A CROSS-SECTIONAL STUDY OF PATIENTS PRESENTING TO AN URBAN EMERGENCY DEPARTMENT IN MWANZA, TANZANIA

by

Shahzmah Suleman Kotecha

MD, MMED (Emergency Medicine)

SLMSHA054

This study is in partial fulfilment of the requirements for the degree Masters of Philosophy in Emergency Medicine, Global Emergency Care stream in the Faculty of Health Sciences at the University of Cape Town

Supervisor(s): A/Prof Peter Hodkinson

Dr. Charmaine Cunningham

A/Prof. Hendry Robert Sawe

February 2024

Declaration

I, Shahzmah Suleman Kotecha, hereby declare that the work on which this thesis is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any other university. I authorise the University to reproduce for the purpose of research either the whole or any portion of the contents in any manner whatsoever. I further declare the following:

1. I know that plagiarism is a serious form of academic dishonesty.
2. I have read the document about avoiding plagiarism, am familiar with its contents and have avoided all forms of plagiarism mentioned there.
3. Where I have used the words of others, I have indicated this by the use of quotation marks.
4. I have referenced all quotations and properly acknowledged other ideas borrowed from others.
5. I have not and shall not allow others to plagiarise my work.
6. I declare that this is my own work.
7. I am attaching the summary of the Turnitin match overview.

Signature: Signed by candidate **Date: 8th February 2024**

Acknowledgements

To my husband, for always encouraging me and being my biggest supporter through this journey.

To my family for always having my back and supporting my education.

To my son, Naman, for always being my sunshine.

To my classmates of the Global Emergency Care stream, for always supporting, guiding, giving ideas, and sharing the laughter and the difficult moments on this journey.

To my supervisors, A/Prof. Peter Hodkinson, Dr Charmaine Cunningham and A/Prof. Hendry Sawe for dedicating their time, guiding me through this journey and most of all being patient with all the obstacles that came our way.

To Bugando Medical Centre's ED staff for being supportive of my research project and my training in general.

List of Tables and Figures

Literature Review

Article

List of Abbreviations

AF – Atrial Fibrillation

AFEM – African Federation of Emergency Medicine

AFT – Abbott Fund Tanzania

BMC – Bugando Medical Centre

DALY – Disability Adjusted Life Years

DOA – Death on Arrival

ED – Emergency Department

EMAT – Emergency Medicine Association of Tanzania

EMD – Emergency Medicine Department

EMR – Electronic Medical Record

EMS – Emergency Medical Services

GA – Gestational Age

HIV/AIDS – Human Immunodeficiency Virus / Acquired Immunodeficiency Syndrome

H-LOS – hospital length of stay

HREC – Human Research and Ethics Committee

ICD 10 – International Classification of Diseases 10^{th} revision

IHD – Ischaemic Heart Disease

MeSH – Medical Subject Headings

MNH – Muhimbili National Hospital

MS – Microsoft

NCDs – Non-Communicable Diseases

OHEC – Out of Hospital Emergency Care

OOP – Out-of-pocket payment

PHEC – Pre-Hospital Emergency Care

SATS – South African Triage Scale

SSA – Sub- Saharan Africa

UCT – University of Cape Town

UHC – Universal Health Coverage

WHA – World Health Assembly

WHO – World Health Organisation

Table of Contents

PART A: LITERATURE REVIEW

1. Objectives of literature review

The main objectives of the literature review include:

a. To describe Emergency Medicine with an African Healthcare System

c. To describe Tanzania's country profile and healthcare system

d. To provide a background around the Bugando Medical Centre

e. To give an overview of the Burden of Disease in Tanzania

2. Strategies for literature search

The literature search utilised several databases. These were, PubMed, Google Scholar and PRIMO accessed through the University of Cape Town (UCT) Health Science Library. In conducting the literature search, Medical Subject Headings (MeSH) terms were utilised to conduct the literature search. These MeSH terms included; "Tanzania", "Sub-Saharan Africa", "Emergency Department presentations", "case-mix", "ED disposition", "burden of disease", "Lake Zone", and "referral challenges". These terms were used in various combinations to yield results. Due to the low numbers of recent studies in Tanzania (or in other African settings) on emergency cases, the search period was set between January 2008 and December 2023.

3. Background

One of the key foundations of an effective health care system is emergency care services, yet worldwide these systems continue to get insufficient prioritisation and funding, especially in low and middle-income countries (1)

Emergency Medicine (EM) in Africa is a relatively young field. Few countries in Africa have established emergency departments (EDs) with even fewer trained emergency physicians. In Tanzania, a training program was initiated in 2010 being the second program in Africa, preceded by a training program in South Africa in 2004 (2).

Robust Emergency Care Systems Framework (ECSF) are especially important in Africa due to the high infectious disease burden coupled with the increasing burden of non-communicable diseases (NCDs) and trauma (3). Thus, in Africa, there exists more demand on the already scarce emergency care systems to provide timely and efficient care. In the recent COVID-19 pandemic, the deficiencies in emergency and

critical care were made evident, this is true globally, but especially in Africa and other resource-limited settings (4). The pandemic posed serious strains on emergency and critical care services. This further cemented the need to have more resilient emergency care systems that can function even in times of pandemics and other disasters (5)(6). Emergency Medicine training is the only way to tackle the challenges of trained staff. Formal training as well as short course training programs can build this capacity. On the African continent, more and more countries striving to have training programs or facilitate training in the field. Most of these training programs rely on foreign assistance to provide a head start due to the scarcity of trainers within the Sub-Saharan African (SSA) region (7).

EM is a speciality field of medicine that deals with all and any undifferentiated acute presentations of illness and injury. In different contexts, EDs may also deal with walk-in and low-acuity patients, in LMIC countries often because there is limited access to healthcare outside of hospital EDs (8). EDs in any given country cannot exist in a silo and are always part of a framework and the World Health Organisation (WHO) has developed the ECSF. EM functions start from the scene of the incident of injury or illness, through transport, and in the hospital, early inpatient care. Emergency Medicine is a link in that chain of survival (9).

Poorly defined disease, and the growing burden of trauma, infectious diseases and NCDs, lead to inappropriate resource allocation in low- and middle-income countries (LMIC). Traditionally funding has been allocated towards infectious and communicable diseases like malaria, Human Immunodeficiency Virus and Acquired Immune Deficiency Syndrome (HIV/AIDS) but this trend needs to be re-evaluated. Only when the seriousness of trauma and the burden of acute exacerbations of NCDs is realised, can resource allocation be appropriately tailored to the true burden of disease and the appropriate development of emergency care systems (10)(11).

In Africa, in 2015 alone, nearly thirty million people died as a result of emergency conditions. Three-quarters of these deaths took place in LMICs. This depicts a disproportionate death toll. The development and reinforcement of emergency care systems might reduce up to half of the deaths and at least a third of the disabilities internationally (12).

Aside from having adequate resources to provide emergency care, a clear understanding of the profile of patients presenting with emergencies is crucial to the planning of the personnel, equipment, medications and other supplies. The knowledge of the demographics of patients and disease patterns can also be utilised

to design training programs focused on ED staff and students in training at different levels and in different contexts.

4. Discussion

Tanzania: country profile and healthcare system.

Tanzania is a country located in East Africa. It is bordered by 8 countries, with Kenya and Uganda to the North; Rwanda, Burundi and the Democratic Republic of Congo to the west, Mozambique Malawi and Zambia bordering it to the south and a 1,424km coastline to the east. Tanzania is a union of Tanzania's mainland and 2 islands of Unguja and Pemba forming Zanzibar. Tanzania covers an area of 945,087 km^2, with a little over 60,000 km^2 of water inland (13).

Tanzania has a total population of 61,741,120 as per the 2022 census, of which around 59,000,000 reside in Tanzania's mainland and a little less than 2 million reside in Zanzibar (14). The population density is about 70/km^2. The average age of its population is 18 years and life expectancy at birth of 66 years (14). Typical of many low and middle-income countries on the continent, there is an increasing burden of NCDs and trauma in Tanzania. As per the Global Burden of Disease 2019 report, Tanzania has DALYs of 41,046 per 100,000 population. It has also been made evident that ischaemic heart disease (IHD) contributes to 1.77% of the total ~~Disability Adjusted Life Years~~ DALYs among the adult group and stroke contributes to 2.5% of the total DALYs. The events of IHD and stroke are projected to increase as the population ages and Western lifestyles and diets impact health (15).

Tanzania has a high maternal and infant mortality rate (16). Among the NCDs, congenital anomalies contribute 5% to the total DALYs. Neonatal disorders contribute to almost 16% of DALYs in Tanzania. This could be attributed to the poor healthcare systems in Tanzania (17). Other reasons could also include the challenges in accessing maternal and neonatal healthcare services (16)(18)(19). Women in rural areas, women who lack education, and those without knowledge of danger signs are the ones who suffer the devastating effects the most (20)(21). Three levels of delays in healthcare access have been described by Thaddeus and Maine in seeking maternal care. The three levels of delay are; the decision to seek health care, the time it takes from decision-making to reach an appropriate health facility and the third is receiving care in the hospital (in-hospital delays) (22). Hosaka et al in 2022 (12) from the Kilimanjaro region in Tanzania described in detail some of the delays at each of the three levels. In delay 1, finance, insufficient education on emergencies and reliance on traditional medicine were described as the main reasons. In delay 2, pre-hospital infrastructural challenges, bystander roles, getting around the emergency

services, delays in providing initial treatment/first aid and certain police-related formalities for injured patients were described as some of the main reasons for delay 2. In delay 3, receiving the patient, requirements of paying first and infrastructural challenges of hospitals were identified as the common challenges (12).

Some 11.16% of all deaths are neonates who succumb in the neonatal period with Tanzania having a neonatal mortality ratio of 24 per 1,000 live births. The maternal mortality ratio in Tanzania is 321 per 100,000 live births, both indices being striking hallmarks of weak and overwhelmed healthcare systems. In adults, the non-communicable diseases stroke and ischaemic heart disease contribute to about 6.43% and 5.47% of the overall mortality, respectively (15)(23).

Healthcare is delivered via a mix of public and private sector health services, with some faith-based organisations working with the Government to promote healthcare delivery. The majority of the population resorts to the public healthcare system due to financial limitations and affordability issues. Tanzania has among the lowest rates of access to health personnel (24) The government runs the majority (60%) of the healthcare facilities, the others being run by faith-based organisations and private facilities (25).

In Tanzania, like many African countries, healthcare financing relies mainly on out-of-pocket payments (25)(26)(27). The WHO defines out-of-pocket (OOP) payments as any direct payments that individuals make at the time of accessing health services. These include official user fees or co-payments, private transactions and any other informal payments (28). In Tanzania, the majority (80%) of the population has no form of insurance coverage and relies on out-of-pocket payment for various services but is also primarily dependent on funding from the Government. Patients with conditions such as HIV/AIDS, leprosy, Tuberculosis (TB), and pregnant and elderly patients have a provision of cost-sharing and exemption of payment from certain services (29).

This has a huge implication on low-income families, as most of their income ends up in accessing healthcare. It is also known that low-income families have higher health needs and the lack of any other means of financing healthcare poses a challenge in accessing healthcare for this group of people (30). Worldwide, nations struggle to pay for healthcare, but in LMIC, where resources are most limited and healthcare needs are the greatest, these difficulties are more pressing. In Sub-Saharan Africa, the disease burden is disproportionate, yet the healthcare sector has the least allocation of money (25). Tanzania's allocation to the health sector budget in the year 2022/2023 was TZS 1.1 billion (equivalent to about USD 430,000). This healthcare financing

receives a significant boost from international donors who contribute about 40% of the health budget and other programs within the Ministry of Health (26). The implication of the low healthcare budget directly impacts the growth of the health sector making it a slow process. This in turn impacts the quality of service provided. This is further compounded by disparities in the distribution of healthcare workers and services between the rural and urban areas, and rural areas are typically underserviced (31).

The country's public healthcare system is pyramidal, with the lowest level of healthcare being the dispensary level followed by health centres, district hospitals, regional referral hospitals, zonal referral hospitals and the national hospital. The lower-level health facilities serve the masses and as the populations require more specialised services, they are referred up the pyramid, where the services are more specialised and the numbers are less as compared to the lower-tier health facilities (32). The healthcare system in Tanzania was set up in a way that enables patients to move up a pyramid from the first level health facility to the next based on the increasing need for speciality care. The referral process is continuous up the levels as long as the patients require more specialised services. This multi-tiered health system is still in place today (2)(33).

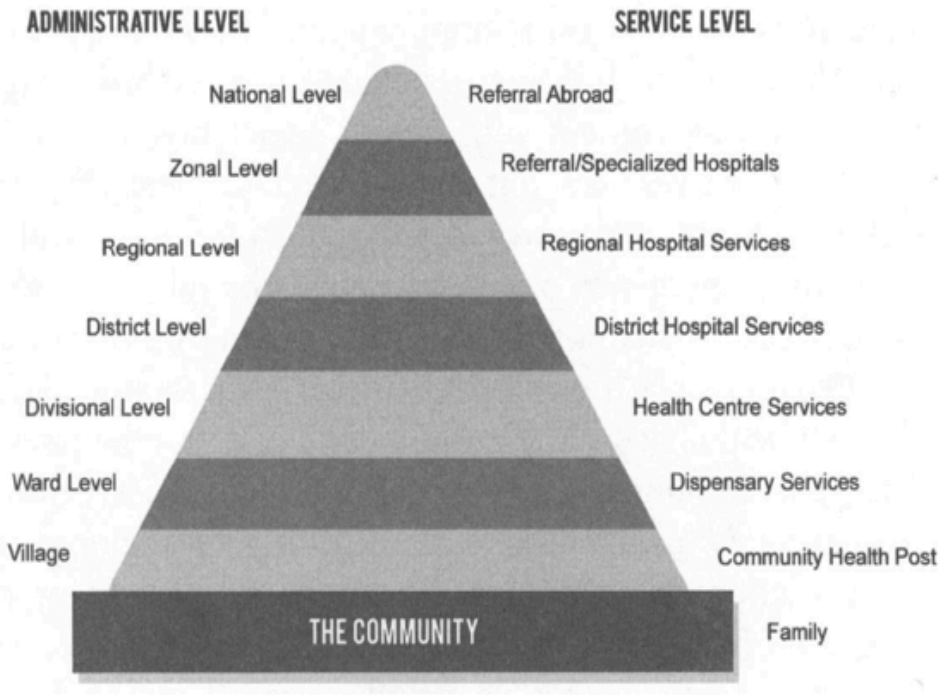


Figure 1: The healthcare referral pathway in Tanzania. Source: Kwesigabo et al

Bugando Medical Centre in Mwanza, Tanzania

Mwanza is a region in the northern part of Tanzania and is one of four zonal referral hospitals in the country (34). Bugando Medical Centre (BMC) receives patients from regional referrals of the surrounding seven regions and Mwanza itself. The population of Mwanza region is 3,699,872 and is the second most populated city in the country. The catchment population for the Lake Zone, which BMC serves is 22,283,236 which is about a third of the country's population (14).

BMC is a 950-bed hospital providing specialised and super-specialised services. Trained emergency physicians have staffed the ED at BMC since 2017 and have been instrumental in major restructuring and refurbishment to allow the provision of in-hospital emergency services. Hospital statistics show that there has been a steady increase in the number of ED visits from about 30,000 to the current about 40,000 over the last 5 years (35). There is no published data on the burden of disease at the hospital except for the quarterly reports that are sent to the MoH by the hospital administration. The ED at BMC is staffed by medical officers and two emergency physicians, and the ED attends to an average of 3000 patients per month (35). Patients attending the ED in this region have not yet been the subject of research on demographics, presenting complaints and waiting times and this data could help in setting standards for the provision of emergency services in Mwanza City as well as set precedence for developing systems that could be implemented in other parts of the country to ensure adequate access to emergency care.

Figure 2: Map of Tanzania showing the highlighted Lake Zone. Source: Open access https://d-maps.com/carte.php?num_car=36240&lang=en

History and Development of Emergency Medicine in Tanzania

EM in Tanzania is a little over a decade old. Historically, as in much of the world before the formalization of emergency medicine as a speciality, emergency services were being provided in a disorganised manner without trained personnel (36). Staff in the acute intake areas, commonly known as casualties, were often junior, on a rotational basis, providing care with more experience rather than training in handling emergencies. An initiative and collaborative effort between Abbott Fund Tanzania (AFT), the Ministry of Health (MoH) of Tanzania and Muhimbili National Hospital (MNH) established the first full-capacity public ED in 2010 (37). Soon after, the first residency program was established (2) and by the end of 2021, there were 73 graduates from the EM residency program (38). In 2011, the Emergency Medicine Association of Tanzania (EMAT) was formed (39). This association was formed to pioneer the spread of emergency medicine throughout the country and incorporated all healthcare workers who work in casualties and/or formal EDs. It has been made evident from the establishment of the ED at Muhimbili and in similar settings in Rwanda, that training in emergency care in various capacities, including EM speciality training has helped to reduce the mortality and morbidity of patients accessing emergency care services (40)(41).

Along with the training of doctors as emergency physicians in Tanzania, nurses, who are an integral part of service delivery to patients are also in the developing stages. Across the continent, nurses form the backbone of the healthcare system, and in some areas, these nurses may be the first point of contact for patients. It is imperative, therefore to have nurses who can recognise and handle emergency conditions. It is with this thought in mind that a short course training was developed for the nurses, from which several locally developed curricula were developed to assist with the training of nurses and this is an ongoing endeavour by EMAT (42). Any establishment of training is not short of challenges. Nursing training also faces several challenges. Some of the challenges in nursing training include lack of resources, communication barriers, and low uptake of education due to barriers in recognition and registration of the various programs to follow long and cumbersome procedures. There is also a lack of monitoring and evaluation practices and this hinders the success of the program. Despite all the challenges, there has been success in establishing context-specific training for nurses across the continent, establishing a mentor group for nurses and making the content available and accessible for nurses across the continent. This has been an endeavour of the African Federation of Emergency Medicine (AFEM) (43).

There is not enough data and documentation on the Emergency Medical Services (EMS) / Pre-Hospital Emergency Care (PHEC) / Out-of-Hospital Emergency Care (OHEC) among African countries. Some countries have well-established EMS systems, while others, due to limited literature, it is difficult to assess the progress and growth of PHEC in Africa (44). Wherever EMS systems in Africa exist, they seem to be, inadequate to meet the needs of the countries (45). There is no formal EMS system in Tanzania (46). While there are efforts to establish emergency departments across the country, the extent of the notable gains of having EDs and pre-hospital systems has not been able to be fully realised because of the absence of the service which hinders timely access to emergency and critical care (47).

Short courses in the provision of emergency care to the already practising staff and task shifting of some primary roles to nurse providers can help with the early recognition and basic interventions before referral. This can lead to a drop in morbidity and mortality rates across the country (48).

Emergency presentations in Tanzania:

At the time of the establishment of the ED in Dar-Es-Salaam a little over a decade ago, research was undertaken, mainly in the first five years within the MNH looking at mortality trends and case mix (41)(49)(50)(51). However, since then, there has been little published research exploring the case mix there or in other settings, despite the spread of trained emergency physicians and the development of the field across the country.

Several studies have been conducted across Africa and other countries describing the case mix in their respective EDs and hospitals, which have facilitated resource allocation, human as well as material. Knowing the case mix and profile of patients attending an ED helps with a deeper understanding of the population and the way they access care, as well as the actual burden of disease, which can vary within the country as well as between African countries at large (52)(53).

ED Case mix research in Africa:

The first African Federation of Emergency Medicine consensus conference held in South Africa in 2011, identified the lack of documentation of the burden of disease across Africa as a hindrance to disseminating emergency care. This gap in data holds back various initiatives that are region-specific and also conceals the considerable impact of the absence of emergency care (39).

The articles chosen for review in the subsequent section are largely from within Tanzania, but due to not having more recent studies from within the country, studies from across the African continent, notably South Africa, on case mix have been included, along with some other international studies that describe some of the aspects for comparison.

Oyediran et al (54) in 2022 in Moshi, Tanzania conducted a prospective study of a 10-month duration looking at adults who presented to the ED with chest pain for the presence of atrial fibrillation (AF). Their study showed the mean age of presentation was 68.1 years with a standard deviation of 21.1 years. Gender differences in this study were not remarkable as males with atrial fibrillation were 43.4%. The study also showed that the main comorbid conditions associated with patients with AF were hypertension, heart failure and ischaemic heart disease (54). Hertz et al (55) in Moshi again in 2019, conducted a prospective observational study among 681 patients presenting with chest pain aiming at quantifying acute myocardial infarction (AMI) among those patients over 10 months. The study showed that almost two-thirds of their patients were male and the mean age was 61.2 years with a standard deviation of 18.5 years (55). This is very much in line with the published literature on the increase in NCDs in Africa. Both these studies demonstrated the occurrence of cardiovascular disease in populations over 60, however, much larger sample sizes are needed to infer similar occurrences in younger populations.

In Moshi, at the ED at Kilimanjaro Christian Medical Centre (KCMC) in 2018-2019, Zimmerman et al (56) conducted a retrospective chart review of adult trauma patients with a sample of 1365 patients. Over 80% were noted to be male patients and 39% of the patients were between the ages of 30 and 49 years (56)

In Mwanza, Tanzania in 2012, Chalya et al (57) conducted a 1-year prospective study of road traffic crash victims, where they enrolled 1678 patients. They showed that twice as many males as females presented with road traffic crashes and the modal age group was 21 to 30 years.

At Bugando Medical Centre, over 2 years from 2009 to 2011, patients sustaining splenic injuries were studied by Chalya et al (58). A total of 118 patients were studied. Of them, 86% were males and the median age was 22 years. This study showed that blunt injuries were the most common and the most common cause of blunt injuries was road traffic accidents (58).

Monafisha et al (59) 2009-2010 conducted a prospective study over 6 months looking at chest injuries presented to the Bugando Medical Centre. This study showed that

male to female ratio was almost 4:1, and the mean age of presentation was 32 years. Among the chest injury patients, 70% of the patients sustained blunt injuries, and road traffic crash was the commonest reason for the blunt injuries (59).

Among the paediatric group, in 2022 in MNH, Dar-Es-Salaam (60) conducted a cross-sectional study with longitudinal follow-up of neonates presenting to the neonatal unit of MNH. They enrolled 348 neonates, the median gestation age (GA) being 38 weeks and 56.6% being male babies with 33% of the neonates arriving hypothermic, 21% hypoxic, 14% hypoglycaemic and 8.6% had poor perfusion. Almost 55% of the nurse escorts had no training in the basic care of sick newborns (60).

Simon et al (61) between 2011 and 2012 at BMC prospectively studied patterns of paediatric injuries in 150 children between the ages of 1 month to 10 years. The median age was reported to be 5 years, with male children being more injured than females (61). The main findings were that; the majority of the patients were victims of road traffic incidents (RTI) (39.3%) with motorcycles being the common form of RTI (71%). Only 7.3% of the patients had received any care before arriving at BMC (61).

The mean age of patients in other studies done across Africa was shown to be 40 and 45 years (62)(63)(64)(65)(66)(67).

International case-mix studies done, show that male-to-female presentations are almost equal across many studies with minor variations, and the paediatric presentations are variable between the different studies. (64)(65)(67)(68) and among paediatric patients, the mean age of presentation was 5 years (69).

By having an idea of the patient population, it is important to plan and empower the staff with knowledge adequate to deal with paediatric emergencies. There are special considerations in the treatment of the paediatric population and the staff needs to have focused paediatric training. With the evolution of emergency medicine in Tanzania, the emergency department staff are now in a better position to handle paediatric emergencies with the training of staff and the presence of emergency physicians.

Referral systems

Understanding the referral system and the challenges associated with the referral system can address delays associated with the referral of patients (70)has direct implications on how health systems and EDs can allocate resources, human as well as material, and prepare themselves for receiving patients. Although patients who attend any health facility would usually receive some sort of basic intervention before

referral for advanced or specialised care, the acuity may not be any less. In Kigoma, Tanzania in 2019 (70), it was demonstrated that for maternal referrals, there were inefficient communication systems in place. More than half the lower-tier health facilities used external ambulances and a third of the patients were compelled to use self-transport to the next-level health facility(70).

At BMC, Mailie et al (71) qualitatively studied the delays experienced by caregivers of paediatric cancer patients. They showed a median referral delay of 49 days, with a median of at least 2 facilities being visited before coming to BMC. Visiting a traditional healer before the first health facility was seen to delay significantly, presentation to the hospital (71). This study also found that BMC only sees an estimated 15% of the cancer patients while it is the only facility in the Lake Zone providing cancer care, though this was a single centre study, BMC is the only cancer care providing hospital in the Lake Zone. It is thought that the various delays at district hospitals and regional hospitals, coupled with several indirect costs cause patients to either lose follow-up or leave care (71)

In Moshi in 2022, Zimmerman et al's study (56) showed that in trauma patients, it took an average of four hours to reach the hospital and this further underlines the weak pre-hospital care system (56)

A prospective study done in Kilimanjaro, Tanzania in 2023 showed that in patients with non-traumatic acute abdomen requiring surgery, surgery was delayed in 78% of patients (72). The most common reasons for delay were personnel shortage, timely availability of theatre space and delay in investigations. The patients who suffered surgical delay had attended the ED and the delay was largely after the surgery decision was made (72). This poses a significant challenge to receiving timely surgical care and therefore directly affecting patient outcomes.

Mselle et al in 2016 (73) studied the referral pattern for maternal cases in district hospitals in Tanzania in a multi-centre study. Several challenges were noted in referring mothers requiring advanced obstetric care. A notable challenge was the rigidity in the referral system whereby a patient had to go up the pyramid through the levels of referral regardless of whether the next health facility was able to offer the appropriate care or not, without 'bypassing" any of the referral levels. This was described as creating an unnecessary delay in receiving appropriate care. Other challenges reported with obstetric referrals were logistical, related to transport resources and communication issues(73).

In a prospective observational cross-sectional study done at MNH, looking at pre-referral stabilisation of trauma patients (46), it was made evident that about a quarter of the patients had received at least one form of pre-referral stabilisation. Over 70% of the patients were referred from district hospitals and 91% of the patients were transferred to the orthopaedic institute within the hospital campus for appropriate orthopaedic or neurosurgical care(46).

Kiputa et al (60) at Muhimbili National Hospital in 2022 showed that for neonatal interfacility transfer, inadequate pre-referral treatment and poor clinical state upon arrival were the main challenges. They recommended that strengthening pre-referral supportive care, healthcare worker training, transportation with enhanced monitoring, clear communication protocols and better referral documentation are areas that need to be invested in (60).

In Cape Town, South Africa, in 2012, a study was done to examine reasons why patients who were triaged green as per South Africa Triage Score (SATS) access ED services as opposed to primary health care (PHC) clinics (74). This study revealed that close to 90% of the patients were self-referred to the ED. The main reasons for this were reported as; the PHC clinic isn't helpful, services at the ED were better than at the PHC, the absence of after-hours PHC services, lengthy waiting times at the PHC and eventual referrals to the ED (74).

Referral challenges in Tanzania exist across the country as is made evident from studies conducted within the country. They range from the system of referral, infrastructure to transport to affordability, communication and care while in transit to the next health facility. Some of these processes can be reviewed to provide more timely care to the patients and improve their outcomes. The main issue is the referral pathway and how it is rigid to discourage "bypass" from one level to another, even if the appropriate care is not available at the next immediate level. Also, the expertise at lower-level health facilities is limited and therefore, forces the patient to move to the next level where the expertise is available.

Temporal presentation

No studies could be found from Tanzania looking at ED attendance on different days of the week and different shifts of the day.

In South Africa, several studies have been done to describe the patterns during the various days of the week and different shifts. In a prospective observational study in Cape Town (75) looking at four different community health centre EDs, it was shown

that the peaks of ED attendance were after 4 pm on weekdays and weekends also had a larger number of patients.

Hodkinson et al (76) in a cross-sectional study in Cape Town showed that more patients attended during the day time with more sick patients attending during the evenings and night shifts.

International studies also show a varied pattern of attendance similar to studies within South Africa (64)(68)(69). This variety of presentations could be attributed to several factors, and these could depend on the healthcare system that is present, and the health-seeking behaviours of the population to name a few.

Being aware of the patient trend and acuity makes it easier for the administration of the department and hospital to allocate adequate staffing during times when the influx of patients is higher. This would in turn have a direct impact on patient satisfaction, ED wait times and eventually service provision within the ED. Given the referral systems, it could be expected that Tanzanian EDs see the majority of patients on weekdays and during day times.

Presenting complaint

Studies from African EDs in South Africa, Madagascar and Nepal, have shown that common ED presentations were abdominal pain or trauma in adults, and fever in the paediatric group. Presentations of trauma ranged between 20% and 40% of all ED presentations in these studies (7)(52)(62)(63)(67). Trauma being among the most common presentations in the ED makes it the responsibility of the health care system to put In place public health interventions and measures and appropriate trauma care systems in place to ensure that there is an adequate and timely response to trauma patients to improve overall outcomes (44)(53)

Hospital Length of Stay and in-hospital mortality

Among all the studies done within Tanzania, from the neonatal age group to adults, for different medical conditions, trauma and at different times, the in-hospital mortality ranged from 3% to about 20% and a mean hospital length of stay (H-LOS) of 1 day to 24 days (56)(60)(61). It is of note that patients in these studies looking at trauma or other medical conditions did not study isolated complaints or presentations. Therefore, H-LOS and in-hospital mortality could be affected by several factors which may start right from the scene to the level of a tertiary hospital. Several referral

challenges have also been depicted and these reasons may also play a part in the H-LOS as well as in-hospital mortality.

Due to the significant challenges in providing healthcare in Tanzania; the lack of pre-hospital services, and inaccessible roads with poor transport infrastructure in some areas, can deny the patients a chance of survival in Tanzania. That opportunity is lost amidst the system. To increase the country's access to emergency care, these factors must be determined by research to understand the needs of the people and the context of the provision of care.

5. References

1. Emilie J. Calvello Hynes. Sub-Saharan African emergency care systems. African Journal of Emergency Medicine [Internet]. 2020 Nov 17 [cited 2023 Jun 30];10(Suppl 1). Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7670231/

2. Nicks BA, Sawe HR, Juma AM, Reynolds TA. The state of emergency medicine in the United Republic of Tanzania. African Journal of Emergency Medicine. 2012;2(3):97–102.

3. Roth GA, Abate D, Abate KH, Abay SM, Abbafati C, Abbasi N, et al. Global, regional, and national age-sex-specific mortality for 282 causes of death in 195 countries and territories, 1980–2017: a systematic analysis for the Global Burden of Disease Study 2017. The Lancet [Internet]. 2018 Nov;392(10159):1736–88. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0140673618322037

4. Ma X, Vervoort D, Reddy CL, Park KB, Makasa E. Emergency and essential surgical healthcare services during COVID-19 in low- and middle-income countries: A perspective. International Journal of Surgery. 2020 Jul 1;79:43–6.

5. Muselli M, Cofini V, Mammarella L, Carmignani C, Fabiani L, Desideri G, et al. The impact of covid-19 pandemic on emergency services. Ann Ig. 2022;34(3):248–58.

6. Ogira D, Bharali I, Onyango J, Mao W, McDade KK, Kokwaro G, et al. Identifying the impact of COVID-19 on health systems and lessons for future emergency preparedness: A stakeholder analysis in Kenya. PLOS Global Public Health. 2022 Dec 21;2(12):e0001348.

7. House DR, Nyabera SL, Yusi K, Rusyniak DE. Descriptive study of an emergency centre in Western Kenya: Challenges and opportunities. African Journal of Emergency Medicine. 2014;4(1):19–24.

8. van Wyk PS, Jenkins L. The after-hours case mix of patients attending the George Provincial Hospital Emergency Centre. South African Family Practice. 2014;56(4):240–5.

9. Hansen K, Boyle A, Holroyd B, Phillips G, Benger J, Chartier LB, et al. Updated framework on quality and safety in emergency medicine. Emergency Medicine Journal. 2020 Jul 1;37(7):437–42.

10. Saleeby J, Myers JG, Ekernas K, Hunold K, Wangara A, Maingi A, et al. Retrospective review of the patient cases at a major trauma centre in Nairobi, Kenya and implications for emergency care development. Afr J Emerg Med [Internet]. 2019/07/02 ed. 2019;9(3):127–33. Available from: https://pubmed.ncbi.nlm.nih.gov/31528530

11. Hsia RY, Zagorov S, Sarkar N, Savides MT, Feldmeier M, Addo N. Patterns in Patient Encounters and Emergency Department Capacity in California, 2011-2021. JAMA Netw Open. 2023 Jun 22;6(6):E2319438.

12. Hosaka L, Tupetz A, Sakita FM, Shayo F, Staton C, Mmbaga BT, et al. A qualitative assessment of stakeholder perspectives on barriers and facilitators to emergency care delays in Northern Tanzania through the Three Delays. African Journal of Emergency Medicine. 2023 Sep 1;13(3):191–8.

13. Ministry of Foreign Affairs and East African Cooperation, Government of Tanzania. Ministry of Foreign Affairs and East African Cooperation [Internet]. 2024 [cited 2023 Dec 14]. Available from: https://www.foreign.go.tz/tanzania/category/country-profile#:~:text=Tanzania%20has%20a%20total%20area,area%20of%20988%20sq.km.

14. Government of Tanzania. Census Information Dissemination Platform [Internet]. 2022 [cited 2023 Dec 14]. Available from: https://sensa.nbs.go.tz/

15. Institute of Health Metrics and Evaluation (IHME). Seattle, WA: IHME, University of Washington. 2015 [cited 2023 Dec 14]. GBD Compare. Available from: http://vizhub.healthdata.org/gbd-compare

16. Osaki H, Sørensen JB, Maaløe N, Mbekenga C, Skovdal M. “It is because the treatment of this lady is a cascade”: Accumulation of delays and the occurrence of obstetric emergencies in an urban maternity unit in Tanzania. Midwifery [Internet]. 2024 Jan;103926. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0266613824000123

17. Willard S, Mahundo S, Wilson K. Improving trauma care – A case study from Dodoma, Tanzania. Int J Orthop Trauma Nurs. 2022 Feb 1;44.

18. Baker T, Lugazia E, Eriksen J, Mwafongo V, Irestedt L, Konrad D. Emergency and critical care services in Tanzania: a survey of ten hospitals [Internet]. 2013. Available from: http://www.biomedcentral.com/1472-6963/13/140

19. Mtei G, Makawia S, Ally M, Kuwawenaruwa A, Meheus F, Borghi J. Who pays and who benefits from health care? An assessment of equity in health care financing and benefit distribution in Tanzania. Health Policy Plan. 2012 Mar;27(SUPPL.1).

20. Vossius C, Mduma E, Moshiro R, Mdoe P, Kvaløy JT, Kidanto H, et al. The impact of introducing ambulance and delivery fees in a rural hospital in Tanzania. BMC Health Serv Res. 2021 Dec 1;21(1).

21. Shamba D, Tancred T, Hanson C, Wachira J, Manzi F. Delayed illness recognition and multiple referrals: A qualitative study exploring care-seeking trajectories contributing to maternal and newborn illnesses and death in southern Tanzania. BMC Health Serv Res. 2019 Apr 11;19(1).

22. Thaddeus S, Maine D. Too Far to Walk: Maternal Mortality in Context. Newsl Womens Glob Netw Reprod Rights. 1994 Aug 19;38:22–4.

23. Ministry of Health. Annual Health Sector Performance Profile. Dodoma; 2022 Aug.

24. Mtei G, Mulligan JA, Palmer N, Kamuzora P, Ally M, Mills A. An Assessment of the Health Financing System in Tanzania: Implications for Equity and Social Health Insurance: Report on Shield Work Package 1. 2007 May 1;

25. Asante A, Wasike WSK, Ataguba JE. Health Financing in Sub-Saharan Africa: From Analytical Frameworks to Empirical Evaluation. Vol. 18, Applied Health Economics and Health Policy. Adis; 2020. p. 743–6.

26. US Department of Commerce. International Trade Administration [Internet]. 2022 [cited 2023 Dec 14]. Available from: https://www.trade.gov/country-commercial-guides/tanzania-healthcare#:~:text=The%20sector%20has%20been%20allocated,that%20assist%20the%20Tanzania%20government

27. Hunter LD, Lahri S, van Hoving DJ. Eventail des patients traités dans le service de réanimation d'un hôpital public de district au Cap, en Afrique du Sud. African Journal of Emergency Medicine. 2017 Mar 1;7(1):19–23.

28. Jalali FS, Bikineh P, Delavari S. Strategies for reducing out-of-pocket payments in the health system: a scoping review. Vol. 19, Cost Effectiveness and Resource Allocation. BioMed Central Ltd; 2021.

29. Gulamhussein MA, Sawe HR, Kilindimo S, Mfinanga JA, Mussa R, Hyuha GM, et al. Out-of-pocket cost for medical care of injured patients presenting to the emergency department of national hospital in Tanzania: a prospective cohort study. BMJ Open. 2023 Jan 31;13(1).

30. Rostampour M, Nosratnejad S. A Systematic Review of Equity in Healthcare Financing in Low- and Middle-Income Countries. Value Health Reg Issues. 2020 May 1;21:133–40.

31. Swere KMR. Challenges Hindering the Accessibility of Tanzania's Health Service: A Literature Review. Int J Econ Finance. 2016 Jul 20;8(8):242.

32. Kwesigabo G, Mwangu MA, Kakoko DC, Warriner I, Mkony CA, Killewo J, et al. Tanzania's health system and workforce crisis. J Public Health Policy [Internet]. 2012;33:s35–44. Available from: http://www.jstor.org/stable/23319321

33. Ezhumalai G, Jayashree M, Nallasamy K, Bansal A, Bharti B. Referrals to a pediatric emergency department of a tertiary care teaching hospital before and after introduction of a referral education module - A quality improvement study. BMC Health Serv Res. 2020 Aug 17;20(1).

34. Bukini D, Nkya S, McCurdy S, Mbekenga C, Manji K, Parker M, et al. Perspectives on building sustainable newborn screening programs for sickle cell disease: Experience from Tanzania. Int J Neonatal Screen. 2021 Mar 1;7(1).

35. Bugando Medical Centre. Bugando Medical Centre [Internet]. 2024 [cited 2024 Jan 26]. Available from: https://bmc.go.tz/public/

36. Alagappan K, Holliman J. History of the Development of International Emergency Medicine. Emerg Med Clin North Am. 2005;23(1):1–10.

37. Reynolds TA, Mfinanga JA, Sawe HR, Runyon MS, Mwafongo V. Emergency care capacity in Africa: A clinical and educational initiative in Tanzania. J Public Health Policy. 2012 Dec;33(SUPPL.1).

38. Emergency Medicine Association of Tanzania. Emergency Medicine Association of Tanzania [Internet]. [cited 2024 Jan 26]. Available from: http://www.emat.or.tz/about-us.html#:~:text=The%20field%20of%20Emergency%20Medicine,in%20more%20than%20ten%20regions.

39. Reynolds TA, Calvello EJB, Broccoli MC, Sawe HR, Mould-Millman NK, Teklu S, et al. AFEM consensus conference 2013 summary: Emergency care in Africa - Where are we now? African Journal of Emergency Medicine. 2014 Sep 1;4(3):158–63.

40. Aluisio AR, Barry MA, Martin KD, Mbanjumucyo G, Mutabazi ZA, Karim N, et al. Impact of emergency medicine training implementation on mortality outcomes in Kigali, Rwanda: An interrupted time-series study. African Journal of Emergency Medicine. 2019 Mar 1;9(1):14–20.

41. Sawe HR, Mfinanga JA, Mwafongo V, Reynolds TA, Runyon MS. Trends in mortality associated with opening of a full-capacity public emergency department at the main tertiary-level hospital in Tanzania. Int J Emerg Med. 2015 Dec 29;8(1).

42. Cunningham C, Brysiewicz P, Sepeku A, White L, Murray B, Lobue N, et al. Developing an emergency nursing short course in Tanzania. Vol. 7, African Journal

of Emergency Medicine. African Federation for Emergency Medicine; 2017. p. 147–50.

43. Brysiewicz P, Scott T, Acheampong E, Muya I. Facilitating the development of emergency nursing in Africa: Operational challenges and successes. Vol. 11, African Journal of Emergency Medicine. African Federation for Emergency Medicine; 2021. p. 335–8.

44. Muchatuta M, Mudariki S, Matheson L, Rice B, Chidzonga M, Walker R, et al. Emergency Medical Services (EMS) Utilization in Zimbabwe: Retrospective Review of Harare Ambulance System Reports. Ann Glob Health. 2022;88(1).

45. Mould-Millman NK, Dixon JM, Sefa N, Yancey A, Hollong BG, Hagahmed M, et al. The state of Emergency Medical Services (EMS) systems in Africa. In: Prehospital and Disaster Medicine. Cambridge University Press; 2017. p. 273–83.

46. Lucumay NJ, Sawe HR, Mohamed A, Sylvanus E, George U, Mfinanga JA, et al. Pre-referral stabilization and compliance with WHO guidelines for trauma care among adult patients referred to an urban emergency department of a tertiary referral hospital in Tanzania. BMC Emerg Med. 2019 Feb 28;19(1).

47. Sawe HR, Mfinanga JA, Kisakeni S, Shao P, Nkondora P, White L, et al. Development and Implementation of Short Courses to Support the Establishment of a Prehospital System in Sub-Saharan Africa: Lessons Learned from Tanzania. Emerg Med Int. 2019 Dec 1;2019:1–7.

48. Rice B, Pickering A, Laurence C, Kizito PM, Leff R, Kisingiri SJ, et al. Emergency medicine physician supervision and mortality among patients receiving care from non-physician clinicians in a task-sharing model of emergency care in rural Uganda: a retrospective analysis of a single-centre training programme. BMJ Open. 2022 Jun 1;12(6).

49. Reynolds T, Sawe HR, Lobue N, Mwafongo V. 107 Most Frequent Adult and Pediatric Diagnoses Among 60,000 Patients Seen in a New Urban Emergency Department in Dar Es Salaam, Tanzania. Ann Emerg Med. 2012 Oct;60(4): S39.

50. Koka PM, Sawe HR, Mbaya KR, Kilindimo SS, Mfinanga JA, Mwafongo VG, et al. Disaster preparedness and response capacity of regional hospitals in Tanzania: A descriptive cross-sectional study. BMC Health Serv Res. 2018 Nov 6;18(1).

51. Sawe HR, Mfinanga JA, Mbaya KR, Koka PM, Kilindimo SS, Runyon MS, et al. Trauma burden in Tanzania: A one-day survey of all district and regional public hospitals. BMC Emerg Med. 2017 Oct 13;17(1).

52. Kannan VC, Ramalanjaona G, Andriamalala CN, Reynolds TA. The clinical practice of emergency medicine in Mahajanga, Madagascar. In: African Journal of Emergency Medicine. African Federation for Emergency Medicine; 2016. p. 5–11.

53. Taljaard L, Maharaj R, Hendrikse C. A descriptive analysis of the casemix presenting to a tertiary hospital emergency centre in East London, South Africa. African Journal of Emergency Medicine. 2022 Sep 1;12(3):252–8.

54. Oyediran IO, Prattipati S, Sakita FM, Kweka GL, Tarimo TG, Peterson T, et al. The prevalence, management, and thirty-day outcomes of symptomatic atrial fibrillation in a Tanzanian emergency department. African Journal of Emergency Medicine. 2021 Dec 1;11(4):404–9.

55. Hertz JT, Sakita FM, Kweka GL, Limkakeng AT, Galson SW, Ye JJ, et al. Acute myocardial infarction under-diagnosis and mortality in a Tanzanian emergency department: A prospective observational study. Am Heart J. 2020 Aug 1;226:214–21.

56. Zimmerman A, Barcenas LK, Pesambili M, Sakita F, Mallya S, Vissoci JRN, et al. Injury characteristics and their association with clinical complications among emergency care patients in Tanzania. African Journal of Emergency Medicine. 2022 Dec 1;12(4):378–86.

57. Chalya PL, Mabula JB, Dass RM, Mbelenge N, Ngayomela IH, Chandika AB, et al. Injury characteristics and outcome of road traffic crash victims at Bugando Medical Centre in Northwestern Tanzania. J Trauma Manag Outcomes. 2012 Feb 9;6(1).

58. Chalya PL, Mabula JB, Giiti G, Chandika AB, Dass RM, McHembe MD, et al. Splenic injuries at Bugando Medical Centre in northwestern Tanzania: A tertiary hospital experience. Vol. 5, BMC Research Notes. 2012.

59. Lema MK, Chalya PL, Mabula JB, Mahalu W. Pattern and outcome of chest injuries at Bugando Medical Centre in Northwestern Tanzania. J Cardiothorac Surg. 2011 Jan 18;6(1).

60. Kiputa M, Salim N, Kunambi PP, Massawe A. Referral challenges and outcomes of neonates received at Muhimbili National Hospital, Dar es Salaam, Tanzania. PLoS One. 2022 Jun 1;17(6 June).

61. Simon R, Gilyoma JM, Dass RM, Mchembe MD, Chalya PL. Paediatric injuries at Bugando Medical Centre in Northwestern Tanzania: A prospective review of 150 cases. J Trauma Manag Outcomes. 2013 Nov 13;7(1).

62. Hedding K, Dippenaar E, Wallis L. A descriptive study of demographics, triage allocations and patient outcomes at a private emergency centre in Pretoria. South African Family Practice. 2021;63(1).

63. Hanewinckel R, Jongman HP, Wallis LA, Mulligan TM. Emergency medicine in Paarl, South Africa: a cross-sectional descriptive study. Int J Emerg Med [Internet]. 2010;3(3):143–50. Available from: https://pubmed.ncbi.nlm.nih.gov/21031037

64. Bahadori M, Mousavi SM, Teymourzadeh E, Ravangard R. Emergency department visits for non-urgent conditions in Iran: A cross-sectional study. BMJ Open. 2019 Oct 1;9(10).

65. Candel BG, Dap S, Raven W, Lameijer H, Gaakeer MI, de Jonge E, et al. Sex differences in clinical presentation and risk stratification in the Emergency Department: An observational multicenter cohort study. Eur J Intern Med. 2022 Jan 1;95:74–9.

66. Gordon S, Brits H, Raubenheimer JE. The effectiveness of the implementation of the Cape Triage Score at the emergency department of the National District Hospital, Bloemfontein. South African Family Practice. 2015;57(1):18–23.

67. Giri S, Rogne T, Uleberg O, Skovlund E, Shrestha SK, Koju R, et al. Presenting complaints and mortality in a cohort of 22,000 adult emergency patients at a local hospital in Nepal. J Glob Health [Internet]. 2019;9(2):20403. Available from: https://pubmed.ncbi.nlm.nih.gov/31489186

68. Abir M, Goldstick JE, Malsberger R, Williams A, Bauhoff S, Parekh VI, et al. Evaluating the impact of emergency department crowding on disposition patterns and outcomes of discharged patients. Int J Emerg Med. 2019 Jan 30;12(1).

69. Almubarak H, Meckler G, Doan Q. Factors and outcomes associated with paediatric emergency department arrival patterns through the day. Paediatrics and Child Health (Canada). 2019 Jul 25;24(5):323–9.

70. Schmitz MM, Serbanescu F, Arnott GE, Dynes M, Chaote P, Msuya AA, et al. Referral transit time between sending and first-line receiving health facilities: A geographical analysis in Tanzania. BMJ Glob Health. 2020 Jul 1;4.

71. Maillie L, Masalu N, Mafwimbo J, Mastidia Maxmilian, Schroeder K. Delays Experienced by Patients With Pediatric Cancer During the Health Facility Referral Process: A Study in Northern Tanzania. JCO Global Oncol [Internet]. 2020;6:1757–65. Available from: https://doi.

72. Mchele GM, Mwanga AH, Kitua DW, Chugulu S. Preoperative waiting time and outcomes of non-traumatic emergency abdominal surgeries: Insights from a zonal referral hospital in northern Tanzania, a reference for health centres with similar capacities. Surgery in Practice and Science. 2023 Sep 1;14.

73. Mselle L, Sirili N, Anaeli A, Massawe S. Understanding barriers to implementing referral procedures in the rural and semi-urban district hospitals in Tanzania: Experiences of healthcare providers working in maternity units. PLoS One. 2021 Aug 1;16(8 August).

74. Becker J, Dell A, Jenkins L, Sayed R. Reasons why patients with primary health care problems access a secondary hospital emergency centre. South African Medical Journal. 2012;102(10):800–1.

75. Wallis L, Twomey M. Workload and case-mix in Cape Town emergency departments. South African Medical Journal. 2007;97:1276–80.

76. Hodkinson PW, Wallis LA. Cross-sectional survey of patients presenting to a South African urban emergency centre. Emergency Medicine Journal. 2009 Sep;26(9):635–40.

PART B: MANUSCRIPT IN ARTICLE FORMAT

Manuscript prepared ready for submission to African Journal of Emergency Medicine as per Guidance for authors:
https://www.sciencedirect.com/journal/african-journal-of-emergency-medicine/publish/guide-for-authors

A cross-sectional study of patients presenting to an urban Emergency Department in Mwanza, Tanzania

Kotecha, Shahzmah Suleman[1*] ;Cunningham, Charmaine[1] ; Sawe, Hendry Robert[2]; Hodkinson, Peter W[1].

* Corresponding author

1. Division of Emergency Medicine, University of Cape Town
2. Emergency Medicine Department, Muhimbili University of Health and Allied Sciences

Word count: 3018

Table/ figure count: 5: Tables 3, Figures 2

Supplementary table: 1

African relevance

- To ensure effective resource allocation in emergency departments across the country, a description of case-mix is an important first step.
- There are significant challenges in the provision of emergency care across Tanzania.
- This descriptive data provides insight that could guide emergency care service delivery in the region.

Abstract

Introduction: Tanzania suffers from limited healthcare resources, accentuated by the burden of trauma and infectious diseases. There is limited data on the profile of patients attending Emergency Departments (ED). This study describes patients attending the Bugando Medical Centre, Mwanza, Tanzania ED.

Methods: A cross-sectional descriptive study was conducted including all patients presenting from 01 – 31 January 2023. Information collected included demographics, referral status, main complaint, ED disposition, hospital length of stay for admitted patients, and hospital outcomes for admitted patients.

Results: A total of 3390 patients presented, and 3224 (98%) were included, of which 49.1 % were male, and the median age was 30 years (interquartile range 12-51). Most (72.9%) were self-referrals. The nature of the complaint for the majority of the patients (61.6%) was medical, and the overall median hospital length of stay was 5 days (IQR of 3-12 days) for admitted patients. Higher proportions (17.3% and 18.9%) of patients presented on Mondays and Tuesdays respectively. Among patients aged 14 years and above, hypertensive heart disease with failure, malignant neoplasm of the oesophagus and intracranial injury were the top medical, surgical and trauma diagnoses respectively. In the paediatric population (<14 years), sickle cell anaemia in crisis, hydrocephalus and diffuse traumatic brain injury were the top medical, surgical and trauma diagnoses respectively. The most common complaints among the patients presenting to the ED were gastrointestinal complaints (8.9%), respiratory complaints (3.1%) and congenital abnormalities (3.2%) in the >14 years, 1-14 years and <1 year age groups respectively. Most (63.6%) patients were discharged directly from the ED, and ED and in-hospital mortality were 0.2% and 15.5% respectively.

Conclusion: In this study, we observed a high burden of medical complaints, a high rate of ED discharge and high in-hospital mortality**.** This study can inform future studies in resource mobilization and allocation for the ED, and the health system.

Keywords: Emergency Department, Case-mix, Bugando Medical Centre, Mwanza, Tanzania.

Introduction

The Emergency Department (ED) in many settings is the entry point for patients seeking emergency care at a hospital. Triaging occurs at entry to prioritise patients and initiate treatment according to acuity (1). Strengthening of emergency care systems is an endeavour that is supported by the World Health Organisation (WHO) and is key to achieving universal health coverage (UHC) (2)(3). Tanzania's healthcare system is a pyramidal one, with a formal referral system in place (4). The majority of Tanzania's population is uninsured and suffers the burden of out-of-pocket payment for healthcare (5)(6). The increasing burden of non-communicable diseases, injury and existing infectious diseases, and the requisite human and material resources to provide quality emergency care, pose some challenges to the actualisation of universal health coverage in Tanzania (7)(8).

Several inequalities exist in Tanzania in terms of lifestyle, urbanisation and socio-economic differences. These, coupled with the determinants of health, contribute significantly to the disease burden (9).

Emergency Medicine in Tanzania has evolved over the last decade, with the initial focus being largely on one region (10), and only in the last five years have EDs around the country increasingly been overseen by qualified emergency physicians (11).

There is severe under-reporting of the true spectrum of acute presentations in Sub-Saharan Africa (SSA), with limited systems, programs and monitoring mechanisms in place to extrapolate data, complicating monitoring, evaluation and implementation of region-specific health interventions (12). To provide effective and timely emergency care with adequate resource allocation, it is imperative to understand the demand and the profile of patients who attend the ED.

Methods

This cross-sectional descriptive study reviewed the case mix of patients presenting to the Bugando Medical Centre (BMC) ED.

BMC is one of the five zonal hospitals in Tanzania. It is located in the Mwanza region and caters for the surrounding seven regions. The catchment population is about 20 million people. The ED at BMC provides outpatient services and acute care (resuscitation) services. Adults and paediatric patients have a separate acute care section. The age band attended in the paediatric section is from neonates up to age 14 years. With no formal triage system, acuity is assessed visually by the reception

staff, with or without vital signs and patient complaints. The ED has two entry points - one for walk-in patients and one for ambulance/private transport drop-offs. Informal triage occurs in both areas, and it is performed by a nurse or medical attendant. Patients may be re-triaged between the areas once the nurses take vital signs. Currently, the staffing consists of two emergency physicians, 12 medical officers and 23 nurses. Medical officers and nurses work 12-hour shifts, and emergency physicians work weekdays and are on-call during after-hours and weekends.

All patients who presented to the ED in January 2023 were enrolled in the study. A was done for all patients who presented to the ED in January 2023 for four (4) weeks. The estimated patient presentation was 75 patients a day, and approximately 2300 patients were anticipated for enrolment. Inclusion criteria included all adult and paediatric patients attending the ED. Patients who arrived dead upon arrival were presenting for follow-up of laboratory or radiology results within 1 week of a prior visit for the same complaint, prematurely born babies and women in labour with gestational age (GA) of more than 28 weeks, and those with missing key information (more than 2 variables) in their records were excluded from this study. All patient clinical notes are entered electronically by the treating doctor into an electronic medical record (EMR) system. This includes patient complaints, presenting illness, past medical history, allergies, physical examination findings, diagnosis (using the default International Classification of Disease version 10 coding system – ICD-10) and disposition. This routinely collected data was extracted into a data capture sheet, and included additional data: EMR number, age, gender, date and time of attendance, day of the week, referral status, region referred from, hospital outcome and length of stay for admitted patients.

Data was extracted by a research assistant - a medical officer, not employed in the ED, and entered using Microsoft (MS) Excel version 16.76, and data analysis was performed in STATA version 15. Descriptive statistics were reported for nominal categorical values (represented by frequencies and proportions). Since the data had both adult and paediatric (including neonates), the numerical variables are represented as median with their corresponding interquartile ranges to limit the skewing of data.

The study was approved by the University of Cape Town's Human Research and Ethics Committee (HREC 238/2022). Institutional ethical clearance, and institutional approvals, were obtained. A waiver of consent was approved as there was no direct patient contact.

Results

A total of 3290 patients presented; 66 patients were excluded from the analysis (30 presenting for follow-up only, six dead on arrival and 30 missing information (defined as two or more key variables), leaving 3224 patients for inclusion. Demographic characteristics are presented in Table 1.

Majority of patients were self-referred 2350(72.9%) of which 1209(55%) were females. Concerning the nature of ED complaints, females were more likely to present with medical and surgical complaints 1047(51%) and 424(51%) while male predominance was noted for trauma 231(67.2%). Referrals comprised 874(27%) of the total number, of which 1151(61%) were admitted. The male-to-female ratio of admitted patients was 1.2:1. Self-referrals were more than referrals by almost 3 times (2.7:1) and a majority (83.9%) of the patients who attended the ED were discharged.

There were seven deaths in the ED, of which, two were referred patients and five were self-referred. Among the admitted patients, 84.3% were discharged, and 0.2% absconded from inpatient treatment. The in-hospital mortality was close to 16% among the ED attendees. This study shows a male predominance of 1640(50.9%). The median age of presentation was 30 years (IQR – 12 – 51). Children under the age of 14 presented almost a third of the study population.

Table 1: Demographic characteristics of patients presenting to BMC ED

CATEGORY	PAEDIATRICS			ADULTS	TOTAL
	<1 yr	1-5 yrs	5-14 yrs	>14 yrs	
	N= 272	N=353	N=233	N=2366	
SEX					
Male	147 (54%)	208 (58.9%)	135 (57.9%)	1150 (48.6%)	1640 (50.9%)
Female	125 (46%)	145 (41.1)	98 (42.1%)	1216 (51.4%)	1584 (49.1%)
REFERRAL STATUS					
Self-Referral	141 (6%)	279 (11.9%)	168 (7.1%)	1762 (75.0%)	2350 (72.9%)
Referral	131 (15.0%)	74 (8.5%)	65 (7.4%)	604 (69.1%)	874 (27.1%)
PRESENTING COMPLAINT CATEGORY					
Medical	86 (4.3%)	239 (12.0%)	155 (7.8%)	1509 (75.9%)	1989 (61.7%)
Surgical	57 (7.4%)	75 (9.8%)	41 (5.3%)	595 (77.4%)	768 (23.8%)
Trauma	4 (1.2%)	39 (11.4%)	37 (10.8%)	262 (76.6%)	342 (10.6)
DAY OF PRESENTATION					
Monday	49 (8.8%)	67 (12.0%)	30 (5.4%)	411 (73.8%)	557 (17.3%)
Tuesday	43 (7.1%)	60 (9.9%)	41 (6.7%)	465 (76.3%)	609 (18.9%)
Wednesday	40 (9.2%)	35 (8.1%)	32 (7.4%)	326 (75.3%)	433 (13.4%)
Thursday	38 (8.5%)	55 (12.3%)	32 (7.1%)	323 (72.1%)	448 (13.8%)
Friday	32 (7.8%)	37 (9.0%)	26 (6.3%)	317 (76.9%)	412 (12.9%)
Saturday	39 (10.2%)	41 (10.8%)	33 (8.7%)	268 (70.3%)	381 (11.8%)
Sunday	31 (8.1%)	58 (15.1%)	39 (10.2%)	256 (66.7%)	384 (11.9%)
EMERGENCY DEPARTMENT DISPOSITION					
Admitted	103 (14.1%)	121 (10.5%)	85 (7.4%)	783 (68.0%)	1151 (35.6%)
Discharged	109 (5.3%)	232 (11.2%)	148 (7.2%)	1577 (76.3%)	2066 (64.2%)
Died in the ED	1 (14.3%)	0 (0%)	0 (0%)	6 (85.7%)	7 (0.2%)
HOSPITAL OUTCOME FOR ADMITTED PATIENTS (N=1151)					
Discharged	133 (13.7%)	111 (11.4%)	77 (7. 9%)	650 (66.9%)	971 (84.4%)
Died in hospital	27 (15.2%)	10 (5.6%)	8 (4.5%)	133 (74.7%)	178 (15.5%)
Absconded	2 (100%)	0 (0%)	0 (0%)	0 (0%)	2 (100%)
Length of Stay	Median 5 days (IQR 3-12) Range: 1 - 180 days				

Table 2 explores the ED disposition based on the nature of complaints in three major categories, medical, surgical and trauma. Seven medical patients died in the ED, 1 who was under 1 year of age and 6 who were over 14 years old. These complaints

were classified into three major categories; medical, surgical and trauma. For patients who presented with either one or more than one complaint, the decision to classify them as medical, surgical or trauma was based on their complaints and final disposition, depending on the service that took over the care of the patient.

Table 2: Age-related nature of complaints and ED disposition

NATURE OF COMPLAINT	**<1 yr**		**1-5 years**		**5-14 years**		**>14 years**		**TOTAL**
	Admitted	**Discharged**	**Admitted**	**Discharged**	**Admitted**	**Discharged**	**Admitted**	**Discharged**	
Medical	92 (4.5%)	56 (2.7%)	74 (3.6%)	165 (8.1%)	57 (2.8%)	98 (4.8%)	419 (20.5%)	1084 (20.5%)	2045 (63.4%)
Surgical	67 (8.1%)	50 (6.0%)	25 (3.0%)	50 (6.0%)	14 (1.7%)	27 (3.3%)	233 (28.1%)	362 (43.7%)	828 (25.7%)
Trauma	3 (0.9%)	3 (0.9%)	22 (6.4%)	17 (4.9%)	14 (4.1%)	23 (6.7%)	131 (38.1%)	131 (38.1%)	344 (10.7%)
TOTAL	162 (5.0%)	109 (3.4%)	121 (3.8%)	232 (7.2%)	85 (2.6%)	148 (4.6%)	783 (24.3%)	1577 (48.9%)	3217 (99.8%)

The most frequent final diagnoses for ED patients, according to ICD-10 coding upon ED disposition, were analysed. The top five diagnoses based on frequency of presentation in both the paediatric and adult groups were determined. Sepsis was the most frequent diagnosis across all age groups with 108 (3.3%) patients having sepsis as their primary diagnosis. When entering the ICD-10 code, the specific diagnosis relating to the source of sepsis is entered instead of inserting sepsis as a diagnosis. It could also be undifferentiated or from a known source (more likely in referred patients). Due to the method of coding and complexity in diagnosis is possible that sepsis remains underrepresented in the data set.

Several congenital malformations were seen and hydrocephalus accounts for 17 (7.3%) of the paediatric presentations, with a total of 103 (37.9%) infants presenting with congenital abnormalities. Among children, 100 (11.7%) presented with respiratory complaints and acute upper respiratory tract infections were the most common diagnosis.

Among the adult patients, there was a mix of infectious diseases and non-communicable diseases (NCDs) with a range of 45 – 65 patients (3-4%) presenting with either NCDs or sepsis. Head trauma was a common diagnosis, n=38 across

adults and paediatric patients. However, due to the nature of the EMR, some patients could have been polytrauma patients but were not listed as polytrauma instead, individual injuries were coded.

At BMC, in the electronic medical record system, specific disease codes need to be mentioned for the record to be counted as complete. Also, patients who had more than one ICD-10 code as a final diagnosis made this more complex hence it was difficult to derive more information on this and represent it more accurately.

The number of patients presenting during the night shift was less than those on the day shift, however, the proportion of admissions in the night was three times higher than the discharges and this is statistically significant (Fisher's exact test, p=0.000) (Figure 1).

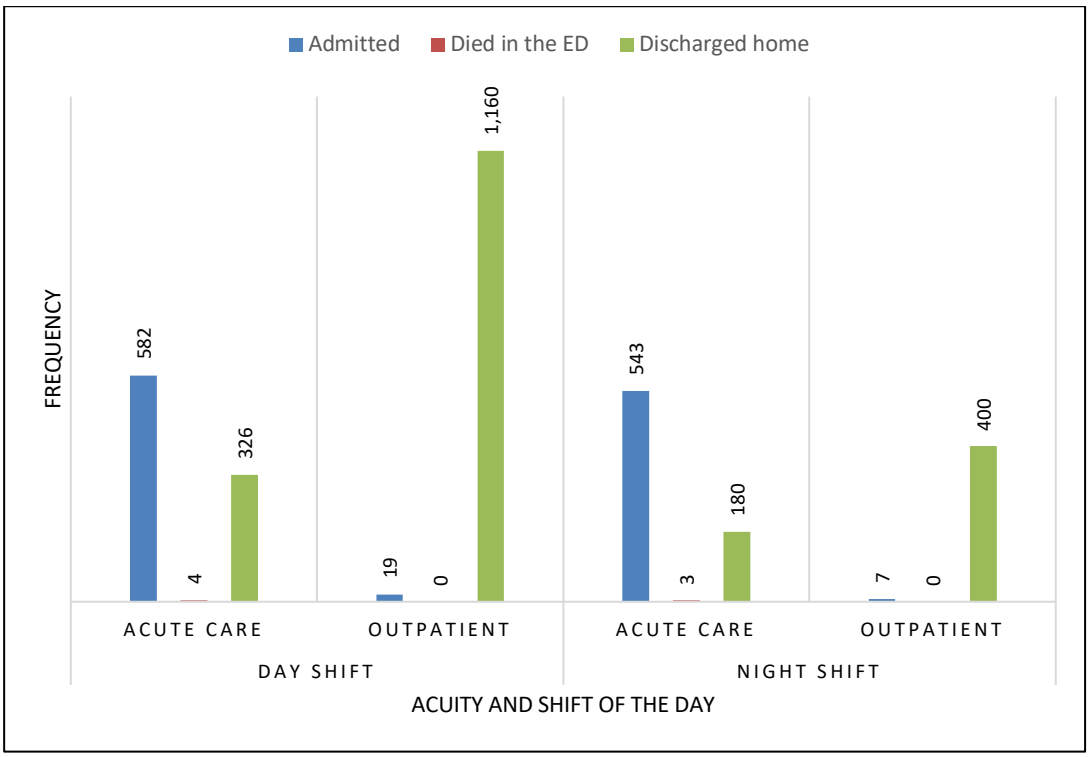


Figure 3: ED disposition based on acuity and shift of day

(Day 07h30-19h30; Night 19h31-07h29)

Among all the referred patients seen in the ED (n=874), some 270 (30.9%) were children under the age of 14 years. The majority of the referred children were admitted across all age groups. There were a total of 604 (69.1%) adult referrals, 351 (58.1%) were admitted, 350 being from the acute care area and one from the outpatient

section. There were 252 (41.7%) adults who were discharged, 121 from the acute care area and 131 from the outpatient area.

Table 3: ED disposition of patients based on acuity and shift of the day

ED DISPOSITION	**DAY SHIFT**			**NIGHT SHIFT**		
	ACUTE CARE	**OUTPATIENT**	**TOTAL**	**ACUTE CARE**	**OUTPATIENT**	**TOTAL**
Admitted	582 (63.8%)	19 (0.6%)	601 (28.7%)	543 (74.8%)	7 (1.7%)	550 (48.5%)
Died in the ED	4 (0.4%)	0 (0%)	4 (0.2%)	3 (0.4%)	0 (0%)	3 (0.3%)
Discharged home	326 (35.8%)	1160 (98.4%)	1486 (71.1%)	180 (24.8%)	400 (98.3%)	580 (51.2%)
TOTAL	**912 (100%)**	**1179 (100%)**	**2091 (100%)**	**726 (100%)**	**407 (100%)**	**1133 (100%)**
Fischer's exact	p = 0.000			p = 0.000		

The majority of patients presented in the day shift 2091 (64.9%) with most attendances being on Tuesday 609 (18.9%) and weekend attendances less; Saturday 381 (11.8%); Sunday 384 (11.9%) (Figure 2). The mean daily attendance was 104 patients. For children under 5 years of age, 116 (18.6%) were seen to attend on Mondays, 116 (18.6%), while for children between the ages of 5 and 14 years, 41 (17.6%) were noted to attend on Tuesdays. A little over half 1638 (50.8%) of patients were seen in the acute care area.

The majority of outpatients 2272 (38.9%) were referred from within Mwanza. The region with the second highest referrals was Mara region with 227 (7%) referrals to BMC. Of all the referrals, 1638 (50.8%) required acute care. Among all the referred patients, 61.6% were admitted to the hospital.

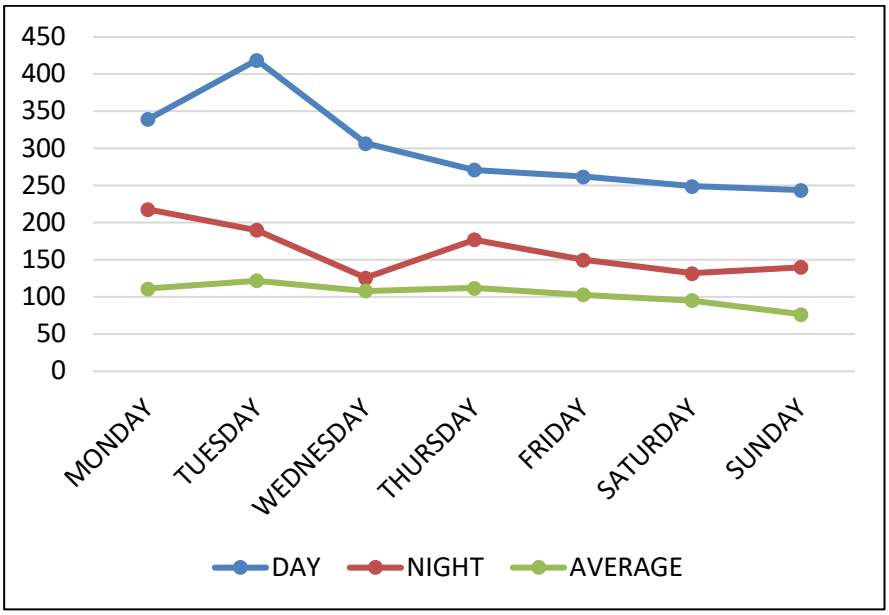


Figure 4: Patient presentations over shifts and days of the week

Discussion

We conducted the first study describing patients presenting to a tertiary hospital ED in northern Tanzania. An average of 104 patients per day presented to the ED, with a balance between high acuity and outpatients (13). Patient acuity was high with over a third of patients presenting admitted, and an in-hospital death rate of close to 16% of ED attendees. Those who were triaged as outpatients were discharged in most instances. This result is similar to studies done in South Africa (14) and could likely suggest that many could have been more appropriately managed at lower-tier health facilities.

Although our data suggests some efficacy in the informal triage by clinician "gestalt" combined with ambulation (15), there is a need to establish a formal triaging system in the ED to improve the overall patient outcome, and patient satisfaction and reduce ED waiting times.

In this study, males to females almost equally attended the ED and this compares to studies which show that male ED attendance ranged from 50% to 60% (16)(17)(18)(19). The median age of attendance was 30 years (IQR 12 – 51) and almost a quarter of the patients were under 14 years of age. Adults were admitted twice as much as children, but the number of paediatric patients was only a third of the adult population. These results compare to studies done within and outside Africa where the proportion of children who attended the ED was about a quarter of the attendance (16)(18)(19). There were more adult deaths as compared to children. This picture is slightly different from the population pyramid in Tanzania as well as other African countries where children and young adults are higher in numbers (20).

Day shifts were busier with almost two-thirds of presentations to the ED during the day, and Mondays and Tuesdays. Abir, M et al (21) demonstrated Mondays and Tuesdays to be the busiest shifts. The weekend attendance compares to Bahadori et al (16) who demonstrated almost 38% attendance on night shifts but a notable difference in the weekend attendance. The same study had a 72% weekend attendance while this study showed between 11 – 12% weekend attendance. Night shift attendance as demonstrated by Almubarak et al (23) was 12% and this is much less than that demonstrated in this study. Anecdotally, it is a common understanding among the general public that there are no doctors available on weekends, evenings and nights and therefore they tend to present more during the day (22).

The majority of ED patients were self-referred and about a quarter were referred from elsewhere. Many of the self-referred patients could have been managed appropriately at lower-tier health facilities. At BMC, the notion of naming patients as “self-referrals” exists. These are patients who have not followed the referral pathway in its entirety and have skipped one or two levels of referrals and come to seek care at BMC. A patient who comes to BMC straight from a health centre or a district hospital is a good example of a “self-referral”. Other self-referrals maybe those who come directly from home to seek care at BMC.

Kilindimo et al (22) in 2013, suggested that there were serious limitations in healthcare infrastructure, equipment and supplies in lower-tier health facilities, and this forces patients to seek care at the next higher-level facility.

In Tanzania, neonatal and maternal referral patterns and challenges have been described. Their findings underlined that there should be rigid protocols for referring patients, that communication challenges exist between healthcare facilities and there are knowledge gaps in handling various emergencies en route (24)(25). Hannewinckel et al (18) demonstrated a high proportion (88.2%) of self-referral in a South African regional ED. Self-referrals were noted to be higher in women in this study. This is different from Candel et al (17) who demonstrated that self-referrals were higher among men. There are differences in referral patterns between South Africa and Tanzania due to the nature of the healthcare system. In Tanzania, most referrals are sent by ambulances because of the acuity of patients. The effectiveness of the ambulances currently in place requires to be studied. There are a small group that have benign conditions and are advised to seek specialised care as outpatients.

Muganyizi et al (26) in a study of obstetric referrals in the BMC region, demonstrated that the longest transport distances existed in the Lake and western zones of the country with an average travel time ranging between two and a half hours to seven hours. This indicates the challenges faced by referred patients, especially the burden of transport costs. As per the formal system, the transfer of patients between facilities is supposed to be free but then due to the various challenges of finances that exist in the local government, sometimes patients and/or their families are forced to contribute towards the ambulance service to facilitate patient transfer to the next higher-level facility.

In terms of patient conditions, we note many for sickle cell anaemia which is no surprise - Ambrose et al (27) demonstrated that sickle cell among newborns in the Lake Zone region of Tanzania is among the highest in the world, and BMC has the

only sickle cell clinic in the Lake Zone. Concerning trauma patients, Chalya et al (28) 2013 demonstrated that trunk and extremity injuries were common in contrast to this study which showed head injuries / intracranial injuries to be more common. It could be because BMC is the only tertiary-level hospital in the Lake Zone with the capability to render neurosurgical care to patients, which may influence the number of referrals for these patients.

ED disposition for this study was mainly discharge, a similar finding to other studies(29)(30), and could be due to the lack of primary healthcare facilities in Tanzania and resource limitations at the lower-tier health facilities. The notion that higher-level healthcare facilities have better care, more staff and are available all the time, may also influence the decision of patients and hence they decide to self-refer to these facilities (31).

A small percentage of patients in this study (0.2%) died in the ED. Hedding et al (30) in a South African study demonstrated a 0.1% mortality rate, which, given the different resource levels and difficulties accessing care in Tanzania, is a fair mortality rate at BMC ED. South Africa has a more formalised EMS system that may offer interventions to the most ill before arrival to the ED. Any pre-hospital intervention provided is bound to increase the chance of survival for the patients.

Strengths and limitations

Descriptive data is vital to guide emergency care interventions and to design context-specific systems. There is limited data in the region of Mwanza on the patient and disease profile and limited data. It was impossible to ascertain any seasonal variations due to the short study duration, and a longer study duration is recommended to provide such information. Missing data in this study were not further explored because the numbers were small and it would not have made a significant difference in the overall picture.

Future research should consider describing the ED workload in other levels of healthcare provision and examining the referral system for emergency patients.

The ICD-10 blocks and specific codes made it particularly difficult to represent some diagnoses accurately. This should be addressed by looking into the ICD-10 blocks in future studies as opposed to specific diagnosis codes.

Conclusion and recommendations

We found a high burden of NCD, hypertension and stroke in adults and sickle cell in children and a relatively young population presenting to this ED. A high discharge rate suggests underutilised lower-tier health facilities for basic care, yet there were many high acuity referrals and admissions which provided useful information to optimise services.

Author's contributions

The following authors made the following contributions to the work's conception and/or design (SSK, PH, CC), data collection, analysis and/or interpretation (SSK, PH, CC). The drafting of the work (SSK) and/or critical revision for significant intellectual content (PH, CC). SSK made a 75% contribution, PH made a 10% contribution, CC made a 10% contribution and HRS made a 5% contribution. The publication of the manuscript was approved by all the authors who also pledged to take responsibility for all parts of the work.

Conflict of interest declaration

SS is the head of the department where the data is being collected. To mitigate this, a research assistant, who is a medical doctor who completed his internship and was waiting for employment, was recruited to enter the information in conjunction with medical records personnel to help retrieve the records.

Other than that, there are no other conflicts of interest to declare.

References

1. Taljaard L, Maharaj R, Hendrikse C. A descriptive analysis of the case-mix presenting to a tertiary hospital emergency centre in East London, South Africa. African Journal of Emergency Medicine. 2022 Sep 1;12(3):252–8.
2. World Health Organisation. Emergency care systems for universal health coverage: ensuring timely care for the acutely ill and injured [Internet]. Geneva; 2019. Available from: http://apps.who.int/gb/ebwha/pdf_files/WHA71/A71_4-en.pdf?ua=1or,
3. Owoo C, Adhikari NKJ, Akinola O, Aryal D, Azevedo LC, Bacha T, et al. The World Health Assembly resolution on integrated emergency, critical, and operative care for universal health coverage and protection from health emergencies: a golden opportunity to attenuate the global burden of acute and critical illness. Vol. 49, Intensive Care Medicine. Springer Science and Business Media Deutschland GmbH; 2023. p. 1223–5.
4. Kwesigabo G, Mwangu MA, Kakoko DC, Warriner I, Mkony CA, Killewo J, et al. Tanzania's health system and workforce crisis. J Public Health Policy [Internet]. 2012;33:s35–44. Available from: http://www.jstor.org/stable/23319321
5. Asante A, Wasike WSK, Ataguba JE. Health Financing in Sub-Saharan Africa: From Analytical Frameworks to Empirical Evaluation. Vol. 18, Applied Health Economics and Health Policy. Adis; 2020. p. 743–6.
6. Jalali FS, Bikineh P, Delavari S. Strategies for reducing out of pocket payments in the health system: a scoping review. Vol. 19, Cost Effectiveness and Resource Allocation. BioMed Central Ltd; 2021.
7. Frumence G, Nyamhanga T, Mwangu M, Hurtig AK. Challenges to the implementation of health sector decentralization in Tanzania: Experiences from Kongwa district council. Glob Health Action. 2013;6(1).
8. Chimhutu V, Tjomsland M, Songstad NG, Mrisho M, Moland KM. Introducing payment for performance in the health sector of Tanzania- the policy process. Global Health. 2015 Sep 2;11(1).
9. Mahmood AUD, Adily P, Francis S, Eastwood J, Bein K, Chakar BA, et al. Understanding low acuity emergency department presentations in infancy: A cohort study. EMA - Emergency Medicine Australasia. 2024;

10. Nicks BA, Sawe HR, Juma AM, Reynolds TA. The state of emergency medicine in the United Republic of Tanzania. African Journal of Emergency Medicine. 2012;2(3):97–102.

11. Reynolds TA, Mfinanga JA, Sawe HR, Runyon MS, Mwafongo V. Emergency care capacity in Africa: A clinical and educational initiative in Tanzania. J Public Health Policy. 2012 Dec;33(SUPPL.1).

12. Reynolds TA, Calvello EJB, Broccoli MC, Sawe HR, Mould-Millman NK, Teklu S, et al. AFEM consensus conference 2013 summary: Emergency care in Africa - Where are we now? African Journal of Emergency Medicine. 2014 Sep 1;4(3):158–63.

13. Zimmerman A, Barcenas LK, Pesambili M, Sakita F, Mallya S, Vissoci JRN, et al. Injury characteristics and their association with clinical complications among emergency care patients in Tanzania. African Journal of Emergency Medicine. 2022 Dec 1;12(4):378–86.

14. Hodkinson PW, Wallis LA. Cross-sectional survey of patients presenting to a South African urban emergency centre. Emergency Medicine Journal. 2009 Sep;26(9):635–40.

15. Cheng MT, Sung CW, Ko CH, Chen YC, Liew CQ, Ling DA, et al. Physician gestalt for emergency department triage: A prospective videotaped study. Academic Emergency Medicine. 2022 Sep 1;29(9):1050–6.

16. Bahadori M, Mousavi SM, Teymourzadeh E, Ravangard R. Emergency department visits for non-urgent conditions in Iran: A cross-sectional study. BMJ Open. 2019 Oct 1;9(10).

17. Candel BG, Dap S, Raven W, Lameijer H, Gaakeer MI, de Jonge E, et al. Sex differences in clinical presentation and risk stratification in the Emergency Department: An observational multicenter cohort study. Eur J Intern Med. 2022 Jan 1;95:74–9.

18. Hanewinckel R, Jongman HP, Wallis LA, Mulligan TM. Emergency medicine in Paarl, South Africa: a cross-sectional descriptive study. Int J Emerg Med [Internet]. 2010;3(3):143–50. Available from: https://pubmed.ncbi.nlm.nih.gov/21031037

19. Gordon S, Brits H, Raubenheimer JE. The effectiveness of the implementation of the Cape Triage Score at the emergency department of the National District Hospital, Bloemfontein. South African Family Practice. 2015;57(1):18–23.

20. Government of Tanzania. Census Information Dissemination Platform [Internet]. 2022 [cited 2023 Dec 14]. Available from: https://sensa.nbs.go.tz/

21. Abir M, Goldstick JE, Malsberger R, Williams A, Bauhoff S, Parekh VI, et al. Evaluating the impact of emergency department crowding on disposition patterns and outcomes of discharged patients. Int J Emerg Med. 2019 Jan 30;12(1).

22. Kilindimo S, Wallis L. Analysis of the resources for emergency care in district and regional public hospitals in Tanzania [Internet]. 2013 [cited 2024 Feb 1]. Available from: https://scholar2.stb.sun.ac.za/handle/10019.1/100724

23. Almubarak H, Meckler G, Doan Q. Factors and outcomes associated with paediatric emergency department arrival patterns through the day. Paediatrics and Child Health (Canada). 2019 Jul 25;24(5):323–9.

24. Kiputa M, Salim N, Kunambi PP, Massawe A. Referral challenges and outcomes of neonates received at Muhimbili National Hospital, Dar es Salaam, Tanzania. PLoS One. 2022 Jun 1;17(6 June).

25. Mselle L, Sirili N, Anaeli A, Massawe S. Understanding barriers to implementing referral procedures in the rural and semi-urban district hospitals in Tanzania: Experiences of healthcare providers working in maternity units. PLoS One. 2021 Aug 1;16(8 August).

26. Muganyizi P. Availability, Coverage and Geographical Distribution of Emergency Obstetric and Neonatal Care Services in Tanzania Mainland. Journal of Gynecology and Obstetrics. 2017;5(1):1.

27. Ambrose EE, Makani J, Chami N, Masoza T, Kabyemera R, Peck RN, et al. High birth prevalence of sickle cell disease in Northwestern Tanzania. Pediatr Blood Cancer. 2018 Jan 1;65(1).

28. Chalya PL, Mabula JB, Dass RM, Mbelenge N, Ngayomela IH, Chandika AB, et al. Injury characteristics and outcome of road traffic crash victims at Bugando Medical Centre in Northwestern Tanzania. J Trauma Manag Outcomes. 2012 Feb 9;6(1).

29. House DR, Nyabera SL, Yusi K, Rusyniak DE. Descriptive study of an emergency centre in Western Kenya: Challenges and opportunities. African Journal of Emergency Medicine. 2014;4(1):19–24.

30. Hedding K, Dippenaar E, Wallis L. A descriptive study of demographics, triage allocations and patient outcomes at a private emergency centre in pretoria. South African Family Practice. 2021;63(1).

31. Becker J, Dell A, Jenkins L, Sayed R. Reasons why patients with primary health care problems access a secondary hospital emergency centre. South African Medical Journal. 2012;102(10):800–1.

PART C: ADDENDA

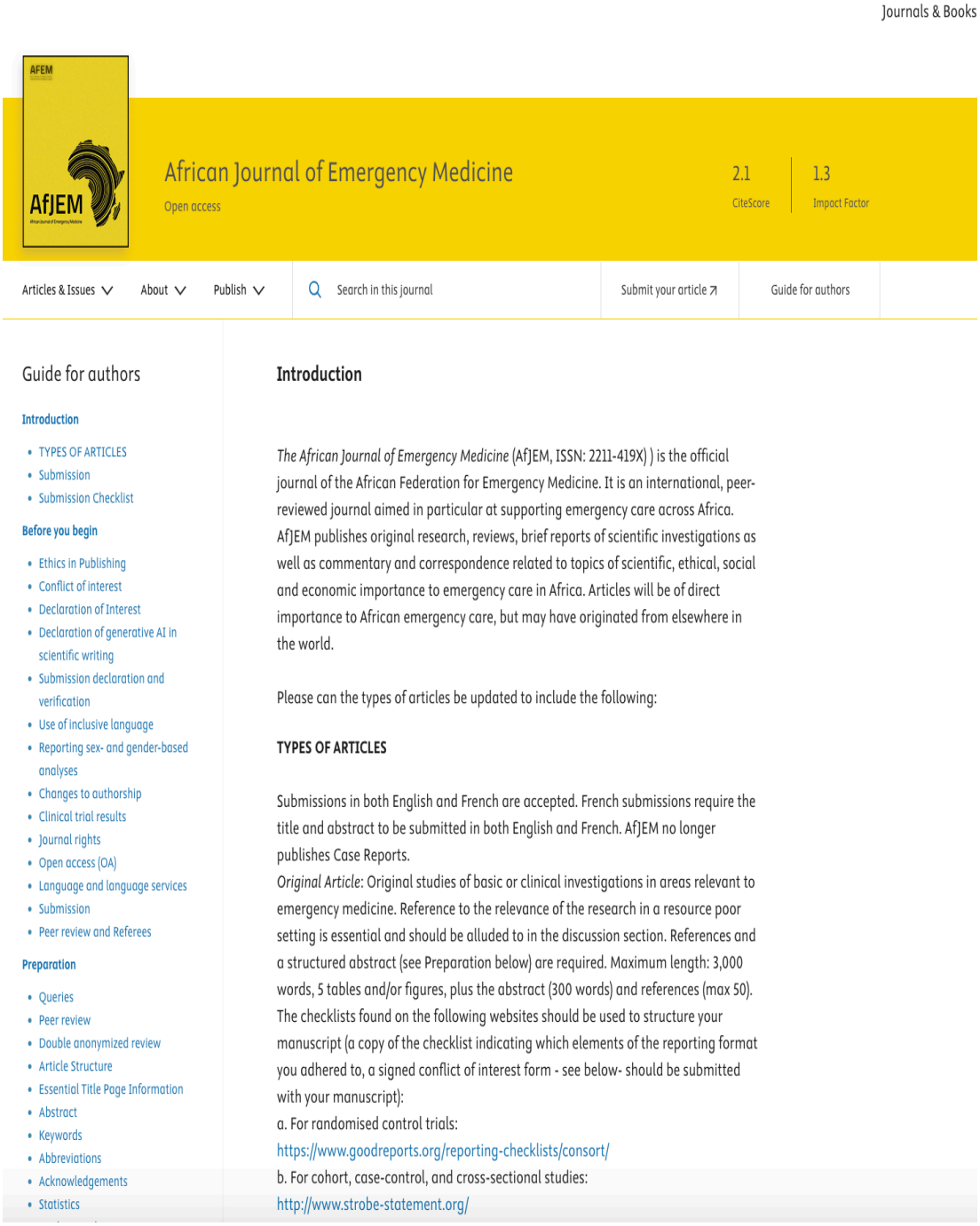
a. Supplementary table

Table 4: Age-related top 5 diagnosis

Nature of ED complaint	**<14 (N=548)**	**Frequency (%)**	**>14 (N=1504)**	**Frequency (%)**
Medical complaints N=2052 (63.6%) Top 5 diagnosis	Sickle cell anaemia in crisis	60 (10.9%)	Hypertensive heart disease with heart failure	66 (4.4%)
	Septicaemia	54 (9.9%)	Stroke, not defined as ischaemic or haemorrhagic	59 (3.9%)
	Acute Upper respiratory tract infection	52 (9.5%)	Septicaemia	45 (3.0%)
	Infectious Gastroenteritis and colitis	21 (3.8%)	Acute upper respiratory tract infection	45 (3.0%)
	Acute nasopharyngitis	18 (3.3%)	H. pylori as the cause of disease	44 (2.9%)
Nature of ED complaint	**<14 (N=234)**	**Frequency (%)**	**>14 (N=594)**	**Frequency (%)**
Surgical complaint N=828 (25.7%) Top 5 diagnosis	Hydrocephalus	17 (7.3%)	Malignant neoplasm of oesophagus	23 (3.9%)
	Hypertrophy of tonsils and adenoids	12 (5.1%)	Malignant neoplasm of breast	20 (3.4%)
	Spina Bifida	9 (3.8%)	Benign prostatic hyperplasia without lower urinary tract symptoms	20 (3.4%)
	Gastroschisis	7 (3.0%)	Malignant neoplasm of prostate	13 (2.2%)
	Adenoid hypertrophy	6 (2.6%)	Urethral stricture	12 (2.0%)
Nature of ED complaint	**<14 (N=82)**	**Frequency (%)**	**>14 (N=262)**	**Frequency (%)**
Trauma N=344 (10.7%) Top 5 diagnosis	Diffuse traumatic brain injury	7 (8.5%)	Intracranial injury	31 (37.8%)
	Intracranial injury	6 (7.3%)	Fracture of skull and facial bones	11 (13.4%)
	Fracture of radius and ulna	4 (4.9%)	Fracture of femur	11 (13.4%)
	Fracture of skull and facial bones	3 (3.7%)	Fracture of shaft of tibia	9 (11.0%)
	Fracture of lower end of humerus	3 (3.7%)	Open wound of scalp	7 (8.5%)

b. Journal Instructions to Authors

Available at https://www.sciencedirect.com/journal/african-journal-of-emergency-medicine/publish/guide-for-authors



Journals & Books

African Journal of Emergency Medicine

Open access

2.1 CiteScore | 1.3 Impact Factor

Articles & Issues | About | Publish | Search in this journal | Submit your article | Guide for authors

Guide for authors

Introduction

- TYPES OF ARTICLES
- Submission
- Submission Checklist

Before you begin

- Ethics in Publishing
- Conflict of interest
- Declaration of Interest
- Declaration of generative AI in scientific writing
- Submission declaration and verification
- Use of inclusive language
- Reporting sex- and gender-based analyses
- Changes to authorship
- Clinical trial results
- Journal rights
- Open access (OA)
- Language and language services
- Submission
- Peer review and Referees

Preparation

- Queries
- Peer review
- Double anonymized review
- Article Structure
- Essential Title Page Information
- Abstract
- Keywords
- Abbreviations
- Acknowledgements
- Statistics

Introduction

The African Journal of Emergency Medicine (AfJEM, ISSN: 2211-419X)) is the official journal of the African Federation for Emergency Medicine. It is an international, peer-reviewed journal aimed in particular at supporting emergency care across Africa. AfJEM publishes original research, reviews, brief reports of scientific investigations as well as commentary and correspondence related to topics of scientific, ethical, social and economic importance to emergency care in Africa. Articles will be of direct importance to African emergency care, but may have originated from elsewhere in the world.

Please can the types of articles be updated to include the following:

TYPES OF ARTICLES

Submissions in both English and French are accepted. French submissions require the title and abstract to be submitted in both English and French. AfJEM no longer publishes Case Reports.
Original Article: Original studies of basic or clinical investigations in areas relevant to emergency medicine. Reference to the relevance of the research in a resource poor setting is essential and should be alluded to in the discussion section. References and a structured abstract (see Preparation below) are required. Maximum length: 3,000 words, 5 tables and/or figures, plus the abstract (300 words) and references (max 50). The checklists found on the following websites should be used to structure your manuscript (a copy of the checklist indicating which elements of the reporting format you adhered to, a signed conflict of interest form - see below- should be submitted with your manuscript):
a. For randomised control trials:
https://www.goodreports.org/reporting-checklists/consort/
b. For cohort, case-control, and cross-sectional studies:
http://www.strobe-statement.org/

c. Ethics approval letter UCT HREC

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

Room 45 E-52-E-Floor- Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6492
Email: hrec-submissions@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/forms

03 June 2022

HREC REF: 238/2022

A/Prof P Hodkinson
Division of Emergency Medicine
F-51 OMB
Email: Peter.hodkinson@uct.ac.za
Student: slmsha054@myuct.ac.za

Dear A/Prof Hodkinson

PROJECT TITLE : A CROSS-SECTIONAL STUDY OF PATIENTS PRESENTING TO AN URBAN EMERGENCY DEPARTMENT IN MWANZA, TANZANIA
(MPHIL DEGREE - DR. SHAHZMAH SULEMAN KOTECHA)

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee (HREC) for review.

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

This approval is subject to strict adherence to the HREC recommendations regarding research involving human participants during COVID -19. Please refer to guidance letter dated 02 February 2022 on our website:
http://www.health.uct.ac.za/fhs/research/humanethics/forms

Approval is granted for one year until the 30 June 2023.

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)

The HREC acknowledge that the student: Dr Shahzmah Suleman will also be involved in this study.

Please quote the HREC REF 238/2022 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, FACULTY OF HEALTH SCIENCES HUMAN RESEARCH ETHICS COMMITTEE
Federal Wide Assurance Number: FWA00001637. Institutional Review Board (IRB) number: IRB00001938 NHREC-registration number: REC-210208-007
This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use: Good Clinical Practice (ICH GCP), South African Good Clinical Practice Guidelines (DoH 2020), based on the Association of the British Pharmaceutical Industry Guidelines (ABPI), and Declaration of Helsinki (2013) guidelines. The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.

HREC/ref238.2022

d. Ethics approval letter BMC (initial)

CATHOLIC UNIVERSITY OF HEALTH
AND ALLIED SCIENCES
BUGANDO

P.O. Box 1464 Phone: (255) 28-250-0881 Email: vc@bugando.ac.tz
Mwanza, Tanzania Fax: (255) 28-250-2678 Website: www.bugando.ac.tz

CUHAS/BMC RESEARCH & ETHICAL COMMITTEE (CREC)
ETHICAL CLEARANCE FORM

Date	14th March 2022
Research Clearance Certificate No	CREC/533/2022
Name of researchers/PI and Institution	▪ Shahzmah Suleman Kotecha (MD, MMed) ▪ University of Cape Town
Purpose of the research	Master of Philosophy in Emergency Medicine
Title of the Research	A cross-sectional study of patients presenting to an urban emergency department in Mwanza, Tanzania
Budget and Sponsor (s)	▪ 850000/= ▪ Self Sponsored
Research period	March 2022 to February 2023

Ethical clearance is hereby granted.

A progress report shall be submitted to the relevant Directorate every 6 months.

CREC Chairperson **CREC Secretary**

Director RESEARCH AND PUBLICATION OF UNIVERSITY OF HEALTH SCIENCES - BUGANDO P.O. Box 1464 MWANZA, TANZANIA.

e. Renewed Proposal institutional ethical approval

CATHOLIC UNIVERSITY OF HEALTH AND ALLIED SCIENCES
BUGANDO

P.O. Box 1464 Phone: (255) 28-250-0881 Email: vc@bugando.ac.tz

Mwanza, Tanzania Fax: (255) 28-250-2678 Website: www.bugando.ac.tz

CUHAS DIRECTORATE OF RESEARCH AND INNOVATIONS

AMENDMENT/RENEWAL FORM

AMENDMENT ☑ **/ RENEWAL** ☑ ***(Please tick the relevant box)***

Date	**23rd June 2023**
Research Clearance Certificate No	**CREC/533/2020**
Research period previously allocated	• **March 2022 to February 2023**
Author(s)	▪ **Dr. Shahzmah Suleman (MD,M.Med)**
Name and e-mail address of corresponding author	**Shahzmah.suleman@gmail.com**
Title of the proposal	**A cross-sectional study of patients presenting to an urban emergency department in Mwanza, Tanzania**
Reason for renewal/amendment	▪ **Modification of data collection procedure as initial procedure was based on data extraction from electronic medical record (HMIS) which was not practical** ▪ **Descriptive study to be finalized within the time frame of the project**
Comments from Directorate	**None**

Authorization to amend ☑ **/renew** ☑ **the above proposal is hereby granted.**

The renewal period is March 2023 to February 2024

Director
RESEARCH AND PUBLICATION
CATHOLIC UNIVERSITY OF HEALTH
AND ALLIED SCIENCES - BUGANDO
P.O. BOX 1464
MWANZA, TANZANIA.

Director, Research and Innovations
Chairperson, Joint BMC/CUHAS Ethics & Review Committee

f. Protocol amendment approval

UNIVERSITY OF CAPE TOWN
IYUNIVESITHI YASEKAPA • UNIVERSITEIT VAN KAAPSTAD

FACULTY OF HEALTH SCIENCES
Human Research Ethics Committee

Form FHS006: Protocol Amendment

HREC office use only (FWA00001637; IRB00001938)			
☑ Approved	☑ Type of review: Expedited	☐ Full committee	
This serves as notification that all changes and documentation described below are approved.			
Signature HREC Chairperson / Designee		Date	4/7/2023

Note: All **Major** amendments must include a **Cover Letter** and a local **PI Synopsis** justifying the changes for the amendment. Please note that incomplete amendment submissions will not be reviewed.

Please email this form and supporting documents (if applicable) in a combined pdf-file to hrec-enquiries@uct.ac.za with subject line: FHS006 + (HREC Reference number).

The latest forms are found on our website.

http://www.health.uct.ac.za/fhs/research/humanethics/forms

Please also clarify your plan for research-related activities during COVID-19 lockdown.

HUMAN RESEARCH ETHICS COMMITTEE
- 4 JUL 2023
HEALTH SCIENCES FACULTY
UNIVERSITY OF CAPE TOWN

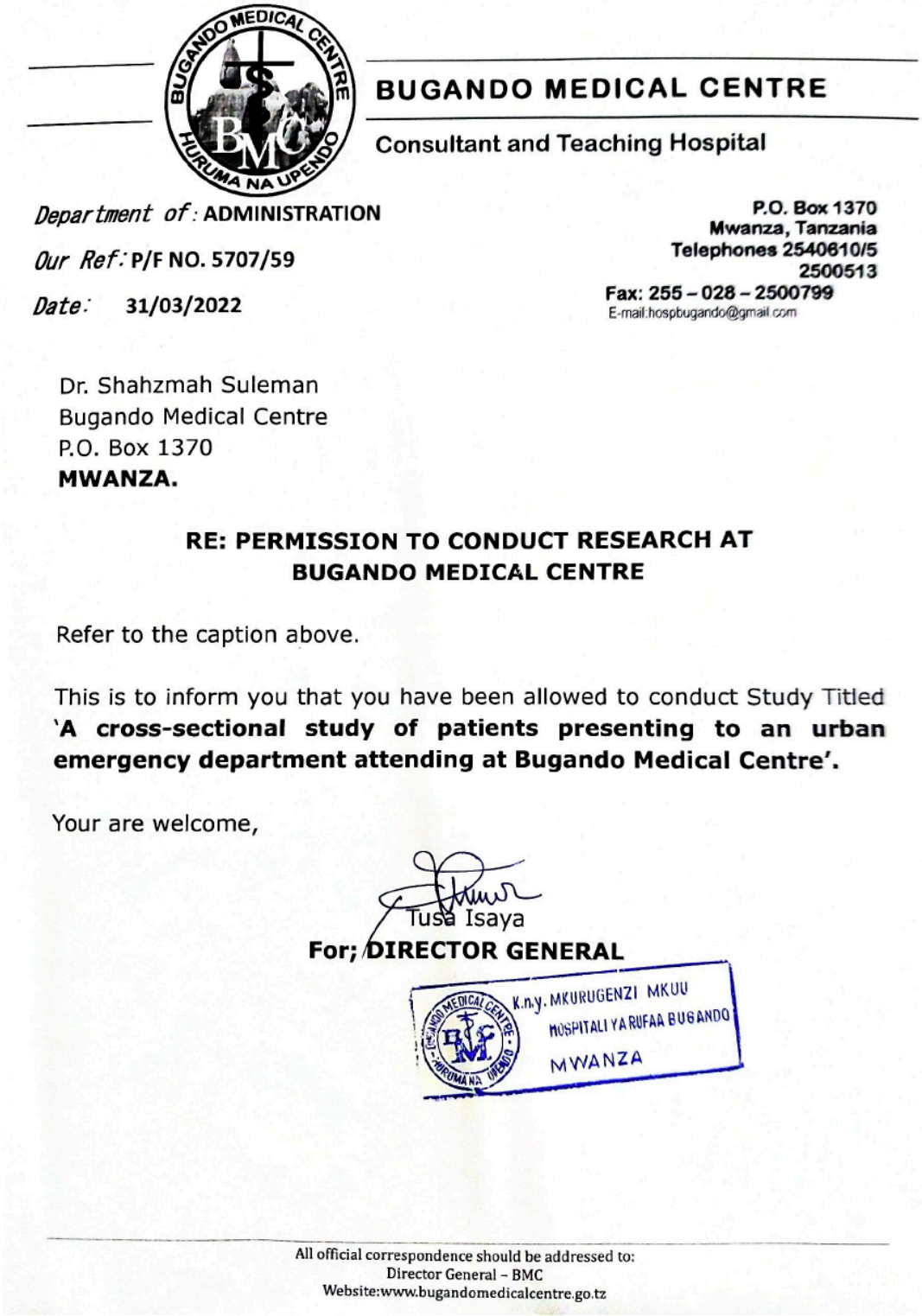
Comments from the HREC to the Principal Investigator:
Note: The approval of this protocol amendment does not grant annual approval. Please complete the FHS016 / FHS017 form for annual approval at least one month before study expiration.

Principal Investigator to complete the following:

1. Protocol information

Date (when submitting this form)	3 July 2023		
HREC REF Number	**238/2022**		
Protocol Title	A cross-sectional study of patients presenting to an urban emergency department in Mwanza, Tanzania		
Protocol Number (if applicable)			
Principal Investigator	A/Prof Peter Hodkinson		
Department / Office Internal Mail Address	F51 OMB, GSH		
1.1 Is this a major or a minor amendment? (see FHS006hlp) Major (tick box) Minor (tick box)		☐ Major	x☐ Minor

g. Institutional data collection approval



BUGANDO MEDICAL CENTRE

Consultant and Teaching Hospital

Department of: ADMINISTRATION

Our Ref: P/F NO. 5707/59

Date: 31/03/2022

P.O. Box 1370
Mwanza, Tanzania
Telephones 2540610/5
2500513
Fax: 255 – 028 – 2500799
E-mail:hospbugando@gmail.com

Dr. Shahzmah Suleman
Bugando Medical Centre
P.O. Box 1370
MWANZA.

RE: PERMISSION TO CONDUCT RESEARCH AT BUGANDO MEDICAL CENTRE

Refer to the caption above.

This is to inform you that you have been allowed to conduct Study Titled **'A cross-sectional study of patients presenting to an urban emergency department attending at Bugando Medical Centre'.**

Your are welcome,

Tusa Isaya
For; DIRECTOR GENERAL

K.n.y. MKURUGENZI MKUU
HOSPITALI YA RUFAA BUGANDO
MWANZA

All official correspondence should be addressed to:
Director General – BMC
Website:www.bugandomedicalcentre.go.tz

h. Amended research proposal

Purpose of the Study

An Emergency Department in many ways is the entry point for patients coming into the hospital. In Tanzania, the Emergency Departments or casualty areas, not only serve to provide acute care but in most instances provide also outpatient care for walk-in patients. All patients who arrive at the Emergency Department for the first time, whether for outpatient services or the acute area, are undifferentiated, meaning, their diagnosis is not yet determined and most do not have any preliminary investigations performed towards their diagnosis. This study seeks to describe the burden of patients who arrive at an urban Emergency Department. The key study areas will include the demographics of patients, their main presenting complaints, common diagnoses and the disposition of patients.

Background

Tanzania is a country in East Africa. It currently has a population of about 60 million and ranks twenty-fourth in the list of countries by population. Tanzania covers an area of 885,800km^2, with a population density of 67 per km^2. The average age of its population is 18 years and life expectancy at birth of 66 years. The country was recently declared a lower-middle-income country by the World Bank (1).

Many African countries face the burden of limited resources compounded by infectious diseases and trauma. Tanzania has not been spared (2). In addition to resource limitations, there is a shortage of medical staff in various roles and levels of healthcare, not to mention the ongoing “brain drain”. There is a mix of public and private sector health services, with some faith-based organizations working with the Government to promote the delivery of healthcare. The majority of the population resorts to the public Healthcare system due to financial limitations and affordability issues (3). The country’s public healthcare system is pyramidal, with the lowest level of healthcare being the dispensary level followed by health centres, district hospitals, regional referral hospitals, zonal referral hospitals and the national hospital. The lower-level health facilities serve the masses as the populations are served and the numbers go down as the facility level goes up (2, 3).

Emergency Medicine in Tanzania is just over a decade old. The first public Emergency Department (ED) was established in 2009 at the Muhimbili National Hospital (4). Since then, several centres have been established with locally trained emergency physicians staffing the centres. There is still a vacuum in terms of the number of emergency care providers, training and lack of adequate resources in the lower-level health facilities.

The establishment of an emergency department in a facility has been shown to have a positive effect on in-hospital mortality (5).

Bugando Medical Centre (BMC) is located in the North-Western city of Mwanza in Tanzania. The North-Western region is also known as the “Lake Zone” because of the presence of Lake Victoria in the city of Mwanza. Tanzanian Healthcare system has levels of healthcare provision and based on these levels, BMC is the Zonal Referral Hospital for the entire Lake Zone. The catchment population for the Lake Zone is almost a third of the country’s population. Mwanza City has a population of about 3 million people, who require services provided by the Zonal Referral Hospital (6). BMC was established half a century ago as a Faith-Based Organization with an agreement with the Government regarding the provision of service to the general public. Bugando Medical Centre is a 950-bed hospital with inpatient and outpatient services. The services included are Obstetrics and Gynaecology, Surgery, Orthopaedics, Neurosurgery, Cardiothoracic Surgery, Plastic and Reconstructive surgery, Internal Medicine, Paediatrics and the more recent Emergency Medicine. The hospital has a 16-bed Intensive Care Unit (ICU) which is managed by anaesthesiology and receives patients who are from either the surgical or medical department (including paediatrics). The ED is the entry point and first point of contact for clinical care for all patients who come to the hospital for the first time. These include patients who are self-referred as well as those who have followed the referral system. It also includes patients who are acutely ill requiring some form of resuscitation and those who are outpatients. Some of the very sick patients may be admitted into the ICU straight from the ED.

The ED at BMC has been led by in-house specialist Emergency Physicians for the last four years. Before this, the ED was run by medical officers who had completed medical training and were in the interim before starting residency or other career options. With this development, the ED underwent major renovation and equipment procurement to try to provide a good standard of care that is evidence-based.

As it is for many other African countries, little is known about the burden of disease among patients arriving in the ED, which is the entry point for a majority of the patients. Various studies have been conducted in various EDs across the continent and beyond to examine specific issues such as trauma, surgical conditions, hypertension, obstetric and gynaecological conditions, but the only study in Tanzania conducted in relation to trends from patients in the emergency department almost a decade ago(7). Reynolds et al demonstrated that about a quarter of the ED visits at the first public ED in Dar-Es-Salaam were trauma-related, cutting across all age groups, adults and children. The study had some challenges with missing data including missing diagnoses and missing

age, hence these were excluded during analysis (10). At BMC, about three studies were conducted by Chalya et al(8-10), which describe only trauma patients, it was been reported that 60.7% of patients were victims of Road Traffic Injuries (RTI) and 37.1% of all ICU admissions were trauma-related.

In a descriptive study conducted in an urban facility in South Africa, it was revealed that about a quarter of the ED diagnoses were trauma-related. Among the non-trauma diagnosis, in the same study, respiratory diagnoses took the lead (14.9%) followed by abdominal diagnoses (14.2%). Other diagnoses such as neurological, sepsis and wound-related, obstetric and gynaecological diagnosis presented at less than 10% (11).

In South Africa, it was described that trauma was the leading diagnosis among patients presenting to the ED (36%). Respiratory and gastrointestinal complaints were close to 15% and about 13% (12). In Nepal, it was found that 29% of the patients were trauma patients. Similar to other studies in resource-limited settings, respiratory and cardiovascular complaints were less than 10% (13).

There has not been any description of the patients who arrive and receive care at the ED at BMC; hence this study will help identify the groups of patients and their demographic characteristics; the most common presenting complaints; the most common diagnoses and the final disposition of the patients.

Methodology

Research question

What are the burdens and outcomes of acute illness presenting to the Emergency Medicine Department at Bugando Medical Centre in Mwanza, Tanzania?

Aims and Objectives

The broad objective is to describe the patients arriving at the ED with the specific objectives being as follows:

1. To determine the demographic characteristics of patients presenting to the ED.
2. To describe the most common presenting complaints patients presenting to the ED.
3. To describe the most common diagnosis among patients presenting to the ED
4. To determine the final disposition of patients presenting to the ED.
5. To describe the outcomes of the patients from the ED and after admission.

Study design

This is a cross-sectional descriptive study of the case mix. Prospective data will be collected for four (4) weeks, targeting all patients arriving in the ED. The intended data collection period is from January 1, 2023 to January 31, 2023, subject to the various approvals required in the process.

Characteristics of the study population

- The research will take place at the ED at BMC. All patients arriving to the ED will be enrolled in the study. This will include adult and paediatric patients, as well as the high-acuity and walk-in patients. The estimated intake per day is about 75 patients. For 4 weeks, an estimated 2300 patients will be enrolled.

● Inclusion and exclusion criteria

The inclusion criteria will be as follows:

- Adult patients who require acute care and are attending the ED for the first time.
- Adult outpatients who are attending the ED for the first time.
- Paediatric patients who require acute care and are attending the ED for the first time.
- Paediatric outpatients who are attending the ED for the first time.
- Patients referred from other health facilities.
- Patients within 1 week of first enrolment with a different complain from the initial visit or worsening symptoms will be enrolled.

The intention of enrolling them only during the first visit and not the consequent visits at least within a week of the first is that, many patients especially the outpatients, may come back in the subsequent days to get their laboratory and/or radiology results reviewed. Most of the acute patients are admitted and hence are not expected to return within a week.

The following patients will be excluded from the study:

- Patients brought in dead before arrival
- Patients who are a follow-up visit within 1 week of the initial visit with the same complaint or for laboratory or radiology results read. If they have a complaint which is unrelated or has a new complaint then they will be enrolled.
- Premature babies - Premature babies transit through the ED corridor and are directly taken to the Neonatal ICU (NICU) or the premature unit and hence are not enrolled in the ED for any services.
- Women in active labour with gestation age 28 weeks and above – these women are dropped off at the ED but wheeled straight to the labour ward which is located down the hall from the ED unless the woman is actively delivering a baby. This is the hospital policy and procedure

● Justify the inclusion of vulnerable populations

● The ED attends to all patients regardless of their age, gender or socioeconomic status. This is a low-risk study as it will be looking at data which is routine hospital data being collected daily without any direct patient contact or medical intervention.

Recruitment and Enrolment

The patient details will be recorded from a paper-based and electronic record and transferred to a Microsoft Excel sheet for use for analysis.

The patient details collected will include, age, sex, referral status, chief complaint and disposition from the ED (whether admitted, discharged or died in the ED).

Additional variables to be included are:

- Day of the week that the patient presented on
- Time of the day that the patient presented on. The two 12-hour shifts that are currently in place will be used, that is, the AM shift will be considered as patients coming in from 7.30 am to 7.30 pm and the PM shift will be considered from 7.31 pm to 7.29 am the next day.
- Status of patient – meaning high acuity (commonly known as inpatient at the EMD) or outpatient

- Hospital outcome for admitted patients
- Hospital length of stay
- Region that patients are referred from. BMC being a zonal referral hospital, it serves 7 regions surrounding it and hence this variable will help determine the region that most refers to BMC.

The student will train a research assistant who will collect data and the student shall be responsible ~~to clean~~ for cleaning the data and entering any missing information.

Data Safety and Monitoring Plan

There will be no collection of any human samples involved and the patients will not be subjected to any delays in receiving care as a result of this study.

The hospital is transitioning from a paper-based recording system to an electronic medical record system named Electronic Health Management System (eHMS). The eHMS is being used to register all patients who visit the hospital in various departments and outpatient clinics and it is also used in the wards for rounds, medication and ordering of investigations. At the ED, there are 2 sections, the acute intake area and the outpatient section. The acute intake area receives ambulances and private transport that brings patients and there are two forms of information being collected. The medical attendant who helps ferry the patient from the vehicle onto the stretcher and into the resuscitation area records the patient's preliminary information which includes, name, age, sex, medical record number, diagnosis and disposition. The data is updated throughout the patient's stay and the record terminates with the final disposition from the ED. The other set of information is collected by the security guard for security reasons whereby he/she records the vehicle number, driver name, time in and time out. In the outpatient section, a certificate nurse enters the patient details into a manual register until the patient disposition.

All patient notes, complaints, ~~diagnosis~~ diagnoses are entered into the eHMS by the doctor responsible for the patient, including laboratory and radiology investigations and pharmacy orders.

The data will therefore be extracted from initially the manual register to get the eHMS number and then get the diagnosis and chief complaints from the eHMS to achieve the completion of variables to be collected. To be efficient with adequate data collection, one research assistant will be employed to assist with entering the data onto the Excel sheet. The data will be collected twice a day, during the morning handover shift and

the evening handover shift. During the rest of the day, data from the electronic medical record will be retrieved for each respective patient. The patients will be followed up till the end of their hospital stay.

All patient-identifiable information will be removed by the principal investigator to anonymize data and achieve confidentiality. Since the hospital is a referral and teaching hospital, the patient population is aware of the records being used to send reports to the Ministry of Health and this study will be merely tapping into that resource with the appropriate permissions from the Hospital Administration. The Primary Investigator and/or research assistant will be responsible ~~to enter~~ for entering data daily into an Excel sheet and it will be password protected. The data will be stored for ~~a period of~~ five (5) years by the investigator. Since the data is routine hospital data, the hospital through the medical records department has its mechanism of ensuring data storage with patient detail safety.

Data Analysis

Data will be entered into a Microsoft® Excel for Mac, version 16.54 sheet. Descriptive data analysis in terms of frequency, appropriate mean and standard deviation, median and interquartile range, and proportions will be calculated. Further appropriate statistical analysis will be performed with the advice of a statistician should this be deemed necessary beyond basic descriptive methods. STATA version 15 will be used to analyse data.

Description of Risks and Benefits

This is a low-risk study. However, to mitigate against any breach of confidentiality, the data collected shall be stored in a password-protected MS Excel file on cloud storage to ensure safety at all times.

There will be no financial or any sort of remuneration to the patients. There are no health or psychological risks associated with this study.

Benefit: The findings of this study will create a better understanding of the burden of disease. This will subsequently inform resource allocation and help inform the focus of improvement in health care provision at the facility level based on findings and areas of concentration.

Informed Consent Process

Process

A waiver of consent will be obtained because the collection of data has no room for patient interaction.

Privacy and Confidentiality

A password-protected Excel sheet will be used to enter non-identifiable patient data and will be stored on an external hard drive. Access to the worksheet will be restricted to the research team. Names of patients will not be collected. For easy tracking of health records, the medical record numbers will be inserted into the Excel sheet but will be deleted before the analysis stage. The data will be stored for five (5) years by the investigator. Since the data is routine hospital data, the hospital through the medical records department has its mechanism of ensuring data storage with patient detail safety. The data collected shall be stored in a password-protected MS Excel file on cloud storage to ensure safety at all times.

Reimbursement for Participation

There will be no remuneration to the patients whose details will be extracted from the hospital records. There will be no contact with patients.

Emergency Care and Insurance for Research-related Injury

This is a low-risk study hence there is no provision of medical cover for any of the participants

Dissemination of findings

The findings of the study will be shared as a research dissertation with the University of Cape Town's central repository. The results will also be shared with the Directorate of Medical Services at Bugando Medical Centre and the Research Division of the Hospital for record-keeping and any administrative interventions that may be deemed necessary.

The findings will also be submitted to a peer-reviewed journal for publication and will be open-access.

References:

1. United Nations DoEaSA, Population Division. Tanzania Population 2021 [updated October 6, 2021; cited 2021 October 6]. Available from: https://www.worldometers.info/world-population/tanzania-population/.
2. Nicks BA, Sawe HR, Juma AM, Reynolds TA. The state of emergency medicine in the United Republic of Tanzania. African Journal of Emergency Medicine. 2012;2(3):97-102.
3. Kwesigabo G, Mwangu M, Kakoko D, Warriner I, Mkony C, Killewo J, et al. Tanzania's health system and workforce crisis. Journal of Public Health Policy. 2012;33.
4. Reynolds TA, Mfinanga JA, Sawe HR, Runyon MS, Mwafongo V. Emergency care capacity in Africa: a clinical and educational initiative in Tanzania. Journal of public health policy. 2012;33 Suppl 1(S1):S126-S37.
5. Sawe H, Mfinanga J, Mwafongo V, Reynolds T, Runyon M. Trends in mortality associated with opening of a full-capacity public emergency department at the main tertiary-level hospital in Tanzania. International journal of emergency medicine. 2015;8:24.
6. Ministry of Health CD, Gender,, Children Ea. ANNUAL HEALTH SECTOR PERFORMANCE PROFILE 2019. Tanzania: Government of Tanzania; 2019.
7. Reynolds T, Sawe HR, Lobue N, Mwafongo V. 107 Most Frequent Adult and Pediatric Diagnoses Among 60,000 Patients Seen in a New Urban Emergency Department in Dar Es Salaam, Tanzania. Annals of emergency medicine : journal of the American College of Emergency Physicians. 2012;60(4):S39.
8. Chalya P, Mabula J, Ngayomela I, Kanumba E, Chandika AB, Giiti G, et al. Motorcycle injuries as an emerging public health problem in Mwanza city, North-Western Tanzania. Tanzania journal of health research. 2010;12:214-21.
9. Chalya PL, Dass RM, McHembe MD, Mbelenge N, Ngayomela IH, Chandika AB, et al. Citywide trauma experience in Mwanza, Tanzania: a need for urgent intervention. J Trauma Manag Outcomes. 2013;7(1):9-.
10. Chalya PL, Gilyoma JM, Dass RM, McHembe MD, Matasha M, Mabula JB, et al. Trauma admissions to the intensive care unit at a reference hospital in Northwestern Tanzania. Scand J Trauma Resusc Emerg Med. 2011;19:61-.
11. Hodkinson PW, Wallis LA. Cross-sectional survey of patients presenting to a South African urban emergency centre. Emergency Medicine Journal. 2009;26(9):635.
12. Hanewinckel R, Jongman HP, Wallis LA, Mulligan TM. Emergency medicine in Paarl, South Africa: a cross-sectional descriptive study. International journal of emergency medicine. 2010;3(3):143-50.
13. Giri S, Rogne T, Uleberg O, Skovlund E, Shrestha SK, Koju R, et al. Presenting complaints and mortality in a cohort of 22 000 adult emergency patients at a local hospital in Nepal. J Glob Health. 2019;9(2):020403-.

Appendix Material

In addition to Sections A, B (synopsis) and C, please attach all appendix material relevant to the protocol application. This includes but is not limited to the following:

Case Report Form

SN	Patient Name	Reg No	Age (years)	Age (months)	Age (days)	Date of Birth	Gender	Date (January 2023)	Day of the week	Shift (AM/PM)	Outpatient / Inpatient	hospital referral / self referral	Region referred from	Main complains	secondary or associated complains	Chronic Medical conditions	Diagnosis	ICD 10 codes	Other diagnoses	ICD 10 code	ED disposition (admitted /discharged / death)	Service admitted under	Hospital outcome (for admitted patients only)	Hospital LOS (days)

Budget summary

ITEM	DESCRIPTION	TOTAL COST (TZS)	TOTAL COST (ZAR)
Local Ethical Clearance fee	A one-time fee paid for obtaining local ethical clearance	100,000/-	700
Stationery	Printing, photocopying, filing, data collection sheets	150,000	1000
Research Assistant	To assist with data collection off working hours for 4 weeks	300,000	2000
TOTAL		550,000	3700