AN ANALYSIS OF THE ISIXHOSA TELEPHONIC DESCRIPTORS OF CARDIAC ARREST (CA) IN A WESTERN CAPE EMERGENCY CONTROL CENTRE

By

Sinethemba Alphius Mgidi

MGDSIN009

This dissertation is submitted in partial fulfilment of the requirements for the Master of Philosophy degree in Clinical Emergency Care at the Division of Emergency Medicine, Department of Surgery, within the Faculty of Health Sciences, University of Cape Town.

Supervisor: Assoc. Prof. Willem Stassen

Co-Supervisor: Mr. Louis Van Rensburg

University of Cape Town

November 2024

The copyright of this thesis vests in the author. No quotation from it or information derived from it is to be published without full acknowledgement of the source. The thesis is to be used for private study or non-commercial research purposes only.

Published by the University of Cape Town (UCT) in terms of the non-exclusive license granted to UCT by the author.

University of Cape Town

The author possesses the copyright to this minor dissertation's contents. No quotations or reproduction of its content is permitted without full attribution to the original. The minor dissertation is only available for academic or unrelated business research purposes.

The author has granted the University of Cape Town (UCT) the non-exclusive authorization to publish this work.

Plagiarism Declaration

Title: Minor dissertation Date: October 4, 2024

I hereby declare the following:

1. I am aware that plagiarism (the use of someone else's work without their permission and/or without acknowledging the original source) is wrong.
2. I know that plagiarism is a severe form of academic dishonesty.
3. I have used the Endnote convention for citation and referencing. Each contribution to, and quotation in, this minor dissertation from the work(s) of other people has been attributed and cited and referenced.
4. Any section taken from an internet source has been referenced to that source.
5. Where I have used the exact words of others, I have indicated this by using quotation marks (i.e., “”) followed by the reference number and the page number where the quotation came from.
6. This minor dissertation is my work and is in my own words (except where I have attributed it to others).
7. I have not allowed and shall not allow anyone to copy my work with the intention of passing it off as her or his work.
8. I acknowledge that copying someone else’s thesis, or part of it, is wrong, and I declare that this is my work.

Name and Surname: Sinethemba Mgidi Date: October 4, 2024,

AI declaration

I hereby declare the following:

1. During the preparation of this work, I have not used AI tools except Grammarly to ensure the accuracy and clarity of my writing.
2. After using this tool/service, I have reviewed and edited the content as needed and take full responsibility for the submitted content.

Name and Surname: Sinethemba Mgidi Date: October 4, 2024

ACKNOWLEDGEMENTS

I want to extend my sincere appreciation to the Western Cape Department of Health and Wellness, EMS, for allowing me to conduct a study and providing me with access to the required data.

I would also like to express my profound gratitude to Penny Masitho for her invaluable assistance in translating the study materials into isiXhosa. Her dedication and commitment significantly enhanced the accessibility and reach of my research.

I am deeply grateful to the Late Thembile Masitho for his generous gesture of allowing me to visit his house anytime, which has greatly facilitated my work with his wife.

Family, friends, and colleagues—your unwavering support and encouragement have made the MPhil and the process more doable and significantly contributed to the success of the research.

Furthermore, I want to reiterate my most profound appreciation to Ass Prof. Willem Stassen and Mr. Louis Van Rensburg for their continuous cooperation and positive contributions and for always being willing to assist when called upon. Your expertise and mentorship have been invaluable.

Table of Contents

TABLES AND FIGURES

Abbreviations

AIDS:	Acquired Immunodeficiency Syndrome
AFEM:	African Federation for Emergency Medicine
AHA:	American Heart Association
ALS:	Advanced Life Support
CAD:	Computer-Aided Dispatcher
CT:	Cape Town
CPR:	Cardiopulmonary Resuscitation
CVDs:	Cardiovascular Diseases
EFAR:	Emergency First Aid-Training Responder
EMS:	Emergency Medical Services
GRR:	Germany Resuscitation Registry
HIV:	Human Immunodeficiency Virus
IHD:	Ischemic Heart Disease
ILCOR:	International Liaison Committee on Resuscitation
JHB:	Johannesburg
LMIC:	Low-Middle Income Countries
NCDs:	Non-Communicable Diseases
OHCA:	Out-of-Hospital Cardiac Arrest
ROSC:	Return of Spontaneous Circulation
SA:	South Africa
SCA:	Sudden Cardiac Arrest
tCPR:	Telephone-assisted CPR
TB:	Tuberculosis
VF:	Ventricular Fibrillation

pVT:	Pulseless Ventricular Tachycardia
WC:	Western Cape
WHO:	World Health Organisation

PART A: Background information of the study

Introduction

Out-of-hospital cardiac Arrest (OHCA) is of considerable public health relevance due to its very time-sensitive, substantial morbidity, and low survival rates (1,2). Globally, OHCA survival continues to present an ongoing challenge to the healthcare system as a result of the diverse aetiologies, manifestations, and interventions of this medical condition (3). It is described as a collapse of cardiac activity with hemodynamic compromise as a result of sudden cardiac arrest (SCA) or cardiac death outside a medical care facility (4). SCA is a sudden and inexplicable cessation of the heart function, often occurring without warning (5).

Over the past decade, Emergency Medical Services (EMS) in low-middle-income countries (LMICs) have gradually grown to mitigate out-of-hospital morbidity and mortality (6). EMS consists of a multidisciplinary team relying heavily on emergency control centres to collect and convey information and distribute necessary resources (7–9). The process begins with the emergency control centre gathering as much relevant information as possible from the caller. This initial phase is an integral aspect of the OHCA chain of survival (9).

The South African government has acknowledged the right to health of all people living in South Africa (SA) (10). However, SA's EMS are under-resourced compared to developed countries with comparable populations (11,12). As a result, SA's survival rate for OHCA is threatened(13). Other issues, such as a paucity of defibrillators (14), inability to calm callers (15)and a lack of telephonic bystander cardiopulmonary resuscitation (CPR) contribute to reducing the chances of survival (16). Furthermore, the African Federation for Emergency Medicine (AFEM) has identified other challenges hindering access to African ambulances (17).

The emergency control centre is responsible for identifying whether the victim sustains an OHCA through telephone communication (18). However, communication gaps within the healthcare system in SA are evident (19), particularly in identifying OHCA cases through telephone communication. This study focuses on IsiXhosa-speaking callers requesting emergency medical assistance during OHCA in the Western Cape (WC) to alleviate language-specific communication difficulties. The study seeks to identify keywords and phrases used during emergency calls leveraging in the WC when isiXhosa-speaking callers request emergency medical care at the emergency control centre in the event of OHCA. This study will add to the existing body of knowledge by providing a deeper understanding of emergency medical communication dynamics, identifying gaps, and highlighting the need for more research.

Literature review objectives

A. To define Out-of-Hospital Cardiac Arrest.
B. To describe the epidemiology of Out-of-Hospital Cardiac Arrest and related diseases.
C. Review the international, continental, national, and regional literature regarding emergency control centre recognition of the descriptors and phrases used by callers.
D. Identification of language descriptors and phrases that are known to describe Out-of-Hospital Cardiac Arrest and examination of their context within the emergency control centre in South Africa and the Western Cape.

Search Strategy

A manual search was done on the following databases on the 21st of September 2024: EBSCOhost, Google Scholar, JSTOR, LexisNexis Online (South Africa), PressReader, ProQuest, PubMed, Scopus, and National ETD Portal.

The search was filtered into English and IsiXhosa languages only.

Separate search strategies were used to generate relevant results in this literature review.

Studies included in this literature review are:

- Out-of-hospital cardiac arrest and pre-hospital cardiac arrest recognition
- Telephonic communication (phases and descriptors) of out-hospital cardiac arrest recognition.
- Published literature that is not more than 10 years old.
- Due to limited literature, we conducted a thorough search for relevant publications before 2014 (ten-years), analysing 16 key publications.
- With relevance to the purpose of the study.

Inclusion and exclusion criteria were applied as per the different databases.

Advanced Boolean search formats with the below search strings:

A. Search one: (Emergency Medical Dispatch AND out-of-Hospital Cardiac Arrest AND South Africa)
B. Search two: (Emergency Medical Dispatch AND Out-of-Hospital Cardiac Arrest)
C. Search three: (Out-of-Hospital Cardiac Arrest AND Sub-Saharan African countries)
D. Search four: (Out-of-Hospital Cardiac Arrest AND Western Cape OR South Africa)
E. Search five: (Out-of-Hospital Cardiac Arrest AND IsiXhosa)
F. Search six: (Emergency Control Centre OR Emergency Medical Communication Centre AND Cardiac Arrest Recognition)

Due to the limited results yielded on the databases initially searched, searches on the National ETD Portal (A portal that collects all theses and dissertations produced nationally and internationally) were conducted using the same search strategy and inclusion-exclusion criteria.

Titles were scanned for relevance, and then the studies were included based on the relevance of their abstracts. If the abstract was irrelevant to the topic, the articles were excluded.

A. Search one: There were eighteen (18) results found.
B. Search two: There were twenty-two (22) results found.
C. Search three: There were ninety-nine (99) results found.
D. Search four: There were seventy-nine (59) results found.
E. Search five: There were seventeen (17) results found.
F. Search six: There were three hundred and thirty-one (331) results found.

The five hundred and forty-six (546) studies were included based on the results obtained from the advanced Boolean search. Duplicates were removed to ensure the integrity of the data. A comprehensive review was done on two hundred and nighty-six (296) results to determine their eligibility for inclusion. The criteria were applied to the articles, leading to the inclusion of one hundred and forty-one (141). These articles were subsequently assessed based on their abstract and the relevance of these articles, resulting in thirty-two (32) articles deemed eligible for the literature review. Articles were excluded if their titles or the length of time the research was conducted did not align with the study's parameters. Figure 1 illustrates the diagram depicting the review process.

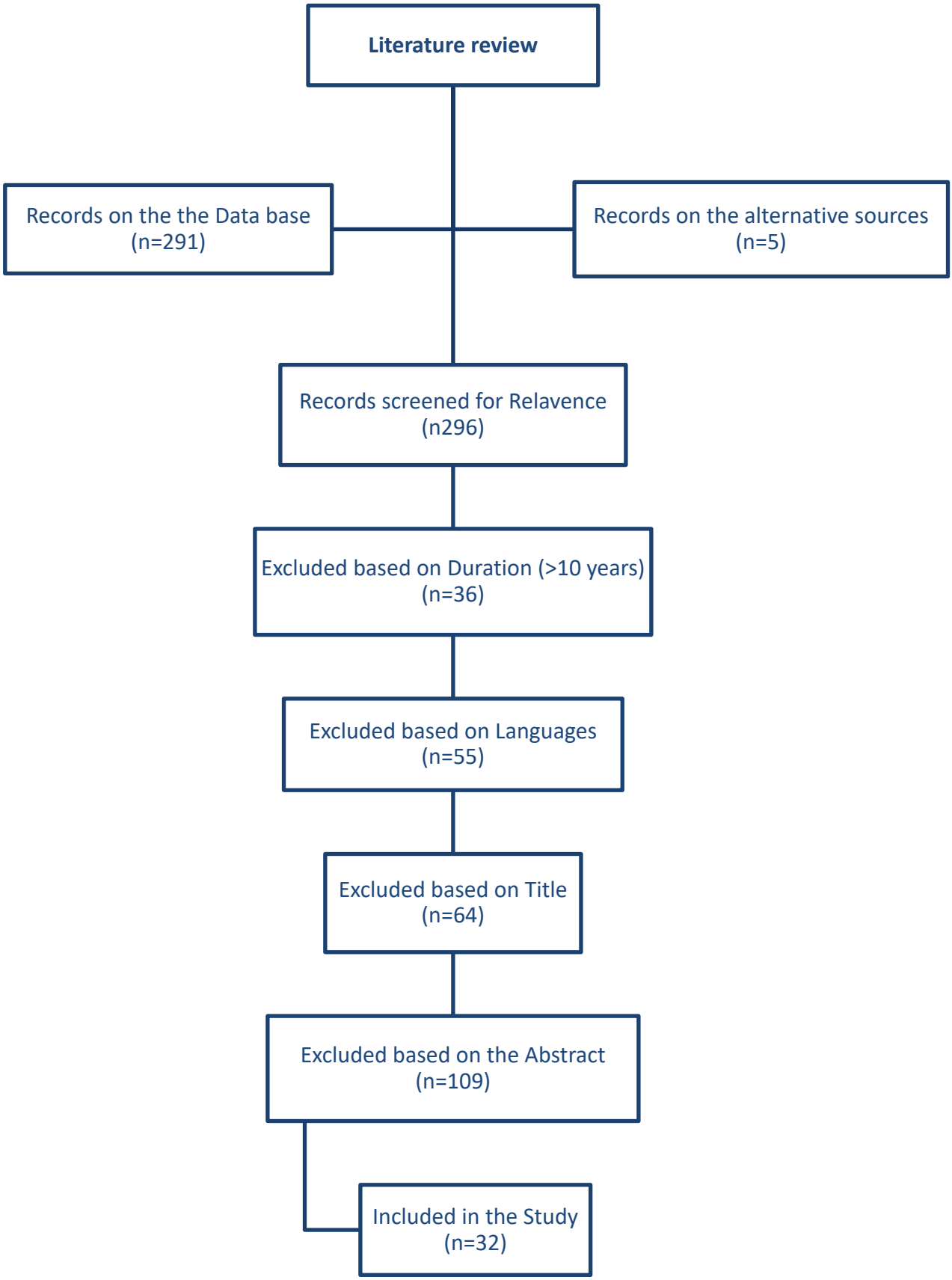

Figure 1-Search Strategy

Literature review

Epidemiology of OHCA and related diseases

Although there have been significant developments in the management of OHCA worldwide, the survival rate for OHCA remains below 10% over a decade (20). More high-quality, evidence-based research is needed to identify the root causes of this stagnation (21). A report released by the International Liaison Committee on Resuscitation (ILCOR) in 2020 indicates that EMS-managed OHCAs have a global survival rate of 3.1%–20.4% (22,23). Gräsner et al. stipulated that the reported incidence of treated OHCA varies between countries (24). Reported OHCA incidences in developed countries are higher than those in low- to middle-income countries (LMICs) (25,26). This could be due to several reasons, including the lack of formal out-of-hospital emergency care services, the length of response times, and the rarity of bystander intervention (27).

The lack of OHCA data on LMICs, which account for 80% of the world's population, is a significant barrier to attaining the ILCOR objective of raising worldwide OHCA survival (28). However, Grasner et al. state that developed countries like Europe also conducted low-quality research, and the actual incidence may be underestimated (29). The reported OHCA incidence in Europe ranges from 53 to 166 per 100,000 (29). OHCA in African countries is estimated to be the leading cause of disability and death; however, the incidence is unknown due to a lack of data (5). Berdowski et al. supported the statement by stating that LMICs bear most of the burden of cardiac diseases; however, OHCA incidence rates and survival rates are not widely known (30).

Cape Town (CT) research reported a higher incidence of OHCA at 23.2 per 100,000 (31), compared to 6.4 per 100,000 in a Johannesburg cohort (12) within the South African context. The incidences can be generalised to other LIMCs because they were similar to those of an Asian study: 28.3 per 100,000 (30), and Cameroonian research also revealed an incidence of 24.2 per 100,000 (5). OHCA has been intensively studied in high-income countries, and research has inspired policy implementation to raise survival rates (32,33). However, many developed countries are also bearing the burden of low OHCA survival rates (33).

Other prosperous countries, such as Australia (3,34,35), are affected by the OHCA burden. Their survival rate is barely 12%, even though they have extensively practised Global Resuscitation Alliance recommendations that advocate registries as a significant tool for improving SCA survival for the last decade (3). Registries alone have proved insufficient to improve OHCA survival rates; public awareness, education, and more proactive emergency response protocols have also had a significant impact (34). However, registers proved helpful because they helped EMS track data about OHCA cases and identify any potential trends or issues contributing to poor survival rates (34).

Chinese BASIC-OHCA cardiac arrest registry reported an overall incidence of 95.7 cases per 100,000 and survival to discharge 6.1% (36). France reports more than 30,000 OHCA cases annually, and the country's OHCA patient survival rate is less than 5% (37). In 7 out of 10 of the 30,000 SCAs outside of hospitals annually in France, bystander CPR is attempted (37). Over 356,000 OHCAs occur annually in the United States of America (USA), and about 90% result in fatalities (38). Continental survival rates differ significantly, with Oceania having the most significant rate (16.2%), Europe having the highest rate (11.7%), and North America having the lowest rate (4.5%) (39).

A study by Mawani et al. found 0% survival rates of OHCA in a developing country (40). At the same time, Chin et al. also demonstrated that the epidemiological studies of SCA in African countries have poor-quality data (41). Berdowski et al. further claimed that assessing OHCA survival rates has yet to be considered in African countries (42).

Cardiovascular diseases (CVDs) have been a principal cause of premature global mortality and a significant contributor to disability (43). The World Health Organisation (WHO) described CVDs as alarming after receiving the update from the global burden of disease (GBD) in 2019 (44). The increase in CVD results in an increased risk of OHCA and can be attributed to rapid growth in urbanization and lifestyle changes predisposing young and old adults to non-communicable diseases (NCDs) (45). WHO also estimates that around 40 million people die due to NCDs annually, making up about 70% of global deaths (46). CVDs have been growing in African countries, causing an upsurge in ischemic heart disease (IHD) (1).

A WHO report indicates that two-thirds of all CVD-related deaths occur in developed countries; additionally, approximately 80% of CVD-related deaths occurred in developing countries in 2018 (32). Kapwata et al. also support the statement by stating that other factors, such as the lack of accessible healthcare in some areas in developing countries, could result in increased related CVD morbidity and mortality (47). In urban and rural areas, non-communicable diseases are on the rise, driven by a surge in relevant risk factors and an ageing population, despite a significant decrease in overall life expectancy due to human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS) (48).

Preventing and treating non-communicable diseases is marginalized in SA because of the overwhelming prevalence of communicable diseases like HIV/AIDS and tuberculosis (TB) (49). Limited resources for treating and preventing non-communicable diseases, inadequate knowledge of risk factors, and limited access to medical care result in many non-communicable conditions, such as CVD, not being diagnosed and treated until it is too late (50).

Best practice recommendations

Despite its high prevalence and time-sensitive nature, OHCA is not considered a futile condition but rather a treatable disorder (51). The chain of survival is a widely recognised concept in resuscitation science that outlines the steps to improve OHCA outcomes. Within this sequence, specific steps delineate the OHCA chain of survival for adults (Figure 2) and paediatrics (Figure 3). The American Heart Association (AHA) guidelines underscore the persistent challenges EMS faces in enhancing OHCA survival (21).

Figure 2-Adult OHCA chain of survival

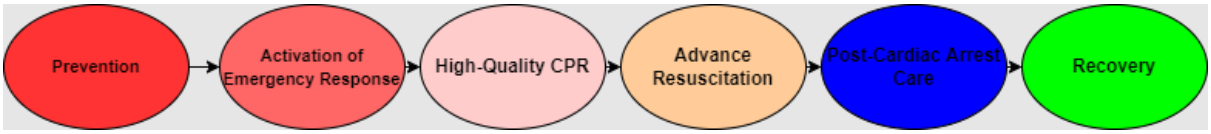

Figure 3-Paediatrics OHCA chain of survival

OHCA chain of survival elaboration

- Recognition and activation of OHCA

An average of 80% of SCA patients experience prodromal symptoms in the absence of EMS before the collapse (52), which may reduce the opportunity to initiate early CPR by EMS. An SCA must be recognised quickly so the bystander can activate the emergency control centre and potentially resuscitate victims(16). The emergency control centre is also responsible for identifying OHCA (53) and dispatching the appropriate response teams. Emergency control centres may also instruct the caller to perform bystander CPR.

- Early Cardiopulmonary Resuscitation

Chest compressions should be performed immediately after detecting SCA (54). The European Resuscitation Council, the AHA, and numerous authors advocate telephone-bystander CPR (53). In many countries, emergency dispatchers struggle to recognise OHCA early, resulting in over half of cases not being treated with CPR (55,56).

- Rapid defibrillation

Using an AED or manual defibrillator as soon as possible is recommended, along with performing CPR. The public's utilization of AEDs has grown considerably in recent decades, culminating in higher rates of restored or reestablished neurologic function (57). However, AED usage by a bystander was not associated with favourable outcomes in OHCA patients with putative non-cardiac causes before defibrillation by EMS personnel (58).

- Advanced Life Support

ALS includes advanced airway management, supportive mechanical ventilation, and medication administration, which can be essential in managing OHCA (59). ALS have access to pharmacotherapy alternatives for patients with ventricular fibrillation (VF) or pulseless ventricular tachycardia (pVT), which could be the primary cause of OHCA (60). Antiarrhythmic drugs such as sodium channel blockers and potassium channel openers can restore normal heart rhythm and prevent further deterioration. Additionally, vasopressors lower the risk of organ failure and improve overall patient well-being. In OHCA cases, combining CPR with fast defibrillation and ALS treatments may significantly enhance resuscitation chances.

- Post-Cardiac Arrest Care

Undoubtedly, early post-arrest care in OHCA is critical (1,2). Not only must this care be timely, but it must also deliver quality emergency care to maximize the chance of recovery. Return of Spontaneous

Circulation (ROSC) complicated pathophysiology of OHCA results in a high in-hospital mortality rate due to circulatory dysfunction, inflammation, coagulopathy, brain damage, and persisting triggers (61). ROSC and the function of the organs within a patient can vary greatly. Therefore, effective post-cardiac arrest care involves identifying and treating the underlying cause and assessing and mitigating ischemia-reperfusion compromise.

The management OHCA in South Africa.

Providing timely access to EMS in SA remains challenging (62). The most extensive presumed study conducted on OHCA in Africa discovered that the prevalence of OHCA in CT, SA, was comparable to previous researchers' outcomes; however, resuscitation attempts were very few, and ROSC rates were minimal (31). Additionally, a similar study in Johannesburg (JHB), SA, revealed that a small percentage of cardiac arrest patients underwent resuscitation, with low rates of patients with shockable rhythms observed and only a tiny percentage of ROSC achieved (63).

Comparatively, the study conducted in JHB reported a high resuscitation rate of 40% among patients, while the study in CT reported a significantly lower rate of 7.4%. In addition, the JHB study revealed that bystanders initiated 36% of resuscitation attempts, constricting the CPT study finding that EMS exclusively handled all resuscitation efforts. Regarding the response time, the CT study reported a median response time of 17 minutes and 32 seconds for attempted resuscitation and 27 minutes and 13 seconds for cases where resuscitation was not attempted. In contrast, the JHB study found a median reaction time of 9 minutes across all reported cases. Furthermore, both studies revealed a prolonged response time, likely impacting ROSC rates. Specifically, the JHB study reported ROSC in 18% of patients, whereas the CT study reported ROSC only in 1.3% of cases.

The two significant barriers to OHCA outcomes in SA are the early recognition of OHCA and the time of arrival of EMS. Given the low rate of bystander CPR in SA, the survival rates of OHCA depend on the prompt arrival of EMS. In South Africa, neither the percentage of OHCAs who are resuscitated nor that of those with shockable rhythms or who have returned to ROSC is high (11). Despite these challenges, some studies have demonstrated the success of the emergency first aid-training responder (EFAR) system in the Metropole of CT-WC and its increasing interest among the population (64).

Recognition of OHCA in emergency control centres

The early recognition of OHCA by emergency call centres remains a significant challenge (65), as evidenced by the limited performance of CPR on half of OHCA calls despite recommendations by organisations like AHA (66). In contrast to developed countries like the USA, where public education and training campaigns conducted by organisations such as the AHA and the American Red Cross advocate for early recognition and activation of EMS as mandatory (56,66). Globally, there is a need for improved accuracy in emergency call-takers recognition of OHCA, as this is crucial for the timely initiation of telephone-assisted CPR (tCPR) and sending out appropriate resources (67).

Emergency call-taker assistance can help alleviate obstacles faced by bystanders (68,69) and minimise such barriers. The simplified approach outlined in recent AHA guidelines (2020), which emphasises only chest compression for untrained bystanders, has made the process more straightforward. Evidence suggests an increase in survival in the proportion of SCA victims receiving assistance due to

this approach (70). Berdowski et al. strongly indicated that the call-takers' inability to recognise OHCA during emergency calls decreases survival rates (71). They further demonstrated that it takes relatively long for emergency call-takers and dispatchers to recognise SCA, a problem that multilingual countries like South Africa may exacerbate.

The Western Cape Department of Health and Wellness's emergency control centre comprises call takers and emergency dispatchers. Call takers are responsible for receiving calls from callers, recording pertinent information, and transmitting it to the dispatcher via a computer-aided dispatcher (CAD) system. Notably, the WC has a significant portion of Afrikaans and isiXhosa-speaking people, with approximately 24% of the population using isiXhosa as their first language (8). Calls are prioritised based on the caller's description of the incident, following the guidelines outlined by the Western Cape Department of Health and Wellness for call prioritisation. As such, successful recognition depends on the caller's ability to provide accurate descriptors of OHCA and the call-taker's interpretation thereof.

Language proficiency is crucial for call takers and dispatchers within the emergency control centre (72). Effective communication and accuracy of incident descriptors are essential if the caller can communicate in the primary language (72). However, many isiXhosa-speaking individuals may encounter difficulties in articulating themselves proficiently in the primary language, which could jeopardize the precision and thoroughness of incident descriptors (73). In such cases, isiXhosa-speaking call-takers or dispatchers may require assistance conveying incident details to English or Afrikaans-speaking individuals utilizing code-switching (74).

While this approach may suffice in some cases, it may only provide the partial information necessary for a comprehensive incident description. Alfsen et al. discovered that factors such as the caller's physical and emotional state and professional background influence the dialogue and the likelihood of correct recognition within the emergency call centre (75). Additionally, the study noted that call takers have multiple roles, as they are tasked with conducting the patient assessment, providing instructions, and reassuring callers amidst their emotional state.

The absence of standardised protocols for call takers and dispatchers results in delays in recognition and, tragically, fatalities. Currently, emergency call-takers in SA lack standardised guidelines for identifying OHCA victims when call-takers do not speak languages other than those of the call-takers. The recognition process relies heavily on the call-taker's experience and estimation abilities. Differences in personal experiences and estimation skills among call-takers can lead to inconsistencies in identifying alarming signs, potentially resulting in missed critical warning signs or delayed dispatch of EMS. This lack of standardization hampers effective communication and decision-making, significantly impacting prognosis.

Descriptors of OHCA made by callers when requesting EMS.

Some developed countries have well-established guidelines and protocols (18,76) through descriptors to minimise delays in initiating CPR and dispatching resources compared to African countries. ILCOR has identified unresponsiveness and absent or abnormal breathing as well-known clinical signs of OHCA (77). Similarly, Clark et al. reported that agonal respiration or gasping was the initial sign in approximately 40% of OHCA cases, with approximately 27% of patients exhibiting agonal respiration

who were discharged alive from the hospital (9). However, Tamminem et al. raised the question of non-trained medical individuals' interpretation of clinical signs and symptoms (78).

The challenge exists in the emergency control centres, particularly regarding the misinterpretation of agonal breathing despite improvements observed after educational interventions (79,80). Fukushima et al. noted a potential for confusion in telecommunication due to various terms used to describe certain signs, such as abnormal breathing. However, the study strongly agreed and affirmed the frequent occurrence of abnormal breathing in the early stages of OHCA (81). Despite the theoretical literature lacking consistent support for a particular descriptor, this dissertation focuses on describing the phrases and words used by IsiXhosa-speaking callers in the WC-SA, whether prompted or not prompted by the emergency call taker in the event of OHCA incidents.

Contextualizing caller descriptors

Emergency control centres' recognition of OHCA heavily relies on descriptors provided by callers. However, there are limited studies globally focusing on the descriptors that callers use to facilitate OHCA recognition by emergency control centres. Riou et al. identified barriers that may interrupt the description flow of the chief complaint by the caller, which can create delays, loss of crucial information, and lower willingness for bystander CPR (82). Perera et al.'s retrospective cohort study of emergency ambulance calls related to OHCA revealed a delayed OHCA recognition when emergency call-takers and dispatchers lacked language fluency (83). The study by Ong et al., which may be generalizable to WC-SA, demonstrated that non-fluent English-speaking communities are often hesitant to request EMS services due to language barriers (84).

Diverse practices exist among emergency control centres regarding the interrogation of emergency calls and the performance of CPR, often needing more scrutiny. Evidence-based studies are required to explore factors influencing tCPR in various situations. Bohm et al. identified one fundamental problem: detecting misinterpretation of terms in emergency control centres by emergency call takers (85). Additionally, the study stated that this was a significant obstacle despite claimed improvements in the event of OHCA.

The ILCOR consensus on science has highlighted the gaps and barriers to knowledge in the emergency control centre and emphasised the importance of training that includes communication configuration (39). Similarly, AHA guidelines advocate for crucial quality indicators of OHCA recognition by emergency dispatch centres (38). However, emergency call-takers and dispatchers often rely heavily on emergency call perceptions of OHCA or in-house policy without scientific reference. Blomberg et al. demonstrated in developing countries that emergency call-takers did not recognise approximately 25% of OHCA cases (86).

South Africa faces significant challenges in identifying OHCA patients due to the many languages (72) spoken and the varying levels of education (87). The key to averting OHCA and its associated survival rates is to improve epidemiological data on emergency conditions such as OHCA. This includes enhancing the terminology used in out-of-hospital care to better align with the population's needs and developing research and systems for out-of-hospital care at the local level. Addressing the barriers must consider contextual influences and the SA population's needs, interests, and expectations.

Role of emergency control centre

Emergency medical control centres are increasingly recognised as a crucial component of the OHCA survival chain (85,88,89). However, there remains a gap in the literature reviewing African countries' current emergency control centres. In developed countries, extensive research has been conducted, providing evidence supporting the notion that emergency control centre staff training leads to improved survival rates. This knowledge could be adapted and implemented in WC-SA to mitigate the disparities in this region.

The recognition of OHCA by the emergency control centre, the activation of appropriate emergency resources by emergency call-takers and dispatchers, and the initiation of telephone-assisted CPR (CPR) have been linked to increased survival rates (25). In 2016, a study by the Germany Resuscitation Registry (GRR) 2016 analysed data showing an increase in bystander CPR rates from 19% to 31% and tCPR from nearly zero to about 10% (90). Similarly, Song et al. also demonstrated improved survival rates in South Korea after implementing tCPR, with bystander CPR rates increasing from 7.1% to 9.4% and doubling good neurological outcomes pre-implementation (91). In addition, a study in the well-established tCPR system in Sweden-Swiss Canton Waadt showed an increase in bystander CPR rates from 31% to 55% and the tCPR increase rate from 0% to 29% (92).

The emergency control centre is critical in tracking response times and outcomes of OHCA calls, ensuring optimum care delivery. AHA strongly advocates for continuous educational interventions and quality monitoring focusing on the emergency control centre's systematic questioning of the callers (93). Utilising this data enables the identification of areas where improvements are needed, ultimately enhancing survival rates. Thibodeau et al. emphasise the need for targeted interventions based on comprehensive epidemiological research data to strengthen the entire chain of survival in the African context (27).

Discovering the most effective methods of educating and training emergency control centres remains a priority. In Arizona and Japan, implementing recommendations from the AHA scientific statement, including novel protocols, training modules, and feedback to individual healthcare providers, led to improved processes and outcome measures (93,94). Emergency control centres must be diligent and innovative in addressing the needs of OHCA victims. This assessment is essential for tailoring the education structure and training methods and fostering necessary buy-in among the administrators and dispatchers.

By understanding the strengths and weaknesses of the system in place, emergency control centres can design customized training programs that effectively tackle the specific challenges their staff faces. This proactive approach ensures that the education and training provided are pertinent and practical, enhancing the centre's capacity to serve OHCA victims effectively.

Summary and conclusion

The literature review has highlighted the importance of the emergency control centre in SA in improving outcomes for OHCA victims. Despite significant efforts and development in management, the global OHCA survival rate remains low at 10%. This emphasizes the urgent need for empirical research to understand the underlying causes behind this stagnation. Fostering collaborative efforts

between EMS and the public in the early identification of OHCA can play a vital role in minimizing the mortality and morbidity associated with OHCA.

Although disparities have been observed between developed and LMICs in data reporting, bridging the gap between the latter can be improved through improved collection and sharing of the data to achieve a shared objective of raising survival rates of OHCA worldwide. The two most prominent barriers to OHCA outcomes in SA are the early recognition of OHCA and the time of arrival of EMS. With a low rate of bystander CPR in SA, the survival of patients with OHCA highly depends on the EMS arrival. Unfortunately, the rates of OHCA resuscitated, shockable rhythms and return to spontaneous circulation remain low in SA. However, amidst these challenges, certain studies have shown promising results with implementing the emergency first aid-training responder (EFAR) system in the Metropole of CT-WC, indicating a growing interest and potential for improvement within the population.

It is essential to highlight that poor diagnoses by bystanders are often unreliable, leading emergency call takers to identify OHCA based on other descriptors, such as poor breathing. This underscores emergency responders' challenges in appropriately evaluating OHCA cases based only on callers' descriptors and the critical role emergency call takers play in recognizing and handling emergencies. Developing an algorithm specifically for common isiXhosa OHCA descriptors would streamline OHCA identification at emergency control centres, facilitating more appropriate responses. Additionally, incorporating these descriptors into teaching methods could enhance recognition accuracy. This comprehensive approach is the way to implement tCPR systems, potentially increasing OHCA's survival rate in the WC, SA.

References

1. Cappuccio FP, Miller MA. Cardiovascular disease and hypertension in sub-Saharan Africa: burden, risk and interventions. Intern Emerg Med. 2016;11(3):299–305.

2. Ro YS, Shin S Do, Song KJ, Cha WC, Cho JS. Triage-based resource allocation and clinical treatment protocol on outcome and length of stay in the emergency department. EMA - Emergency Medicine Australasia. 2015;27(4):328–35.

3. Wittwer MR, Ruknuddeen MI, Thorrowgood M, Zeitz C, Beltrame JF, Arstall MA. Overcoming challenges of establishing a hospital-based out-of-hospital cardiac arrest registry: accuracy of case identification using administrative data and clinical registries. Resusc Plus [Internet]. 2021;6(December 2020):100136. Available from: https://doi.org/10.1016/j.resplu.2021.100136

4. Frohlich G, Lyon R, Sasson C, Crake T, Whitbread M, Indermuehle A, et al. Out-of-Hospital Cardiac Arrest –Optimal Management. Curr Cardiol Rev. 2014;9(4):316–24.

5. Bonny A, Tibazarwa K, Mbouh S, Wa J, Fonga R, Saka C, et al. Epidemiology of sudden cardiac death in Cameroon: The first population-based cohort survey in sub-Saharan Africa. Int J Epidemiol. 2017;46(4):1230–8.

6. Kironji AG, Hodkinson P, De Ramirez SS, Anest T, Wallis L, Razzak J, et al. Identifying barriers for out of hospital emergency care in low and low-middle income countries: A systematic review. BMC Health Serv Res. 2018;18(1):1–20.

7. Anest T, Stewart De Ramirez S, Balhara KS, Hodkinson P, Wallis L, Hansoti B. Defining and improving the role of emergency medical services in Cape Town, South Africa. Emergency Medicine Journal. 2016 Aug 1;33(8):557–61.

8. Penn C, Koole T, Nattrass R. When seconds count: A study of communication variables in the opening segment of emergency calls. J Health Psychol. 2017;22(10):1256–64.

9. Hardeland C, Skåre C, Kramer-Johansen J, Birkenes TS, Myklebust H, Hansen AE, et al. Targeted simulation and education to improve cardiac arrest recognition and telephone assisted CPR in an emergency medical communication centre. Resuscitation [Internet]. 2017;114(2017):21–6. Available from: http://dx.doi.org/10.1016/j.resuscitation.2017.02.013

10. Republic of South Africa. Constitution of the Republic of South Africa, 1996 - Chapter 2: Bill of Rights. Pretoria; 1996.

11. Stassen W, Wylie C, Djärv T, Wallis LA. Out-of-hospital cardiac arrests in the city of Cape Town, South Africa: a retrospective, descriptive analysis of prehospital patient records. BMJ Open [Internet]. 2021;11:49141. Available from: http://bmjopen.bmj.com/

12. Stein C, Stein MC. Out-of-hospital cardiac arrest cases in Johannesburg, South Africa: a first glimpse of short-term outcomes from a paramedic clinical learning database. Available from: http://emj.bmj.com/

13. Crause S, Slabber H, Theron E, Stassen W. Telephonic descriptions of out-of-hospital cardiac arrest by laypersons calling the dispatch centre of a private emergency medical service in South Africa. South African Journal of Pre-hospital Emergency Care | Original Research ARTICLE [Internet]. Available from: http://www.journals.ac.za/index.php/sajpec/

14. Komori A, Iriyama H, Abe T. Impact of defibrillation with automated external defibrillator by bystander before defibrillation by emergency medical system personnel on neurological outcome of out-of-hospital cardiac arrest with non-cardiac etiology. Resusc Plus. 2023 Mar 1;13.

15. Fukushima H, Panczyk M, Hu C, Dameff C, Chikani V, Vadeboncoeur T, et al. Description of Abnormal Breathing Is Associated With Improved Outcomes and Delayed Telephone Cardiopulmonary Resuscitation Instructions. Available from: http://ahajournals.org

16. Viereck S, Møller TP, Ersbøll AK, Bækgaard JS, Claesson A, Hollenberg J, et al. Recognising out-of-hospital cardiac arrest during emergency calls increases bystander cardiopulmonary resuscitation and survival. Resuscitation [Internet]. 2017;115(2017):141–7. Available from: http://dx.doi.org/10.1016/j.resuscitation.2017.04.006

17. Stein C, Mould-Millman NK, De Vries S, Wallis L. Accès aux soins d'urgence hors de l'hôpital en Afrique: recommandations de la Conférence de concertation. African Journal of Emergency Medicine. 2016 Sep 1;6(3):158–61.

18. Mao DRH, Ee AZQ, Leong PWK, Leong BSH, Arulanandam S, Ng M, et al. Is your unconscious patient in cardiac arrest? A New protocol for telephonic diagnosis by emergency medical call-takers: A national study. Resuscitation. 2020 Oct 1;155:199–206.

19. Claassen J, Jama Z, Manga N, Lewis M, Hellenberg D. Building freeways: piloting communication skills in additional languages to health service personnel in Cape Town, South Africa. BMC Health Serv Res. 2017 Jun 7;17(1).

20. Kleinman ME, Goldberger ZD, Rea T, Swor RA, Bobrow BJ, Brennan EE, et al. 2017 American Heart Association Focused Update on Adult Basic Life Support and Cardiopulmonary Resuscitation Quality: An Update to the American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2018;137(1):e7–13.

21. Cheskes S, Schmicker RH, Rea T, Morrison LJ, Grunau B, Drennan IR, et al. The association between AHA CPR quality guideline compliance and clinical outcomes from out-of-hospital cardiac arrest. Resuscitation [Internet]. 2017;116(2017):39–45. Available from: http://dx.doi.org/10.1016/j.resuscitation.2017.05.003

22. Kiguchi T, Okubo M, Nishiyama C, Maconochie I, Ong MEH, Kern KB, et al. Out-of-hospital cardiac arrest across the World: First report from the International Liaison Committee on Resuscitation (ILCOR). Resuscitation. 2020 Jul 1;152:39–49.

23. Zheng J, Lv C, Zheng W, Zhang G, Tan H, Ma Y, et al. Incidence, process of care, and outcomes of out-of-hospital cardiac arrest in China: a prospective study of the BASIC-OHCA registry. Lancet Public Health. 2023 Dec 1;8(12):e923–32.

24. Gräsner JT, Lefering R, Koster RW, Masterson S, Böttiger BW, Herlitz J, et al. EuReCa ONE—27 Nations, ONE Europe, ONE Registry: A prospective one month analysis of out-of-hospital cardiac arrest outcomes in 27 countries in Europe. Resuscitation. 2016 Aug 1;105:188–95.

25. Nichol G, Thomas E, Callaway CW, Hedges J, Powell JL, Aufderheide TP, et al. Regional variation in out-of-hospital cardiac arrest incidence and outcome. JAMA - Journal of the American Medical Association. 2008;300(12):1423–31.

26. Berdowski J, Berg RA, Tijssen JGP, Koster RW. Global incidences of out-of-hospital cardiac arrest and survival rates: Systematic review of 67 prospective studies. Resuscitation [Internet]. 2010;81(11):1479–87. Available from: http://dx.doi.org/10.1016/j.resuscitation.2010.08.006

27. Thibodeau J, Werner K, Wallis LA, Stassen W. Out-of-hospital cardiac arrest in Africa: a scoping review. BMJ Open. 2022;12(3):e055008.

28. Jacobs I. 104-116 Table 1 ILCOR Co-chairs (1992-present). Name Years of Service Council Richard Cummins, MD 1992-1999 AHA Douglas Chamberlain, MD 1992-1999 ERC William Montgomery, MD 1999-2007 AHA Petter Steen. Vol. 121, Resuscitation. 2017.

29. Gräsner JT, Herlitz J, Tjelmeland IBM, Wnent J, Masterson S, Lilja G, et al. European Resuscitation Council Guidelines 2021: Epidemiology of cardiac arrest in Europe. Resuscitation. 2021 Apr 1;161:61–79.

30. Berdowski J, Berg RA, Tijssen JGP, Koster RW. Global incidences of out-of-hospital cardiac arrest and survival rates: Systematic review of 67 prospective studies. Resuscitation. 2010 Nov;81(11):1479–87.

31. Stassen W, Wylie C, Djärv T, Wallis LA. Out-of-hospital cardiac arrests in the city of Cape Town, South Africa: A retrospective, descriptive analysis of prehospital patient records. BMJ Open. 2021 Aug 16;11(8).

32. Vos T, Abajobir AA, Abbafati C, Abbas KM, Abate KH, Abd-Allah F, et al. Global, regional, and national incidence, prevalence, and years lived with disability for 328 diseases and injuries for 195 countries, 1990-2016: A systematic analysis for the Global Burden of Disease Study 2016. The Lancet. 2017;390(10100):1211–59.

33. Yan S, Gan Y, Jiang N, Wang R, Chen Y, Luo Z, et al. The global survival rate among adult out-of-hospital cardiac arrest patients who received cardiopulmonary resuscitation: A systematic review and meta-analysis. Crit Care. 2020 Feb 22;24(1).

34. Andrew E, Smith K. 4 Revising EMS dispatch procedures to manage growing demand in victoria, australia. In BMJ; 2017. p. A2.1-A2.

35. Bray J, Acworth J, Page G, Parr M, Morley P, Cameron A, et al. Aussie KIDS SAVE LIVES: A position statement from the Australian Resuscitation Council and supported by stakeholders. EMA - Emergency Medicine Australasia. 2021 Oct 1;33(5):944–6.

36. Zheng W, Zheng J, Wang C, Pan C, Zhang J, Liu R, et al. The development history, current state, challenges, and future directions of the BASIC-OHCA registry in China: A narrative review. Vol. 18, Resuscitation Plus. Elsevier B.V.; 2024.

37. Lafrance M, Canon V, Hubert H, Grunau B, Javaudin F, Recher M, et al. Out-of-hospital cardiac arrests occurring at school in France: A nation-wide retrospective cohort study from the RéAC registry. Resuscitation. 2023 Aug 1;189.

38. Lerner EB, Rea TD, Bobrow BJ, Acker JE, Berg RA, Brooks SC, et al. Emergency medical service dispatch cardiopulmonary resuscitation prearrival instructions to improve survival from out-of-hospital cardiac arrest: A scientific statement from the American heart association. Circulation. 2012;125(4):648–55.

39. Perkins GD, Handley AJ, Koster RW, Castrén M, Smyth MA, Olasveengen T, et al. European Resuscitation Council Guidelines for Resuscitation 2015. Section 2. Adult basic life support and automated external defibrillation. Resuscitation. 2015;95(2015):81–99.

40. Mawani M, Kadir MM, Azam I, Mehmood A, McNally B, Stevens K, et al. Epidemiology and outcomes of out-of-hospital cardiac arrest in a developing country-a multicenter cohort study. BMC Emerg Med [Internet]. 2016;16(1):1–10. Available from: http://dx.doi.org/10.1186/s12873-016-0093-2

41. Chin A. Sudden cardiac death in Africa. Cardiovasc J Afr. 2014;25(4):151–2.

42. Berdowski J, Berg RA, Tijssen JGP, Koster RW. Global incidences of out-of-hospital cardiac arrest and survival rates: Systematic review of 67 prospective studies. Resuscitation. 2010;

43. Roth GA, Mensah GA, Johnson CO, Addolorato G, Ammirati E, Baddour LM, et al. Global Burden of Cardiovascular Diseases and Risk Factors, 1990-2019: Update From the GBD 2019 Study. J Am Coll Cardiol. 2020;76(25):2982–3021.

44. Bank W. World Population Ageing 2019 [Internet]. World Population Ageing 2019. 2019. 64 p. Available from: http://link.springer.com/chapter/10.1007/978-94-007-5204-7_6

45. Mayosi BM, Flisher AJ, Lalloo UG, Sitas F, Tollman SM, Bradshaw D. Series The burden of non-communicable diseases in South Africa. The Lancet [Internet]. 374:934–47. Available from: www.thelancet.com

46. Chikafu H, Chimbari MJ. Cardiovascular disease healthcare utilization in Sub-Saharan Africa: A scoping review. Int J Environ Res Public Health. 2019;16(3).

47. Kapwata T, Manda S. Geographic assessment of access to health care in patients with cardiovascular disease in South Africa. BMC Health Serv Res. 2018;18(1):1–10.

48. Alberts M, Urdal P, Steyn K, Stensvold I, Tverdal A, Nel JH, et al. Prevalence of cardiovascular diseases and associated risk factors in a rural black population of South Africa [Internet]. Available from: https://academic.oup.com/eurjpc/article/12/4/347/5932759

49. Stringhini S, Bovet P. Socioeconomic status and risk factors for non-communicable diseases in low-income and lower-middle-income countries. Lancet Glob Health [Internet]. 2017;5(3):e230–1. Available from: http://dx.doi.org/10.1016/S2214-109X(17)30054-2

50. Mayosi BM, Flisher AJ, Lalloo UG, Sitas F, Tollman SM, Bradshaw D. Series The burden of non-communicable diseases in South Africa. The Lancet [Internet]. 374:934–47. Available from: www.thelancet.com

51. Andersen LW, Kim WY, Chase M, Berg KM, Mortensen SJ, Moskowitz A, et al. The prevalence and significance of abnormal vital signs prior to in-hospital cardiac arrest. Resuscitation. 2016;98(2016):112–7.

52. Masterson S, Teljeur C, Cullinan J, Murphy AW, Deasy C, Vellinga A. Out-of-hospital cardiac arrest in the home: Can area characteristics identify at-risk communities in the Republic of Ireland? Int J Health Geogr. 2018 Feb 20;17(1).

53. Travers S, Jost D, Gillard Y, Lanoë V, Bignand M, Domanski L, et al. Out-of-hospital cardiac arrest phone detection: Those who most need chest compressions are the most difficult to recognize. Resuscitation. 2014;85(12):1720–5.

54. Vadeboncoeur T, Stolz U, Panchal A, Silver A, Venuti M, Tobin J, et al. Chest compression depth and survival in out-of-hospital cardiac arrest. Resuscitation [Internet]. 2014;85(2):182–8. Available from: http://dx.doi.org/10.1016/j.resuscitation.2013.10.002

55. Travers AH, Perkins GD, Berg RA, Castren M, Considine J, Escalante R, et al. Part 3: Adult basic life support and automated external defibrillation: 2015 international consensus on cardiopulmonary resuscitation and emergency cardiovascular care science with treatment recommendations. Vol. 132, Circulation. 2015. 51–83 p.

56. Magid KH, Heard D, Sasson C. Addressing Gaps in Cardiopulmonary Resuscitation Education: Training Middle School Students in Hands-Only Cardiopulmonary Resuscitation. Journal of School Health. 2018;88(7):524–30.

57. Weisfeldt ML, Pollack RA. Public Access Defibrillation: Is This Making Any Difference? Controversial Issues in Resuscitation from Cardiac Arrest. Vol. 9, Cardiac Electrophysiology Clinics. W.B. Saunders; 2017. p. 551–7.

58. Zijlstra JA, Stieglis R, Riedijk F, Smeekes M, van der Worp WE, Koster RW. Local lay rescuers with AEDs, alerted by text messages, contribute to early defibrillation in a Dutch out-of-hospital cardiac arrest dispatch system. Resuscitation [Internet]. 2014;85(11):1444–9. Available from: http://dx.doi.org/10.1016/j.resuscitation.2014.07.020

59. Reuter PG, Agostinucci JM, Bertrand P, Gonzalez G, De Stefano C, Hennequin B, et al. Prevalence of advance directives and impact on advanced life support in out-of-hospital cardiac arrest victims. Resuscitation. 2017 Jul 1;116:105–8.

60. Cabañas JG, Myers JB, Williams JG, De Maio VJ, Bachman MW. Double sequential external defibrillation in out-of-hospital refractory ventricular fibrillation: A report of ten cases. Prehospital Emergency Care. 2015;19(1):126–30.

61. Park JH, Kim YJ, Ro YS, Kim S, Cha WC, Shin S Do. The effect of transport time interval on neurological recovery after out-of-hospital cardiac arrest in patients without a prehospital return of spontaneous circulation. J Korean Med Sci. 2019;34(9):1–14.

62. C Stein PLW 3 MCFMOA[3] P. Meeting national response time targets for priority 1 incidents in an urban emergency medical services system in South Africa: More ambulances won't help. 2015 Oct;105(10).

63. Stein C. Out-of-hospital cardiac arrest cases in Johannesburg, South Africa: A first glimpse of short-term outcomes from a paramedic clinical learning database. Emergency Medicine Journal. 2009 Sep;26(9):670–4.

64. Slingers M, De Vos S, Sun JH. Ten years of the community-based emergency first aid responder (EFAR) system in the Western Cape of South Africa: What has happened, what has changed, and what has been learned. Vol. 12, African Journal of Emergency Medicine. African Federation for Emergency Medicine; 2022. p. 299–306.

65. Travers S, Jost D, Gillard Y, Lanoë V, Bignand M, Domanski L, et al. Out-of-hospital cardiac arrest phone detection: Those who most need chest compressions are the most difficult to recognize. Resuscitation. 2014;85(12):1720–5.

66. Wilks J, Pendergast D. Skills for life: First aid and cardiopulmonary resuscitation in schools. Health Educ J. 2017;76(8):1009–23.

67. Mao DRH, Ee AZQ, Leong PWK, Leong BSH, Arulanandam S, Ng M, et al. Is your unconscious patient in cardiac arrest? A New protocol for telephonic diagnosis by emergency medical call-takers: A national study. Resuscitation [Internet]. 2020;155(August 2020):199–206. Available from: https://doi.org/10.1016/j.resuscitation.2020.08.009

68. Mackay E, Theron E, Stassen W. The barriers and facilitators to the telephonic application of the FAST assessment for stroke in a private emergency dispatch centre in South Africa. African Journal of Emergency Medicine. 2021 Mar 1;11(1):15–9.

69. De Caires LP, Evans K, Stassen W. The understandability and quality of telephone-guided bystander cardiopulmonary resuscitation in the Western Cape province of South Africa: A manikin-based study. African Journal of Emergency Medicine. 2023 Dec 1;13(4):281–6.

70. Ommen SR, Mital S, Burke MA, Day SM, Deswal A, Elliott P, et al. 2020 AHA/ACC Guideline for the Diagnosis and Treatment of Patients With Hypertrophic Cardiomyopathy A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. Vol. 142, Circulation. 2020. 558–631 p.

71. Berdowski J, Beekhuis F, Zwinderman AH, Tijssen JGP, Koster RW. Importance of the first link: Description and recognition of an out-of-hospital cardiac arrest in an emergency call. Circulation. 2009;119(15):2096–102.

72. Perera N, Birnie T, Ngo H, Ball S, Whiteside A, Bray J, et al. “I’m sorry, my English not very good”: Tracking differences between Language-Barrier and Non-Language-Barrier emergency ambulance calls for Out-of-Hospital Cardiac Arrest. Resuscitation. 2021 Dec 1;169:105–12.

73. Salie M, Moletsane M, Mukuna RK. Case study of isiXhosa-speaking foundation phase learners who experience barriers to learning in an english-medium disadvantaged Western Cape school. S Afr J Educ. 2020 May 1;40(2):1–9.

74. King JR, Chetty R. Codeswitching: Linguistic and literacy understanding of teaching dilemmas in multilingual classrooms. Linguistics and Education. 2014;

75. Alfsen D, Møller TP, Egerod I, Lippert FK. Barriers to recognition of out-of-hospital cardiac arrest during emergency medical calls: A qualitative inductive thematic analysis. Scand J Trauma Resusc Emerg Med [Internet]. 2015;23(1):1–8. Available from: http://dx.doi.org/10.1186/s13049-015-0149-4

76. Greatbatch D, Hanlon G, Goode J, O’Caithain A, Strangleman T, Luff D. Telephone triage, expert systems and clinical expertise. Sociol Health Illn. 2005;

77. Olasveengen TM, de Caen AR, Mancini ME, Maconochie IK, Aickin R, Atkins DL, et al. 2017 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations Summary. Resuscitation [Internet]. 2017;121(2017):201–14. Available from: http://dx.doi.org/10.1016/j.resuscitation.2017.10.021

78. Tamminen J, Lydén E, Kurki J, Huhtala H, Kämäräinen A, Hoppu S. Spontaneous trigger words associated with confirmed out-of-hospital cardiac arrest: A descriptive pilot study of emergency calls. Scand J Trauma Resusc Emerg Med. 2020;28(1):1–7.

79. Ho AFW, Sim ZJ, Shahidah N, Hao Y, Ng YY, Leong BSH, et al. Barriers to dispatcher-assisted cardiopulmonary resuscitation in Singapore. Resuscitation. 2016;105(2016):149–55.

80. Vaillancourt C, Verma A, Trickett J, Crete D, Beaudoin T, Nesbitt L, et al. Evaluating the Effectiveness of Dispatch-assisted Cardiopulmonary Resuscitation Instructions. Academic Emergency Medicine. 2007;14(10):877–83.

81. Fukushima H, Panczyk M, Hu C, Dameff C, Chikani V, Vadeboncoeur T, et al. Description of abnormal breathing is associated with improved outcomes and delayed telephone cardiopulmonary resuscitation instructions. J Am Heart Assoc. 2017;6(9).

82. Riou M, Ball S, O’Halloran KL, Whiteside A, Williams TA, Finn J. Hijacking the dispatch protocol: When callers pre-empt their reason-for-the-call in emergency calls about cardiac arrest. Discourse Stud. 2018;20(5):666–87.

83. Perera N, Birnie T, Ngo H, Ball S, Whiteside A, Bray J, et al. “I’m sorry, my English not very good”: Tracking differences between Language-Barrier and Non-Language-Barrier emergency ambulance calls for Out-of-Hospital Cardiac Arrest. Resuscitation [Internet]. 2021;169(September 2021):105–12. Available from: https://doi.org/10.1016/j.resuscitation.2021.10.035

84. Ong BN, Yip MP, Feng S, Calhoun R, Meischke HW, Tu SP. Barriers and facilitators to using 9-1-1 and emergency medical services in a limited English proficiency Chinese community. J Immigr Minor Health. 2012;14(2):307–13.

85. Bohm K, Stålhandske B, Rosenqvist M, Ulfvarson J, Hollenberg J, Svensson L. Tuition of emergency medical dispatchers in the recognition of agonal respiration increases the use of telephone assisted CPR. Resuscitation. 2009;80(9):1025–8.

86. Blomberg SN, Christensen HC, Lippert F, Ersbøll AK, Torp-Petersen C, Sayre MR, et al. Effect of Machine Learning on Dispatcher Recognition of Out-of-Hospital Cardiac Arrest during Calls to Emergency Medical Services: A Randomized Clinical Trial. JAMA Netw Open. 2021;4(1):1–10.

87. van Staden D. Investing in health professions education: A national development imperative for South Africa. South African Journal of Higher Education. 2021 Mar;

88. Hardeland C, Claesson A, Blom MT, Blomberg SNF, Folke F, Hollenberg J, et al. Description of call handling in emergency medical dispatch centres in Scandinavia: recognition of out-of-hospital cardiac arrests and dispatcher-assisted CPR. Scand J Trauma Resusc Emerg Med [Internet]. 2021 Dec 1 [cited 2022 Jul 10];29(1). Available from: https://pubmed.ncbi.nlm.nih.gov/34193226/

89. Møller TP, Andréll C, Viereck S, Todorova L, Friberg H, Lippert FK. Recognition of out-of-hospital cardiac arrest by medical dispatchers in emergency medical dispatch centres in two countries. Resuscitation [Internet]. 2016;109(2016):1–8. Available from: http://dx.doi.org/10.1016/j.resuscitation.2016.09.012

90. Maier M, Luger M, Baubin M. Telefonreanimation: Eine Literaturanalyse. Notfall und Rettungsmedizin. 2016;19(6):468–72.

91. Song KJ, Shin S Do, Park CB, Kim JY, Kim DK, Kim CH, et al. Dispatcher-assisted bystander cardiopulmonary resuscitation in a metropolitan city: A before-after population-based study. Resuscitation [Internet]. 2014;85(1):34–41. Available from: http://dx.doi.org/10.1016/j.resuscitation.2013.06.004

92. Strömsöe A, Andersson B, Ekström L, Herlitz J, Axelsson Å, Göransson KE, et al. Education in cardiopulmonary resuscitation in Sweden and its clinical consequences. Resuscitation. 2010;81(2):211–6.

93. Lerner EB, Rea TD, Bobrow BJ, Acker JE, Berg RA, Brooks SC, et al. Emergency medical service dispatch cardiopulmonary resuscitation prearrival instructions to improve survival from out-of-hospital cardiac arrest: A scientific statement from the American heart association. Circulation. 2012;125(4):648–55.

94. Jost D, Degrange H, Verret C, Hersan O, Banville IL, Chapman FW, et al. DEFI 2005: A randomized controlled trial of the effect of automated external defibrillator cardiopulmonary resuscitation protocol on outcome from out-of-hospital cardiac arrest. Circulation. 2010;121(14):1614–22.

PART B: Manuscript in Article Format

NOTE FROM THE AUTHOR

The study presented here constitutes one-third of a broader Thuthuka-funded research project, in which the primary investigator also serves as the principal supervisor. The overarching aim of this comprehensive project was to investigate the descriptors used in Afrikaans, isiXhosa, and English to describe situations of out-of-hospital cardiac arrest when individuals seek assistance from the Western Cape-Emergency Medical Services.

In this specific segment of the project, the student was assigned the responsibility for conducting sampling, analysing the data, and drafting a report of the descriptors in the isiXhosa language. The outcomes and insights that were explicitly derived from the meticulous analysis of the isiXhosa descriptors are presented here. These results offer a focused view of the terminology and language choices employed by isiXhosa-speaking individuals when faced with the critical task of requesting help during life-threatening situations. It is worth noting that these isiXhosa descriptors were studied in isolation, independent of the corresponding descriptors in Afrikaans and English.

The culmination of this extensive research effort involved combining the findings from the isiXhosa language segment with the parallel investigations conducted in Afrikaans and English. The intention was to create a comprehensive publication that would provide a holistic understanding of how individuals in the Western Cape region describe patients with out-of-hospital cardiac arrest during emergency calls to the Western Cape Emergency Medical Services across all three languages.

An Analysis of the IsiXhosa Telephonic Descriptors of Cardiac Arrest (CA) in a Western Cape Emergency Control Centre- A Cross-Sectional Study.

Sinethemba Mgidi [a,] *, Willem Stassen [a,] Louis C van Rensburg [a]

[a] Division of Emergency Medicine, University of Cape Town, South Africa

* Corresponding author.

E-mail address: sinejack.mgidi@gmail.com (S. Mgidi)

Tel: +27 73 598 3071

ABSTRACT

Introduction: Out-of-hospital cardiac Arrest (OHCA) represents a considerable public health challenge, characterised by its critical time sensitivity, high morbidity, and poor survival rates. Despite decades of low survival rates, OHCA survival has been a constant concern for healthcare systems globally. The first stage of managing OHCA is immediate recognition by bystanders and emergency control centre personnel, which rely on the descriptors that callers provide. Varying educational levels and languages make identifying such patients in the Western Cape (WC), South Africa (SA), challenging. This study aims to identify key isiXhosa speaking descriptors used telephonically in the Western Cape Department of Health and Wellness, EMS, when IsiXhosa speaking callers are requesting emergency medical care at the emergency control centre in the event of OHCA.

Methodology: Data from the computer-aided dispatch (CAD) programme with a “medical” and "patient unresponsive" incident classification were collected for 12 months (January 2018, to December 2018). A collection of corresponding patient care data were collected to confirm OHCA. The original voice recordings between the caller and the emergency call taker during the emergency were transcribed verbatim. Transcriptions underwent inductive, Hseih and Shannon qualitative content analysis to the manifest level. Descriptors of OHCA in isiXhosa calls were coded, categorised, and quantified.

Results: The study identified 729 confirmed OHCA cases, of which 24 (3.3%) were in isiXhosa and were eligible for analysis. Five distinctive categories were identified from the content analysis. Notable descriptors used by callers to describe OHCA were related to respiratory effort (29.4%), cardiac activity (23.5%), level of consciousness (23.5%), clinical features (11.8%) and ill health (11.8%).

Conclusion: This study highlighted the descriptors used by isiXhosa-speaking callers when reporting out-of-hospital cardiac arrest telephonically in South Africa's Western Cape province. The findings underscore the importance of providing a list of phrases and words descriptors used in communication between the caller and call takers.

Keywords: Out-of-Hospital Cardiac Arrest; Emergency Control Centre; Call Taker; Emergency Dispatcher, IsiXhosa.

Introduction

Out-of-hospital cardiac arrest (OHCA) poses a significant health challenge, with mortality rates varying widely across different regions (1). OHCA occurs when cardiac activity ceases outside a hospital setting, leading to the non-existence of systemic circulation (2,3). According to the 2020 International Liaison Committee on Resuscitation (ILCOR) report, the global survival rates for OHCA managed by EMS range from 3.1% to 20.4% worldwide (4,5). However, studies have shown that survival rates in higher-income countries (HICs) tend to be higher, ranging from 4.3% to 11% (2,6). On the contrary, in a low-resource setting, survival rates can go as low as 0% (7,8).

Despite the global impact of OHCA, there is a notable of dearth of data from the African region (9). In South Africa (SA), OHCA incidence rates range from 6.4 per 100,000 (10) to 23.2 per 100,000 population (11). Similarly, Cameroon reports an incidence rate of 31.3 per 100,000 population (12). However, OHCA cases treated by EMS may underestimate the true incidence of OHCA due to various factors, including reliable and accessible data (13). The effective management and prognosis of OHCA require a methodical chain of survival (14). The South African study reported that OHCA victims received limited resuscitation, leading to low rates of return of spontaneous circulation (ROSC) (11).

Early access to the emergency control centre, for telephonic cardiopulmonary resuscitation (tCPR) is crucial for OHCA's positive outcomes as it forms part of the initial link in the chain of survival (15). Therefore, bystander interventions, such as bystander cardiopulmonary resuscitation (CPR), dispatcher-assisted tCPR, and automated external defibrillators (AEDs), play a crucial role in OHCA survival in the absence of EMS (16). However, OHCA is frequently misidentified by emergency call takers worldwide, resulting in missed opportunities for resource deployment and CPR delivery (17).

In the emergency control centre, OHCA is identified based on caller descriptions while seeking emergency care (18). Approximately 31.1% of the population in the Western Cape province speaks isiXhosa as a first language (19). However, there is no published literature on the isiXhosa OHCA descriptors used by people in the Western Cape (WC), SA, when contacting the emergency call centre. Therefore, this study aimed to identify keywords and phrases used telephonically by isiXhosa-speaking callers in the WC, SA, while requesting emergency medical care in the event of OHCA.

Methods

A descriptive, retrospective qualitative study identified unprompted isiXhosa OHCA descriptors (keywords and phrases) used by callers seeking ambulances in the Western Cape. In this study, "unprompted" refers to a description spontaneously provided by the caller without the call taker asking a particular question. Verbatim transcriptions of the calls were subjected to inductive, Hseih and Shannon qualitative content analysis (20) to the manifest level. This analysis involved coding, categorising, and quantifying the descriptors of OHCA mentioned in isiXhosa calls.

Study setting

The data were collected at the Western Cape Department of Health and Wellness' EMS control centre. The Western Cape Department of Health and Wellness-EMS is a provincially funded service that provides emergency care to all residents in the Western Cape Province. The Western Cape Department of Health and Wellness-EMS control centre receives around 2000 calls daily and 65,000

calls monthly. The facility receives emergency calls from Western Cape residents seeking an ambulance. Emergency call takers are generally the primary point of communication between the public and emergency services. Call takers at the Western Cape Department of Health and Wellness-EMS are generally non-medical trained and receive orientation and in-house training on call-taking procedures and computer systems.

Calls at the emergency control centre are unscripted, with call takers focusing on acquiring geographical information rather than condition-specific details. Language discrepancies at emergency control centres are typically resolved through code-switching (either the call-taker or caller speaks in a different language, typically English) or transfer to a language-proficient call-taker (21)

Data collection

Computer-aided dispatch (CAD) data were analysed to identify non-trauma "patient unresponsive" incidents between January 2018, and December 2018. The ePCR were extracted for OHCA verification. OHCA was verified in a variety of ways. The ePCR data were filtered based on the final prehospital triage code: "Red" for urgent, time-critical patients and "Blue" for expectant or deceased. A retrospective chart review was conducted on the ePCRs for these cases. OHCAs were confirmed in cases with a final red triage code who were initially unresponsive and pulseless or when emergency medical responders performed CPR upon arrival.

We excluded cases where cardiac arrest was not the primary cause of unresponsiveness, such as those involving stroke or hypoglycaemia. For cases with a final blue triage code and a declaration of death, OHCA validation was using the ePCR records. Cases not meeting these criteria were excluded from the study since they were unlikely to represent OHCA incidents. Subsequently, voice recordings from the included cases were randomly selected using Microsoft Excel (Microsoft Corp., Washington, United States) and transcribed verbatim by isiXhosa transcribers.

Data analysis

After transcription, the calls underwent inductive, qualitative content analysis to the manifest level, emphasising the isiXhosa descriptors used for OHCA in the Western Cape of South Africa. The researcher coded descriptors, including keywords and phrases associated with isiXhosa OHCA, which the co-authors then validated. Data were organized and analysed using NVivo 12 (QSR International Pty Ltd, Australia) data analysis software. The analysis took place in three steps. Step 1: Developing and Applying Codes. Step 2: Recognizing categories, patterns, and relationships. Step 3: Summarizing and Quantifying the Data (20). With coding completed, emergent patterns were identified using keywords and phrases that were repeated in all coded data sets and connected to OHCA (22).

Trustworthiness

Using a well-defined study methodology ensured qualitative rigour and trustworthiness, which were then addressed under the elements established by Guba (23).

- *Credibility:* Credibility was ensured through extended interaction with the sampled data and member verification amongst investigators during debriefings (24). The OHCA cases selected for this study were all non-traumatic and genuine. Cases were chosen at random until

saturation was reached. Due to the small sample size, saturation could not be proven for isiXhosa calls.

- *Transferability:* This study's applicability is confined to its setting in the Western Cape province of South Africa, and it primarily focuses on isiXhosa callers. Transferability cannot thus be determined. However, a detailed description of the setting has been provided for readers to determine how results may be transferred to their contexts.
- *Dependability:* Using an appropriate study design, data collection, and analytic method ensured reliability. Readers can analyse the methodology used to collect data (24). Investigators' audit trails have been maintained.
- *Confirmability:* The investigators did the transcription. Transcriptions were verified for accuracy. Confirmability was enhanced through investigator triangulation and double coding of transcriptions.
- *Reflexivity*: The researchers analysed the data without prior expertise or comprehension of the subject matter. As a result, findings were derived entirely from data instead of being biased by preconceived notions, thus ensuring an impartial, objective approach. The lack of pre-existing familiarity reduced the possibility of confirmation bias, bolstering the study's credibility and methodological integrity.

Ethical Considerations

- *Risk and Benefits for Participants:* A retrospective analysis of the Western Cape Department of Health and Wellness EMS ePCRs and call recordings was conducted as part of this study. The Western Cape Department of Health and Wellness emergency control centre routinely records and assesses emergency calls as part of its quality assurance procedures. They also review ePCRs to ensure that ambulance personnel are delivering an adequate level of care. These procedures are known to employees within the Western Cape Department of Health and Wellness EMS, so including this data poses no risks. Their inclusion shouldn't pose any risks.
- *Consent:* The ePCRs were anonymized before data collection to minimize the risk of identifying families, patients, and ambulance crews. As a result, the research team could only ascertain whether the patient experienced an OHCA. In this retrospective study, patient care was not impacted. A waiver for consent was granted due to the anonymization of ePCRs and call recordings both prior to and during transcription.

Results

In total, 15,678 non-trauma incident type "patient unresponsive" cases were identified. Due to an array of factors, such as not being related to OHCA, language, and call recordings not being obtained, only 24 (3,3%) isiXhosa calls were included in the analysis after 15 654 cases were excluded (Figure 1). The patients' basic demographic information based on ePCR results included male patients (n=16, 67%) and females (n=8, 33%), with a mean age of 48.3 years.

The 24 transcribed calls yielded 17 meaning units (descriptors). During content analysis, meaning units were coded into five categories (see Table 1). Descriptors were grouped in descending order. The frequency with which descriptive terms are used is illustrated in Figure 2. The categories included cardiac activity (23.5%), clinical features (11.8%), ill health (11.8%), level of consciousness (23.5%) and respiratory effort (29,4%).

Cardiac activity categories classify documented observations of vital signs, such as the absence of a pulse or heartbeat, indicating that blood circulation is inactive. Clinical features encompass visible physical manifestations, such as expressions, responses, and sensations, which may signify circulation or bodily functioning changes. Ill health represents a subject's health status, where observing potential medical conditions could reveal their overall health. Categories of level of consciousness describe observable conditions related to a person's state, documented with precise indicators and recorded observations. The respiratory effort category is established based on specific recorded indications of respiratory impairment.

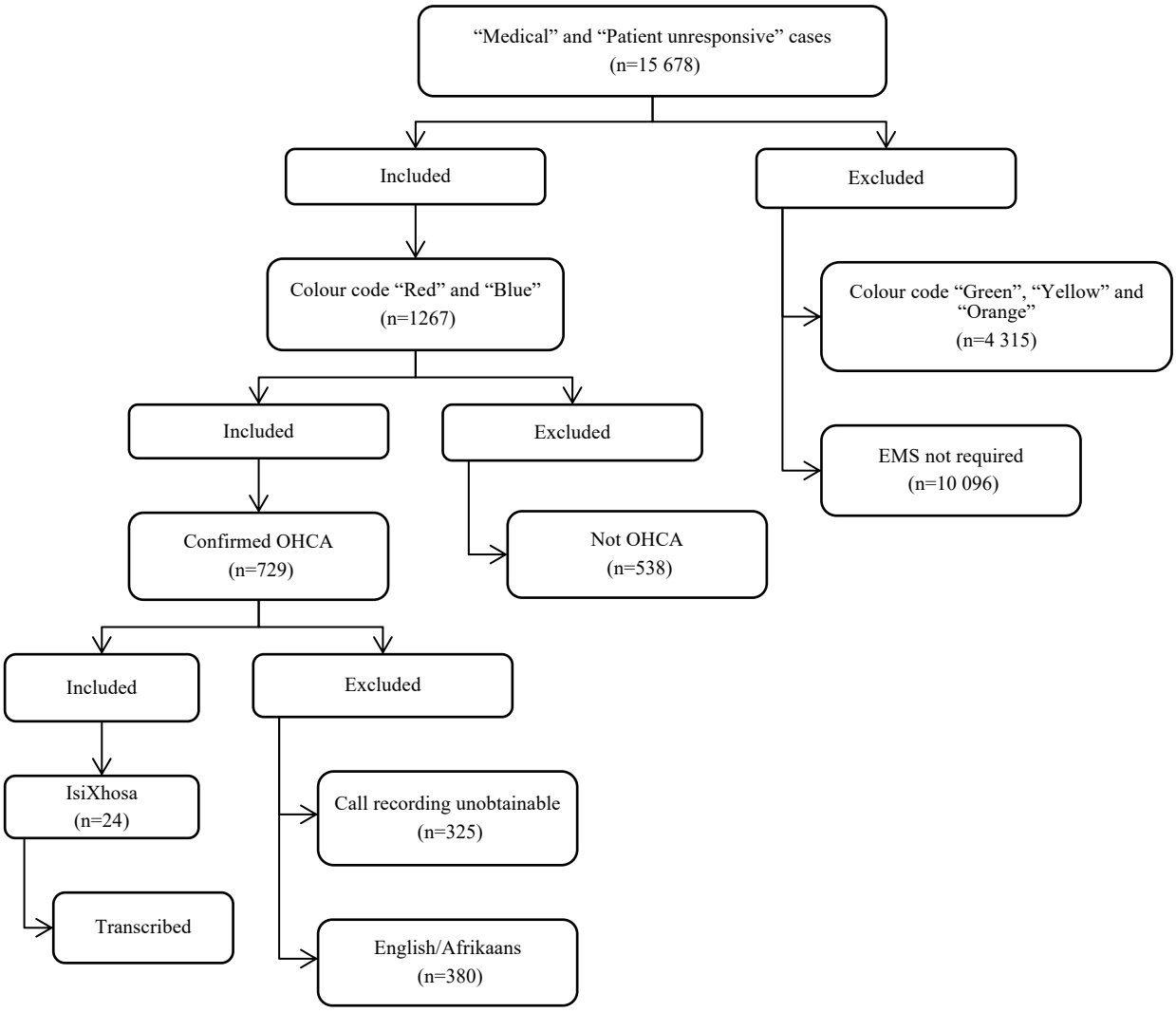

Fig. 1. Data collection and extraction process

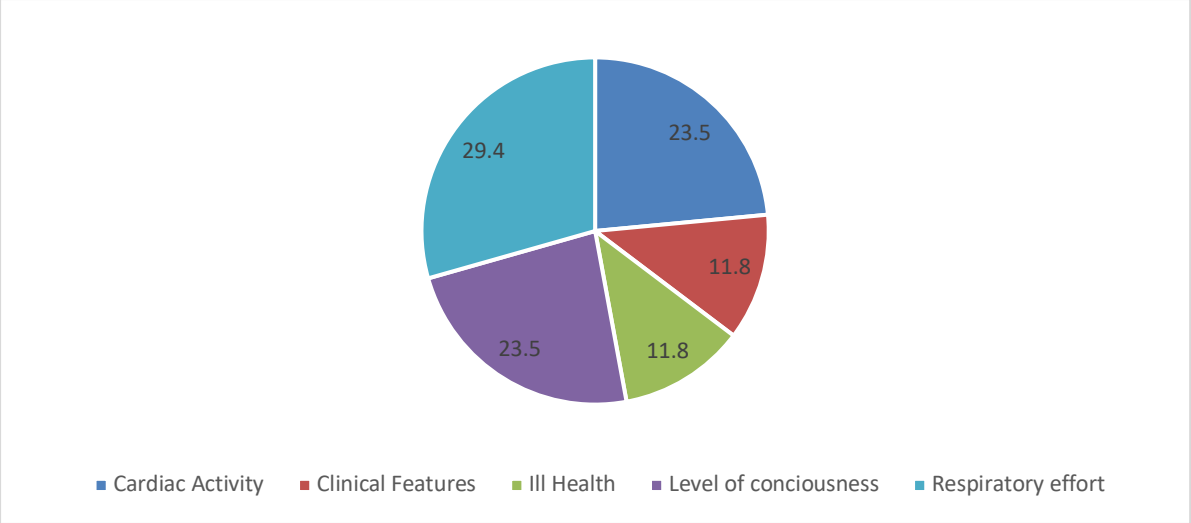

Fig. 2. Categories of isiXhosa descriptors of Out-of-Hospital Cardiac Arrest used by callers.

Table 1-IsiXhosa descriptors of Out-of-Hospital Cardiac Arrest used by callers.

Category	**Code**	**Meaning Unit**	**English Translation**
Ill Health	Suspected diagnosis	“Bakhwirisha ingathi uhlaselwe”	“Looks like she had a stroke”
	Medical History	” Utata uveske wawa”	“Daddy just fell”
Level of Consciousness	Unresponsive	“ Umntana akavuki” “ Patient ilele” “ Akarispondi xa emkhwaza” “ Yena ukholapsile”	“The baby does not wake up” “Patient is sleeping” “Did not respond when he cried out.” “He collapsed”
Cardiac Activity	Pulselessness	“ Ndiyendazama ukuva i-pulse, ndeva i-pulse ndeva kuthulekile” “ Ndizitshekhile pulse zakhe akho resipontsi”	“Tried to feel for the pulse, no pulse” “I have checked pulses and there are no responses”
	Suspected Death	” Ingathi uswelekile” ” Akavuki uswelekile”	“Seems like dead” “Does not wake up, she is dead”
Clinical Features	Facial Descriptors	“ ukhamisile”	“His mouth opened” also "He gasped"
	Body Temperature	” uyabanda”	“She is feeling cold”
Respiratory Effort	Apnoea	” Thina asazi asimani simphefumlisa” ” So akaphefumli kengoku” “ akaphefumli”	”We do not know if she has stopped breathing” “He is not breathing right now” ”He is not breathing”
	Difficulty in breathing	“ Ingathi uyaphefumla kancinci kakhulu andimazi noba uyasweleka na andimazi” “ Kancinci”	“She seems to be breathing very slowly, and I don't know if she is dying.” “A bit” or “shallow”.

Discussion

The findings of this study shed light on the descriptors predominantly used by isiXhosa-speaking callers to report OHCA. It was observed that isiXhosa-speaking callers frequently utilized terms related to various aspects of the patient's condition, including descriptors related to cardiac activity, clinical features, ill health, level of consciousness, and respiratory effort. This study found that breathing difficulty emerged as the most reported characteristic of OHCA among isiXhosa-speaking callers. Our study also revealed that the callers frequently cited cardiac activity and consciousness level descriptors. Furthermore, fewer isiXhosa-speaking callers' descriptions were related to clinical features and ill health.

The overall study findings were consistent with the published literature in the region, albeit with different substantial descriptors utilised (25,26). It is noteworthy that Crause et al. found cardiac activity to be the most frequently used description for putative OHCA in the private sector of SA (26). However, van Rensburg et al. discovered that the most common description was related to ill health in the public sector in the Western Cape (WC) province of SA (25). Our study's findings could overestimate the importance of breathing difficulties as a perceived connection to OHCA in the region.

However, this study's findings are consistent with global studies linking abnormal breathing as a prominent descriptor of OHCA (18). A systematic review of 16 studies revealed a median awareness of 74% of OHCA bystanders, albeit with considerable variability (27), emphasising the importance of identifying breathing difficulties during OHCA. Additionally, other less prominent descriptors found in this study and by other local authors cannot be ignored, specifically "unconsciousness," which emerged as one of the most common descriptors of OHCA in other regions (28).

Furthermore, descriptors such as cardiac activity "pulseless," which were found to be the second most prominent descriptor, are critical. It indicates a life-threatening condition where the heart has ceased adequately pumping blood (29). It is important to promptly recognize and intervene in cases of pulselessness to initiate CPR and potentially save the person's life (30,31). However, it is essential to highlight that pulse evaluations by bystanders are often unreliable, leading emergency call takers to identify OHCA based on other descriptors, such as poor breathing (32). IsiXhosa-speaking callers also mentioned clinical characteristics that are not distinctive to OHCA. The most frequently mentioned features in this category were "mouth is open" and "cold," which have no supporting literature.

These variability descriptors emphasise the importance of reassessing our understanding of OHCA, specifically in isiXhosa-speaking callers. As a result, awareness of region-specific characteristics is critical for developing strategies for improving OHCA survival. This underscores the challenges of emergency control centres in appropriately evaluating OHCA cases based only on callers' descriptors and the critical role emergency call takers play in recognizing and handling emergencies.

Interestingly, we observed instances where isiXhosa-speakers incorporated English terms to describe OHCA. Additionally, findings from the local literature indicated that callers often mixed their native language with English to enhance clarity, potentially posing challenges with either the caller or call taker being unfamiliar with the language shift (33). Language shifting is intentional and self-directed in a multilingual population (34). While code-switching can facilitate comprehension by providing

access to a broader vocabulary and expressions, it can also have negative consequences, such as misunderstanding (35).

The Western Cape Department of Health and Wellness emergency call takers heavily depend on the information provided by the caller to assess the OHCA. How callers describe the situation to the emergency control centre significantly influences the call taker's ability to prioritise the case and dispatch appropriate resources (36). This study excluded 68% of patients with the colour code "Red" or "Blue" due to linguistic disparities in languages other than isiXhosa. This finding aligns with previous research identifying language barriers in the WC, SA (37,38). Caires et al. further supported this assertion, reporting that 94% of participants believed CPR instructions should be offered in their native language in SA (39).

Identifying isiXhosa words and phrases through telecommunication poses even more significant challenges for non-isiXhosa call takers in an emergency. This difficulty is compounded by the fact that prefixes and suffixes in isiXhosa can significantly alter the root word's meaning (40), making it one of the most challenging languages for non-natives to understand. Despite the province's official language policy, language barriers remain significant and persistent (41). Misunderstanding of descriptions may lead to worsened patient prognosis and potentially irreversible damage. Naidoo (42) has highlighted the importance of exercising extra caution and allocating additional time when communicating with patients whose third language is not commonly spoken.

Furthermore, callers may experience panic or uncertainty during emergencies, resulting in unclear or inaccurate descriptions of the situation (43). Crause et al. (44) noted that poor communication during OHCA can elicit irritation and emotional responses from both callers and call takers. These communication challenges may lead to delays in dispatching appropriate resources and potentially compromise the effectiveness of EMS's response times. The findings of this study underscore the critical need to address this barrier and find the common language barriers within the WC and SA. Urgent action is required to devise methods that promote clear and effective communication within the emergency control centre.

The misinterpretation of OHCA descriptors in multilingual groups emphasises gaps in EMS protocols and training materials, echoing concerns from similar findings. Addressing these issues is crucial for improving OHCA patient survival and ensuring equitable emergency care access.

Strengths

This study emphasizes the importance of designing recognition algorithms specific to the context of different sociolinguistic scenarios, particularly in emergency medical call-taking and dispatch. These areas operate at the intersection of language, communication, and healthcare. A significant strength of this research is its original contribution to understanding the linguistic descriptors used to identify OHCA in isiXhosa telephonic communications. The findings have practical implications, especially for developing an OHCA recognition algorithm tailored for isiXhosa speakers, which could improve the accuracy and efficiency of emergency responses.

Moreover, the study suggests enhancing dispatcher-assisted tCPR training by incorporating language nuances, which may lead to better recognition accuracy and potentially increase OHCA survival rates.

Integrating these linguistic descriptors into multilingual emergency response systems could promote more equitable out-of-hospital care for South Africa's diverse linguistic communities. It is crucial to address this information gap to enhance emergency response methods and improve OHCA outcomes.

Limitations

The study's limited sample size of isiXhosa-only calls from a single provincial EMS control centre constrains its transferability. Future researchers could address this by conducting a multi-centre study across multiple provincial EMS control centres handling isiXhosa calls and increasing the sample size over a longer duration to capture a broader range of variability.

Future studies should assess the effectiveness of these descriptors individually and in combination to enhance OHCA recognition accuracy. Despite these limitations in transferability, these descriptors can be integrated into an OHCA recognition algorithm for implementation. Combining our results with other language descriptors in an OHCA recognition algorithm could improve accuracy and reliability.

Developing an algorithm specifically for common isiXhosa OHCA descriptors would streamline OHCA identification at emergency control centres, facilitating more appropriate responses. Additionally, incorporating these descriptors into teaching methods could enhance recognition accuracy. This comprehensive approach would pave the way for implementing tCPR systems, potentially increasing OHCA survival rates in the WC, SA.

Conclusion

This study sheds light on the consistent use of descriptors by isiXhosa callers when requesting ambulance service for OHCA at the Western Cape Department of Health and Wellness emergency control centre of SA. Future research must assess the accuracy of these descriptors in distinguishing between OHCA and other disorders. Additionally, there is a pressing need to develop and validate telephonic OHCA detection algorithms to enhance recognition accuracy. The findings underscore the importance of developing specialized tCPR algorithms and language strategies to address existing hurdles and improve OHCA response in the region.

Ethics approval

Ethical clearance for this study was obtained from the University of Cape Town Human Research Ethics Committee (HREC Reference number: 678/2024)

Funding

This study was funded through a National Research Foundation of South Africa grant (Thuthuka Grant Nr 121971), held by WS.

Data dissemination

Per ethics permission, data for this study was formally requested from the South African National Department of Health's National Health Research Database (NHRD). The NHRD can provide data upon request. The findings were shared with the appropriate emergency medical service following existing partnerships.

Author's contribution

Conceptualization: WS

Formal analysis: SM, LvR and WS

Investigation: SM and LvR

Methodology: SM, LvR & WS

Project administration: WS

Supervision: WS and LvR

Writing: original draft: SM

Declaration of Competing interest

We have no conflict of interest to declare.

Acknowledgements

In recognition of Penelopy Masitho's valuable contribution to the consensus judgement and translation process. Western Cape Department of Health and Wellness-EMS emergency call takers and managers Trezinha Naidoo, Bradley Berling, and Selwyn September, who assisted in collecting data and extracting call records.

References

1. Chia MYC, Lu QS, Rahman NH, Doctor NE, Nishiuchi T, Leong BSH, et al. Characteristics and outcomes of young adults who suffered an out-of-hospital cardiac arrest (OHCA). Resuscitation. 2017 Feb 1;111:34–40.

2. Rajagopal S, Booth SJ, Brown TP, Ji C, Hawkes C, Siriwardena AN, et al. Data quality and 30-day survival for out-of-hospital cardiac arrest in the UK out-of-hospital cardiac arrest registry: A data linkage study. BMJ Open. 2017 Nov 1;7(11).

3. Veronese JP, Wallis L, Allgaier R, Botha R. Cardiopulmonary resuscitation by Emergency Medical Services in South Africa: Barriers to achieving high quality performance. African Journal of Emergency Medicine. 2018 Mar 1;8(1):6–11.

4. Kiguchi T, Okubo M, Nishiyama C, Maconochie I, Ong MEH, Kern KB, et al. Out-of-hospital cardiac arrest across the World: First report from the International Liaison Committee on Resuscitation (ILCOR). Resuscitation. 2020 Jul 1;152:39–49.

5. Zheng J, Lv C, Zheng W, Zhang G, Tan H, Ma Y, et al. Incidence, process of care, and outcomes of out-of-hospital cardiac arrest in China: a prospective study of the BASIC-OHCA registry. Lancet Public Health. 2023 Dec 1;8(12):e923–32.

6. Berdowski J, Berg RA, Tijssen JGP, Koster RW. Global incidences of out-of-hospital cardiac arrest and survival rates: Systematic review of 67 prospective studies. Resuscitation. 2010 Nov;81(11):1479–87.

7. Schnaubelt S, Monsieurs KG, Semeraro F, Schlieber J, Cheng A, Bigham BL, et al. Clinical outcomes from out-of-hospital cardiac arrest in low-resource settings — A scoping review. Vol. 156, Resuscitation. Elsevier Ireland Ltd; 2020. p. 137–45.

8. Mawani M, Kadir MM, Azam I, Mehmood A, McNally B, Stevens K, et al. Epidemiology and outcomes of out-of-hospital cardiac arrest in a developing country-a multicenter cohort study. BMC Emerg Med [Internet]. 2016;16(1):1–10. Available from: http://dx.doi.org/10.1186/s12873-016-0093-2

9. Thibodeau J, Werner K, Wallis LA, Stassen W. Out-of-hospital cardiac arrest in Africa: a scoping review. BMJ Open. 2022;12(3):e055008.

10. Stein C. Out-of-hospital cardiac arrest cases in Johannesburg, South Africa: A first glimpse of short-term outcomes from a paramedic clinical learning database. Emergency Medicine Journal. 2009 Sep;26(9):670–4.

11. Stassen W, Wylie C, Djärv T, Wallis LA. Out-of-hospital cardiac arrests in the city of Cape Town, South Africa: A retrospective, descriptive analysis of prehospital patient records. BMJ Open. 2021 Aug 16;11(8).

12. Bonny A, Tibazarwa K, Mbouh S, Wa J, Fonga R, Saka C, et al. Epidemiology of sudden cardiac death in Cameroon: The first population-based cohort survey in sub-Saharan Africa. Int J Epidemiol. 2017;46(4):1230–8.

13. Stein C, Stein MC. Out-of-hospital cardiac arrest cases in Johannesburg, South Africa: a first glimpse of short-term outcomes from a paramedic clinical learning database. Available from: http://emj.bmj.com/

14. Hong Tuan Ha V, Jost D, Bougouin W, Joly G, Jouffroy R, Jabre P, et al. Trends in survival from out-of-hospital cardiac arrest with a shockable rhythm and its association with bystander resuscitation: A retrospective study. Emergency Medicine Journal. 2023 Nov 1;40(11):761–7.

15. Ng YY, Leong SHB, Ong MEH. The role of dispatch in resuscitation. Singapore Med J. 2017 Jul 1;58(7):449–52.

16. Kleinman ME, Goldberger ZD, Rea T, Swor RA, Bobrow BJ, Brennan EE, et al. 2017 American Heart Association Focused Update on Adult Basic Life Support and Cardiopulmonary Resuscitation Quality: An Update to the American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2018;137(1):e7–13.

17. Mao DRH, Ee AZQ, Leong PWK, Leong BSH, Arulanandam S, Ng M, et al. Is your unconscious patient in cardiac arrest? A New protocol for telephonic diagnosis by emergency medical call-takers: A national study. Resuscitation. 2020 Oct 1;155:199–206.

18. Fukushima H, Panczyk M, Hu C, Dameff C, Chikani V, Vadeboncoeur T, et al. Description of Abnormal Breathing Is Associated With Improved Outcomes and Delayed Telephone Cardiopulmonary Resuscitation Instructions. Available from: http://ahajournals.org

19. Christopher AJ. Statistics as news: South African newspapers and the release of Community Survey 2016. African Journalism Studies. 2017 Jan 2;38(1):85–103.

20. Hsieh HF, Shannon SE. Three approaches to qualitative content analysis. Qual Health Res. 2005 Nov;15(9):1277–88.

21. Penn C, Watermeyer J, Nattrass R. Managing language mismatches in emergency calls. J Health Psychol. 2017 Dec 1;22(14):1769–79.

22. Hsieh HF, Shannon SE. Three approaches to qualitative content analysis. Qual Health Res. 2005 Nov;15(9):1277–88.

23. Shenton AK. Strategies for ensuring trustworthiness in qualitative research projects. Vol. 22, Education for Information. IOS Press; 2004.

24. Nowell LS, Norris JM, White DE, Moules NJ. Thematic Analysis: Striving to Meet the Trustworthiness Criteria. Int J Qual Methods. 2017 Sep 28;16(1).

25. van Rensburg LC, Richmond L, Mgidi S, Claassen J, Wylie C, Stassen W. The lay descriptors of out-of-hospital cardiac arrest in the Western Cape province, South Africa. Resusc Plus [Internet]. 2021;7(June 2021):100146. Available from: https://doi.org/10.1016/j.resplu.2021.100146

26. Crause S, Slabber H, Theron E, Stassen W. Telephonic descriptions of out-of-hospital cardiac arrest by laypersons calling the dispatch centre of a private emergency medical service in South Africa. South

African Journal of Pre-hospital Emergency Care | Original Research ARTICLE [Internet]. Available from: http://www.journals.ac.za/index.php/sajpec/

27. Viereck S, Møller TP, Rothman JP, Folke F, Lippert FK. Recognition of out-of-hospital cardiac arrest during emergency calls - a systematic review of observational studies. Vol. 25, Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine. BioMed Central Ltd.; 2017.

28. Vaillancourt C, Charette ML, Bohm K, Dunford J, Castrén M. In out-of-hospital cardiac arrest patients, does the description of any specific symptoms to the emergency medical dispatcher improve the accuracy of the diagnosis of cardiac arrest: A systematic review of the literature. Vol. 82, Resuscitation. 2011. p. 1483–9.

29. Gupta B, Agrawal P, Soni K, Souza ND', Farooque K. An unusual differential for a pulseless trauma patient [Internet]. Vol. 5, From: Journal of Emergencies, Trauma, and Shock. Available from: http://www.onlinejets.org/

30. Vaillancourt C, Stiell IG, Wells GA. Understanding and improving low bystander CPR rates: A systematic review of the literature. Canadian Journal of Emergency Medicine. 2008.

31. Viereck S, Møller TP, Ersbøll AK, Bækgaard JS, Claesson A, Hollenberg J, et al. Recognising out-of-hospital cardiac arrest during emergency calls increases bystander cardiopulmonary resuscitation and survival. Resuscitation [Internet]. 2017;115(2017):141–7. Available from: http://dx.doi.org/10.1016/j.resuscitation.2017.04.006

32. Kleinman ME, Brennan EE, Goldberger ZD, Swor RA, Terry M, Bobrow BJ, et al. Part 5: Adult basic life support and cardiopulmonary resuscitation quality: 2015 American Heart Association guidelines update for cardiopulmonary resuscitation and emergency cardiovascular care. Circulation. 2015 Oct 20;132(18):S414–35.

33. Deumert A. "It would be nice if they could give us more language" - Serving South Africa's multilingual patient base. Soc Sci Med. 2010;

34. Penn C, Watermeyer J, Nattrass R. Managing language mismatches in emergency calls. J Health Psychol. 2017;22(14):1769–79.

35. Dewaele JM, Wei L. Attitudes towards code-switching among adult mono- and multilingual language users. J Multiling Multicult Dev. 2014;35(3):235–51.

36. Møller TP, Kjærulff TM, Viereck S, Østergaard D, Folke F, Ersbøll AK, et al. The difficult medical emergency call: A register-based study of predictors and outcomes. Scand J Trauma Resusc Emerg Med. 2017 Mar 1;25(1).

37. Al Shamsi H, Almutairi AG, Al Mashrafi S, Al Kalbani T. Implications of language barriers for healthcare: A systematic review. Vol. 35, Oman Medical Journal. Oman Medical Specialty Board; 2020. p. 1–7.

38. Crause S, Slabber H, Theron E, Stassen W. The barriers and facilitators to initiation of telephone-assisted bystander cardiopulmonary resuscitation for patients experiencing out-of-hospital cardiac arrest in a private emergency dispatch centre in South Africa. Resusc Plus. 2024 Mar 1;17.

39. De Caires LP, Evans K, Stassen W. The understandability and quality of telephone-guided bystander cardiopulmonary resuscitation in the Western Cape province of South Africa: A manikin-based study. African Journal of Emergency Medicine. 2023 Dec 1;13(4):281–6.

40. Pascoe M, Smouse M. Masithethe: Speech and language development and difficulties in isiXhosa. South African Medical Journal. 2012;

41. Claassen J, Jama Z, Manga N, Lewis M, Hellenberg D. Building freeways: piloting communication skills in additional languages to health service personnel in Cape Town, South Africa. BMC Health Serv Res. 2017 Jun 7;17(1).

42. DENTAL ETHICS [Internet]. Available from: www.sada.co.za

43. Mackay E, Theron E, Stassen W. The barriers and facilitators to the telephonic application of the FAST assessment for stroke in a private emergency dispatch centre in South Africa. African Journal of Emergency Medicine. 2021 Mar 1;11(1):15–9.

44. Crause S, Slabber H, Theron E, Stassen W. The barriers and facilitators to initiation of telephone-assisted bystander cardiopulmonary resuscitation for patients experiencing out-of-hospital cardiac arrest in a private emergency dispatch centre in South Africa. Resusc Plus. 2024 Mar 1;17.

PART C: Addendums

Addendum A: Publication instructions

The author chose the Emergency Medicine Journal (EMJ) for publication because it facilitates open access, and our recommendations are applicable to a global audience.

https://emj.bmj.com/pages/authors/

Addendum B: Research Protocol

An analysis of the isiXhosa telephonic descriptors of Cardiac Arrest (CA) in a Western Cape Emergency Control Centre

Student Name	Sinethemba Mgidi (isiXhosa)
Student Number	MGDSIN009
Supervisor and Principal Investigator	Willem Stassen - University of Cape Town
Co-Supervisor	Louis van Rensburg
Division	Emergency Medicine

This study is in partial fulfilment of the requirements for a Masters in Philosophy: Clinical Emergency Care.

List of abbreviations used in the proposal

AHA:	American Heart Association
CA:	Cardiac Arrest
CAD:	Computer Aided Dispatch
CPR:	Cardiopulmonary Resuscitation
CVD:	Cardiovascular Disease
EMS:	Emergency Medical Services
ePCRs:	Electronic Patient Report Forms
IHD:	Ischemic Heart Disease
OHCA:	Out-Of-Hospital Cardiac Arrest
SA:	South Africa
tCPR:	Telephone Guided Cardiopulmonary Resuscitation
WCEMS:	Western Cape Provincial Emergency Medical Services

Purpose of the Study

Out-of-hospital cardiac arrest (OHCA) is a time-sensitive emergency requiring early recognition, early cardiopulmonary resuscitation (CPR), and emergency service activation (1). Without prompt management, it can lead to severe disability or death. Early bystander cardiopulmonary resuscitation (CPR) has been shown to increase the survival of neurologically intact patients (1,2).

The incidence of OHCA has drastically increased over the last few decades, and this is due to the increase in the prevalence of people suffering from cardiovascular disease (CVD). The increase in CVD could be attributed to the rapid urbanisation occurring in low-to-middle-income countries such as South Africa (3,4). Apart from rapid urbanisation, many South Africans are from a poor socioeconomic background, and it has been proven to affect their lifestyle choices, which oftentimes leads to heavy alcohol consumption and unhealthy eating habits, which puts them at risk for developing CVDs (5).

Delays in delivering effective and efficient CPR during cardiac arrest would increase the mortality and morbidity of OHCA (6). It has been proven that delay in prompt management would result in permanent patient disability or death (7). Early bystander CPR has shown to increase neurologically intact survival, thus reducing mortality and morbidity rates of OHCA. In a lot of OHCA cases bystander CPR uptake is poor, and this could be attributed, but not limited, to the fact that the lay person is not trained or not confident enough to assist (8).

Uptake of bystander CPR has been shown to improve when emergency call centre agents offer guidance on performing telephonic CPR (tCPR). However, this is dependent on the recognition of OHCA based on the information provided by the caller to the call-taker. Within South Africa (SA), there are unique challenges that influence emergency call taking, and this is due to a highly diverse South African society, with multiple languages, different levels of education and socioeconomic statuses. Within the Western Cape, 46,6 % of the population is Afrikaans speaking, 25% speaks IsiXhosa and 20% speaks English. thus relying only on English language descriptors of cardiac arrest would not be inclusive at all, and it could result in missing victims of OHCA (9). With being able to telephonically recognise OHCA and provide tCPR, one would be able to improve the patient's chances of survival, by providing early CPR and sending the appropriate resources to the incident.

This study seeks to describe the IsiXhosa terms used to describe OHCA by callers phoning the Western Cape Provincial emergency contact centre. Through a retrospective review of electronic patient report forms (ePCRs), we will identify index cases from which original emergency calls will be extracted and subjected to content analysis; to identify words and phrases used by isiXhosa callers to describe a patient that suffered from OHCA.

Background

Cardiovascular Disease (CVD) burden has increased significantly in sub-Saharan African and low-to-middle income countries, while historically, CVD only affected high-income countries. The drastic rise in the prevalence of CVD within these countries could be attributed to rapid urbanisation, unhealthy lifestyles and poor socio-economic statutes. Within South Africa, 68% of women are deemed obese, while 31% of men are overweight and obese. It has been reported that CVD is the second highest

cause of death, with HIV and AIDS being the highest in SA. (10,11). CVD and IHD are one of the biggest causes of OHCA thus the incidences would rise.

OHCA is a time-sensitive condition, and the prompt management thereof can improve the chances of viable survival (1,7). According to Heart Disease and Stroke Statistics about 90 % of patients who experience OHCA die before reaching the hospital and this could be attributed to poor bystander CPR uptake(12). In a Johannesburg-based study done by Stein et al. on OHCA only 36% of patients who suffered witnessed cardiac arrest received bystander CPR (13). In 44% of OHCA victims which survived, all received early bystander CPR.

Early bystander CPR has been proven to increase the survival rate of OHCA, and it increases the chances of full neurological recovery (13,14). In the South African context, it is common that ambulances take longer than five minutes to arrive at the scene of an emergency and in the study mentioned above they had a median response time of 9 min, which again just reiterates the importance of having early bystander's CPR initiated as this could increase the chances of survival for the OHCA patient (7,14).

Despite bystander CPR increasing the patient's chances of survival, the uptake of bystander CPR is poor. Bystander CPR uptake/initiation is poor due to several factors with the main ones being fear of causing more harm, lack of confidence, the visible presence of blood or vomitus and being unsure as to whether CPR should be attempted (8). Due to poor bystander CPR uptake internationally, further research has suggested that the telephonic recognition of CA by the call centre agent and tCPR guidance can increase the uptake of bystander CPR in the OHCA patients(15).

Bystander CPR uptake to an OHCA victim could be improved, if call centre agents can identify the OHCA and provide the necessary telephonic guidance to the caller. In order to improve the survival rate of OHCA in SA, we would need to decrease the amount of time it takes from Cardiac Arrest (CA) to hands on the chest CPR and reduces our time to first defibrillation (16)Due to the language variation inside South Africa with regard to total population and those identifying English as their second language there are discrepancies and a need to identify descriptors in specific languages, and in this study, it will be Afrikaans.

Within the Western Cape, 46,6% of the population is Afrikaans speaking, 25% speaks IsiXhosa and 20% speaks English thus relying on international language descriptors of cardiac arrest would not be inclusive enough, and it could result in us missing out victims of OHCA (9). Thus, determining how Afrikaans-, isiXhosa- and English-speaking callers describe OHCA might help in developing an algorithm for recognising OHCA when calling for an emergency ambulance.

There is a lack of literature available that describe key words and phrases used in South Africa by callers when calling for ambulance assistance in case of OHCA. Due to the incidences of OHCA becoming more frequent, it is of utmost importance that these telephonic descriptors get identified. It would enable us to provide better patient care in the form of CPR and which suggests that we will have higher bystander CPR uptake which in return should improve patient outcome in the OHCA cases, but this needs to be confirmed by further future research(15).

This study seeks to identify the descriptors of OHCA within the Afrikaans, isiXhosa and English-speaking communities of the Western Cape when phoning for an emergency ambulance to the WCEMS emergency call centre.

Research Question

When calling into the emergency contact centre of the Western Cape Provincial EMS, how do, the callers describe OHCA when seeking emergency medical assistance?

Aim and Objectives

This study aims to identify the key descriptors (words and phrases) of OHCA used by isiXhosa callers seeking emergency medical assistance when calling into the emergency contact centre of the Western Cape Provincial EMS by way of inductive content analysis.

In order to address this aim, the objectives of this study are:

- To transcribe the calls, and by way of inductive content analysis, identify the descriptors of OHCA used by isiXhosa callers into the emergency contact centre.

Study Methodology

Study Design

This is a retrospective, descriptive study using content analysis.

Characteristics of the Study Population

The study will be set within the Western Cape Government (WCG) Emergency Medical Services (EMS) emergency control centre, based on the Tygerberg Hospital premises within the provincial disaster management centre. WCG EMS is a provincially based service and renders emergency care to all residents within the Western Cape Province. EMS operates over 250 ambulances and renders primary emergency care, helicopter emergency services, inter-facility transport and rescue services (17). Emergency call takers are most often the first point of contact between members of the public and emergency services. The latter are mostly non-medically trained personnel, whom upon appointment undergo orientation within EMS and receive in-house training on call taking procedures and the computer-aided dispatch (CAD) system being utilized by WCG EMS.

Sampling Method

CAD data will be used to identify all emergency calls of a medical incident group with a corresponding patient unresponsive incident type for the twelve-month period (Jan – December 2018). From here we will then pull corresponding electronic patient care report (ePCR) data for all the case reference numbers identified from the CAD database. The ePCR database will then be filtered to only include cases with a final triage colour code red and blue. All corresponding cases with a triage colour code green, yellow or orange will be excluded as these cases are highly unlikely to indicate OHCA.

All identified ePCR cases with a triage colour code red and blue will then undergo a quick retrospective chart review. OHCA will be verified in all cases with a final triage colour code blue by identifying a corresponding declaration of death slip number. OHCA in all colours coded red cases will be verified if the chart review indicates that CPR was initiated upon arrival of the EMS crew. All case reference numbers with verified OHCA will then be included and corresponding voice recordings will be collected. Figure 1 represents the sampling method used. The recordings will then be extracted and transcribed using ELAN transcribing software, and resampling would occur until saturation is reached.

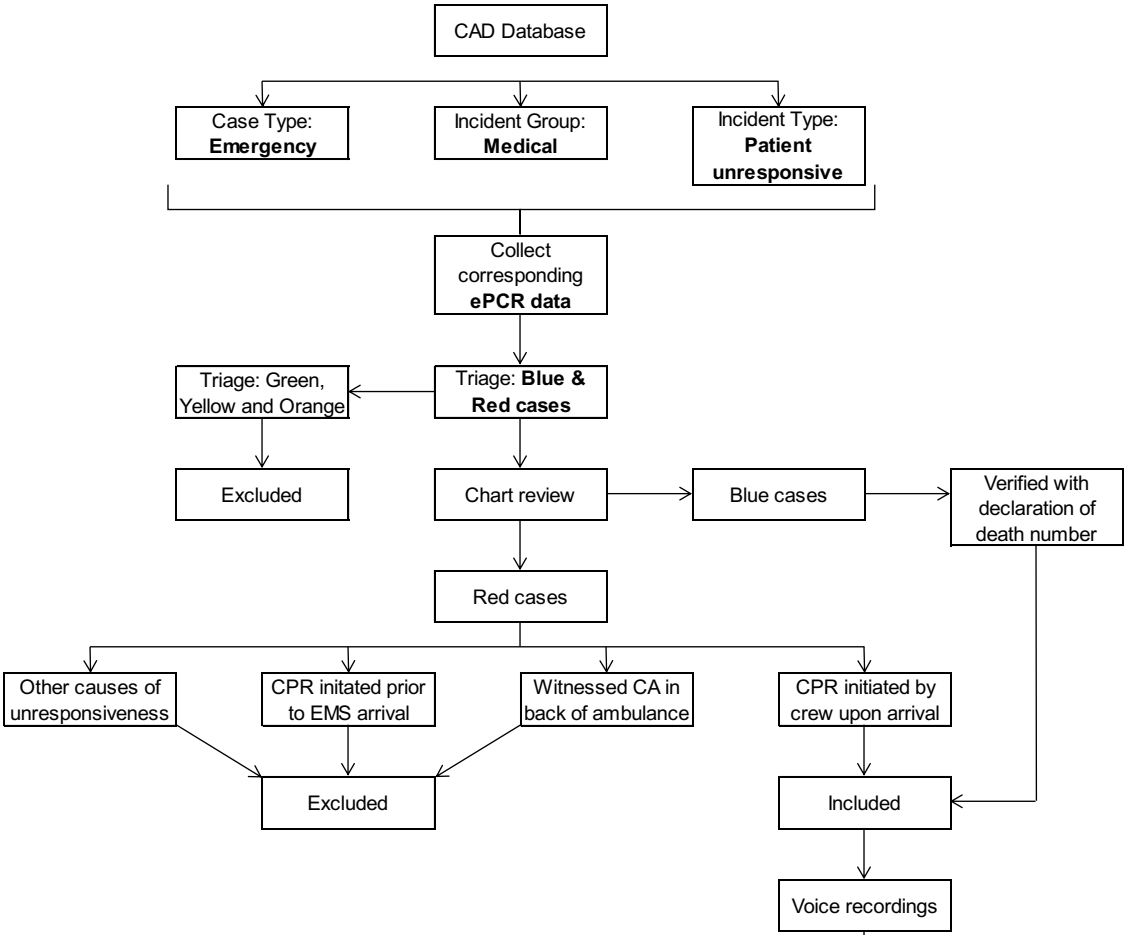

Figure 1. Sampling method

Inclusion Criteria

Cases will be included if they meet the following inclusion criteria:

- Primary Medical Emergency Cases with a registered incident type of patient unresponsive
- Cardiac arrest occurred prior to arrival of EMS
- CPR initiated upon EMS' arrival on scene
- Cases where patients were declared dead upon arrival

Exclusion Criteria

Cases will be excluded if they meet the following criteria:

- Inter-Facility Transports
- Cardiac arrest occurred whilst in EMS' care
- Cases in which OHCA could not be verified

Data Analysis

All transcribed data will be analysed primarily by the researcher, with supervisor assistance being provided if needed. Content analysis will be done inductively and to the manifest level which is in line with previously conducted studies within emergency control centres (18). The data will be analysed using the following three steps Step 1: Developing and Applying Codes, Step 2: Identifying themes, patterns and relationships and Step 3: Summarizing the data (18).

Step one would be done with ELAN computer software, which will be utilized to transcribe recordings. During organisation of raw data/call recordings, the researcher will make use of nVivo for content analysis and coding, which will result in condensed codes with categories that relate to each other. With coding completed, emerging patterns will be identified by means of keywords being repeated in all the data sets which have been coded and is related OHCA (18). Trustworthiness during this study would be ensured by using a well-defined study methodology which would not leave any uncertainties and further addressed according to the following headings.

- Credibility

Through prolonged engagement with the sampled data and researcher member checking between myself my supervisors (17). Experts in the field of language would also be consulted to ensure the credibly of the descriptors identified,

- Transferability

Transferability would not be assessed at this stage of the study as it is beyond the scope of this study. This would only be assessed when the call taking algorithm produced is subjected to use by the call takers in real world scenarios.

- Dependability

Dependability would be ensured by using a logically and clearly designed study methodology, data collection and analysis process. This would enable readers to examine the methodology used to gather the data(17). Furthermore, an audit trail between myself and the supervisor would be kept where necessary.

- Confirmability

Transcribed calls will be spot checked by my supervisor to ensure that the information transcribe is indeed true and reflects what happened during the call taking procedure.

Data Management

All data collected for this study will be kept on a password protected personal laptop and files would be backed up onto a password protected cloud, only accessible to the research team. The data collected from this study will be kept for the duration of six months post completion of the study, after

which it will be deleted. Any hardcopies of data will be kept in a secure, locked cupboard and office at the WCG EMS offices in Bellville. Once data collection has been completed, all printed hardcopies of data will be destroyed by means of shredding.

The completed dissertation will be compiled, and findings will be submitted to both the University of Cape Town open-access database (i.e. OpenUCT) and WCG EMS senior management.

Ethical Considerations

Risk and Benefits for participants

This study involves a retrospective review of WCEMS ePCRs and calls recordings. At WCEMS it is standard practice for an emergency call to be recorded and reviewed for quality assurance purposes and ePCRs get reviewed to ensure an acceptable standard of care is delivered by ambulance personnel. Employees within the WCEMS are aware of these procedures; thus, their inclusion should not put them at any risk.

The risk of identifying the families, patients and ambulance crews would be mitigated by anonymising the ePCRs before data collection; thus, the only information that would be available to the research team is whether the patient suffered OHCA.

The study is aiming to detect the language descriptors/key words of OHCA it could only be of benefit to the callers of the Western Cape EMS emergency call centre as this would improve call taker efficacy and would assure that the correct resources get dispatched to assist the public in need of an ambulance, when someone suffered OHCA.

Informed Consent Process

The aim is to identify the language descriptors of OHCA within the isiXhosa speaking communities of the Western Cape when phoning for an emergency ambulance the WCEMS emergency call centre. When a call is made to the WCEMS emergency call centre, callers are informed that the call is recorded for quality assurance purposes.

It would be impossible to gain full consent from the caller, as this would be able in a real-world setting and might potentially hinder lifesaving service delivery to the patient on hand. The study is retrospective, so it would not affect the patient care delivered. Furthermore, the ePCRs and call recordings would be anonymised before and during transcription. For this reason, a waiver of consent is sought.

Privacy and Confidentiality

Privacy and confidentiality of all parties involved would be assured by anonymising the ePCR patient and caller details, where we would remove these fields from the database before extracting the data and all identifying details would also not be transcribed.

All the data collected would be kept on a password protected personal laptop by the researcher and files would be backed up onto a password protected cloud, and disposed of once the research has been completed.

Reimbursement for participation

Nobody would be reimbursed during this study, and no form of payment could be expected by the emergency contact centre personnel of the WCEMS.

Strengths and Limitations

The strength of this study is the fact that we would identify the language descriptors for OHCA, which would enable future researchers to develop a standardised algorithm which can assist emergency call takers in making decisions and giving telephone guided CPR (tCPR). This is a first for South Africa, and in this, we hope to expedite the best possible care for the individual suffering OHCA and to improve their chances of survival by ensuring excellent and proper tCPR can be given before ambulance arrival.

This study results could be utilised by national 112 call centres, as well as private ambulance call centre, as they also receive many calls whether it is originating from the Western Cape, or not.

Dissemination of Findings

The complete dissertation would be compiled, and findings would be submitted to the UCT open access database and WCEMS senior management.

Budget and Funding

A layout of the estimated funds that would be required to fund this research projected are indicated in the table below:

Category	**Cost**
Travelling	R 2500.00
Printing (500 pages at 2 rand a page)	R 1000.00
Language Editing	R 3000.00
General (Calls, Data and WiFi)	R 1000.00
Total	R 7500.00

Travelling: The fund allocated here would be used to cover fuel for when I'm traveling to meet up the research supervisor and during the data collection phase to travel to and from the emergency call centre.

Printing: These funds is estimated, and it would cover the cost of printing the documents that would be required during my research and the printing of the final write up.

Language: Prior to final submission of the document, it would be edited and scrutinised by a language professional which would incur some costs.

General: These funds are being made available to cover all unforeseen costs and to cover the day-to-day necessities that I would need during my research.

This study would be privately funded by the student himself, and no external finances would be used for the completion of this study.

Bibliography

1. Leary Marion, McGovern Shaun, Dainty Katie N., Doshi Ankur A., Blewer Audrey L., Kurz Michael C., et al. The Latest in Resuscitation Science Research. J Am Heart Assoc. 7(2):e008589.

2. Lee SY, Ro YS, Shin SD, Song KJ, Hong KJ, Park JH, et al. Recognition of out-of-hospital cardiac arrest during emergency calls and public awareness of cardiopulmonary resuscitation in communities: A multilevel analysis. Resuscitation. 2018 Jul;128:106–11.

3. Cappuccio FP, Miller MA. Cardiovascular disease and hypertension in sub-Saharan Africa: burden, risk and interventions. Intern Emerg Med. 2016;11:299–305.

4. Why heart disease is on the rise in South Africa [Internet]. [cited 2019 May 1]. Available from: http://www.news.uct.ac.za/article/-2016-11-29-why-heart-disease-is-on-the-rise-in-south-africa

5. Everson SA, Maty SC, Lynch JW, Kaplan GA. Epidemiologic evidence for the relation between socioeconomic status and depression, obesity, and diabetes. J Psychosom Res. 2002 Oct;53(4):891–5.

6. Odendaal C. Cardiopulmonary-cerebral resuscitation. South Afr J Anaesth Analg. 2010 Mar;16(2):45–60.

7. Wellens HJ, Lindemans FW, Houben RP, Gorgels AP, Volders PG, ter Bekke RMA, et al. Improving survival after out-of-hospital cardiac arrest requires new tools. Eur Heart J. 2016 May 14;37(19):1499–503.

8. Dobbie F, MacKintosh AM, Clegg G, Stirzaker R, Bauld L. Attitudes towards bystander cardiopulmonary resuscitation: Results from a cross-sectional general population survey. PLoS ONE [Internet]. 2018 Mar 7 [cited 2019 May 1];13(3). Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5841784/

9. Statistics South Africa. Provincial profile: Western Cape Community Survey 2016 [Internet]. Stats SA Library Cataloguing-in-Publication (CIP) Data; 2016 [cited 2019 Jan 5]. Available from: http://cs2016.statssa.gov.za/wp-content/uploads/2018/07/WesternCape.pdf

10. Schutte AE. Urgency for South Africa to prioritise cardiovascular disease management. Lancet Glob Health. 2019 Feb;7(2):e177–8.

11. Byrne J, Eksteen G, Crickmore C. Heart Foundation SA Resources [Internet]. Heart & Stroke Foundation South Africa. 2016 [cited 2019 Apr 23]. Available from: http://www.heartfoundation.co.za/wp-content/uploads/2017/10/CVD-Stats-Reference-Document-2016-FOR-MEDIA-1

12. CPR Facts and Stats [Internet]. [cited 2019 May 1]. Available from: https://cpr.heart.org/AHAECC/CPRAndECC/AboutCPRECC/CPRFactsAndStats/UCM_475748_CPR-Facts-and-Stats.jsp

13. Riva Gabriel, Ringh Mattias, Jonsson Martin, Svensson Leif, Herlitz Johan, Claesson Andreas, et al. Survival in Out-of-Hospital Cardiac Arrest After Standard Cardiopulmonary Resuscitation or Chest Compressions Only Before Arrival of Emergency Medical Services: Nationwide Study During Three Guideline Periods. Circulation [Internet]. [cited 2019 May 1];0(0). Available from: https://www.ahajournals.org/doi/10.1161/CIRCULATIONAHA.118.038179

14. Stein C. Out-of-hospital cardiac arrest cases in Johannesburg, South Africa: a first glimpse of short-term outcomes from a paramedic clinical learning database. Emerg Med J EMJ. 2009 Sep;26(9):670–4.

15. Ho AFW, Sim ZJ, Shahidah N, Hao Y, Ng YY, Leong BSH, et al. Barriers to dispatcher-assisted cardiopulmonary resuscitation in Singapore. Resuscitation. 2016 Aug;105:149–55.

16. Graham R, McCoy MA, Schultz AM. Strategies to Improve Cardiac Arrest Survival. A Time to Act. 2013;456.

17. Nowell LS, Norris JM, White DE, Moules NJ. Thematic Analysis: Striving to Meet the Trustworthiness Criteria. Int J Qual Methods. 2017 Dec;16(1):160940691773384.

Addendums C: HREC Approval Letter

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/home/human-research-ethics

09 September 2024

HREC REF: 678/2024

A/Prof W Stassen
Department of FaCE
Division of Emergency Medicine
E-52 OMB
Email: Willem.stassen@uct.ac.za
Student: mgdsin009@myuct.ac.za

Dear A/Prof Stassen

PROJECT TITLE: AN ANALYSIS OF THE ISIXHOSA TELEPHONIC DESCRIPTORS OF CARDIAC ARREST (CA) IN A WESTERN CAPE EMERGENCY CONTROL CENTRE-SUB STUDY LINKED TO 459/2019-
(MPHIL IN EMERGENCY MEDICINE-MR SINETHEMBA MGIDI)

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.

Approval is granted for one year until the 30 September 2025.

Please submit a progress form, using the standardised Annual Report Form (FHS016) or FHS017 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: Mr Sinethemba Mgidi will also be involved in this study.

Please quote HREC REF 678/2024 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

Signed by candidate

PROFESSOR MARC 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

HREC/ref 678.2024

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/ref 678.2024

Addendums D: The Western Cape Department of Health and Wellness-EMS Approval Letter

Western Cape Government
Health

DIRECTORATE: **EMERGENCY MEDICAL SERVICES**
ENQUIRIES: **Dr Shaheem de Vries**
shaheem.devries@pgwc.gov.za
: +27 21 932 1966

Attention: **Dr. Willem Stassen**
Mr Liam Richmond
Mr Sinejack Mgidi

RE: PROJECT TITLE: AN ANALYSIS OF THE AFRIKAANS, ENGLISH AND ISIXHOSA TELEPHONIC DESCRIPTORS OF CARDIAC ARREST (CA) IN A WESTERN CAPE EMERGENCY CONTROL CENTRE.

Dear Dr Stassen and Messrs. Richmand and Mgidi.

Your request on the above matter refers.

Thank you for the request to conduct research within the Western Cape Government Emergency Medical Services. Your amended proposal has been and has been recommended for approval by this office.

I am therefore pleased to inform you that such approval is hereby granted.

I wish you well in your endeavor.

Yours sincerely

Signed by candidate

Dr Shaheem de Vries
Medical Director: Emergency Medical Services
Western Cape Government Health

Date: 19th August 2020