and non-trauma presentations. This is in keeping with other local EC data on temporal attendance patterns, where presentations appear to peak around Sundays. [16,17] This pattern is mostly driven by trauma presentations and most likely reflects the relationship between alcohol use and trauma-related injuries. [22] This, together with the hourly distribution of presentations, which peaks at 19h00 – 20h00, has staffing implications when it comes to shift allocations.

The high burden of trauma (56% of all presentations) is similar to what has been described in the Eastern Cape before, but overshadows data from other Provinces, as well as what has been described in the rest of Africa. [15,20,22,28,29] Male patients comprised 64% of all trauma presentations, with nearly 50% being as a result of an assault. This also exceeded the number of intentional injuries reported in other parts of the country. [23,20] Interestingly, assault due to penetrating trauma (stab wounds) represented 13% of trauma presentations over the study period, with only 18 (1%) due to a firearm. This may relate to relatively lower levels of gang activity in this region as compared to reports from the Western Cape, where much higher numbers of firearm related injuries has been described. [23,20]

Despite the high trauma burden, 68% of all trauma presentations had a lower SATS category (green and yellow) with 87% being discharged home. This could be attributed to the lack of after hour radiological and wound suturing services, with only one community health centre in close proximity and no other after-hour radiological facilities in the region. Frere Hospital EC therefore provides a primary, secondary, and tertiary service to the community after hours. A restructuring and appropriate allocation of resources throughout the health system in East London could address this challenge and could result in improved access to care and a better overall patient-centered service.

Respiratory and abdominal complaints dominated non-trauma presentations, which accounted for 44% of all presentations. This is in keeping with results from other ECs. [17,22,19] Adult patients with primarily medical complaints represented only 25% of all patients. This low number may point towards this group of patients accessing health care through an alternative route. A total of 116 patients (7%) presented with ingestion of poison / overdose, a higher proportion than what has been reported previously. [24,25] The majority of them required either admission or a period of EC observation (35% and 46% respectively).

Even though patients with green and yellow triage categories represented the majority of patients, waiting times for these patients met the targets of the SATS. [26] Waiting times for higher acuity patients however did not meet the SATS targets, suggesting a need for quality improvement interventions.

The majority (69%) of patients were discharged home, with only 16% of patients being referred to other specialist departments for admission. This high discharge rate is in keeping with other casemix research, especially when the majority of patients had a lower triage category. [17,20,19] This is an unexpected high discharge rate for a tertiary level EC, highlighting the hypothesis that a fair proportion of patients could potentially have been managed at a lower level of care.

With regards to geospatial data, 13% of patients who lived within 20 km of Frere Hospital, resided within communities serviced by a CHC. This could reflect the limited radiological and laboratory resources within these facilities but could also point towards a general lack of acceptability of healthcare provided at a mostly nurse driven PHC level. [27] Data with regards to the mode of presentation (self-presentation or via ambulance) were not collected and further inferences would be inaccurate.

Even though this descriptive study is one of the first to provide insight into the burden and caseload of a tertiary emergency centre in the Eastern Cape, there are a few limitations. The selection period of three consecutive months did not allow for the impact of seasonal variation to be assessed.

Future research should aim to assess the caseload in emergency centres in secondary and primary health care facilities and that should inform a regional needs assessment. An investigation into available resources to treat trauma and basic emergency care at each level, should follow to understand what resources are available, as well as EMS capacity and how the community access health care.

Conclusion

This descriptive study provides essential data to guide further development of emergency care systems within the Eastern Cape. The low proportion of elderly patients seeking emergency care is incongruent with the population age metrics and may indicate an overall lack of access to health care. A high trauma burden, comprising predominantly of lower acuity presentations and a reasonably young population accessing emergency care, is described. The high discharge rate and high proportion of patients with lower triage categories, as well as the lack of after hour basic radiology services and suturing capabilities in the primary health sector, may indicate that a formal evaluation of the cost effectiveness of the current service provision model is required.

Dissemination of results

The results have been disseminated to the respective Emergency Centre and Hospital managers, as well as academic head of Emergency Care in the Eastern Cape.

Authors' contributions

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: LT contributed 60%; CH 30%; and RM 10%. All authors approved the manuscript to be published and agreed to be accountable for all aspects of the work.

Declaration of Competing Interest

CH is an editor of the African Journal of Emergency Medicine. CH were not involved in the editorial workflow for this manuscript. The African Journal of Emergency Medicine applies a double blinded process for all manuscript peer reviews. The authors declared no further conflicts of interest.

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Supplementary materials

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