

**VIEWS AND PERCEPTIONS OF ADVANCED LIFE SUPPORT PRACTITIONERS ON
INITIATING, WITHHOLDING AND TERMINATING RESUSCITATION IN OUT-OF-
HOSPITAL CARDIAC ARREST IN THE EMERGENCY MEDICAL SERVICES OF THE
WESTERN CAPE**

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ABBREVIATIONS

ACLS:	Advanced Cardiac Life Support
AED:	Automated Electronic Defibrillator
AHA:	American Heart Association
ALS:	Advanced Life Support
BLS:	Basic Life Support
CI:	Confidence Interval
CPR:	Cardiopulmonary Resuscitation
CVD:	Cardiovascular Disease
ECG:	Electrocardiogram
ECP:	Emergency Care Practitioner
ECT:	Emergency Care Technician
EMS:	Emergency Medical Services
ETCO ₂ :	End-tidal Carbon Dioxide
HIC:	High-income Countries
ILCOR:	International Liaison Committee on Resuscitation
ILS:	Intermediate Life Support
LMIC:	Low-to-middle-income Countries
MESH:	Medical Subject Headings
OHCA:	Out-of-hospital Cardiac Arrest

OR:	Odds Ratio
PCI:	Percutaneous Coronary Intervention
PEA:	Pulseless Electrical Activity
ROSC:	Return of Spontaneous Circulation
tCPR:	Telephone-assisted Cardiopulmonary Resuscitation
TOR:	Termination of Resuscitation
UK:	United Kingdom
WCG:	Western Cape Government
WHA:	World Health Assembly
WHO:	World Health Organisation

PART A: Background and Literature Review

Introduction

Non-communicable disease as a cause of death is on the rise. Cardiovascular disease was the main non-communicable cause of death in South Africa and the Western Cape in 2018, comprising of 18.9% of all deaths in the country. (1) Cardiovascular disease remains the predominant cause of out-of-hospital cardiac arrest (OHCA). (2)

The overall prognosis and neurological outcome associated with OHCA are rather poor and have remained unchanged for the past thirty years. There is a survival rate of approximately 10% following discharge from hospital. (3, 4) This is from the United Kingdom and the United States, which are both high-income countries (HIC). Overall survival following OHCA in low-to-middle-income countries (LMIC) has been reported to be poor, but studies are limited. (5, 6) South Africa is an LMIC with a limited healthcare budget and resources and is thus likely to have a lower survival rate than other HICs.

Immediate Cardiopulmonary Resuscitation (CPR) can double or triple the chances of survival after cardiac arrest. (7) Early defibrillation is a critical component of improving the survival rate in patients in ventricular fibrillation. (8) HICs are more likely to have Automated Electronic Defibrillators (AED) and ambulances within close proximity, thereby increasing the chance of survival in OHCA. It can therefore be assumed that the survival rate of OHCA would be less in the LMIC setting.

Response times in South Africa are significantly longer than those reported elsewhere in the world. (9, 10) There is an inadequate number of ambulances in the Western Cape to attend to the rising number of emergency cases (11), resulting in these increased response times. The longer the downtime before CPR is initiated, the less likely a successful resuscitation would be. This highlights the importance of a rapid decision upon arrival on scene of whether or not to initiate CPR, but also the viability of successful resuscitation after a delayed response time.

The benefits of CPR and other interventions are considerable, but there is a natural end to life and the existence of modern techniques and interventions may, in some cases, prolong the lives of patients that have very little chance of recovery. The quality

of life following cardiac arrest and the subsequent interventions within a system that isn't capable of adequate continuation of care may broach questions regarding whether the initiation and continuation of resuscitation are in the best interest of the patient and their family.

If an Advanced Life Support (ALS) practitioner decides to resuscitate a patient, the approach is usually all-or-nothing. The American Heart Association (AHA) Chain of Survival for adult OHCA recommends advanced resuscitation once CPR has commenced. (7) This means that advanced resuscitation will ensue until all reversible causes of cardiac arrest have been accounted for and treated where necessary. This resuscitation not only utilises an assortment of costly equipment but is likely to keep an ambulance crew and ALS practitioner occupied for some time, rendering them unavailable to attend to any other emergencies. This is especially important to consider in the context of LMICs and where a patient likely has a poor prognosis.

The decision to either commence or withhold resuscitation is equally important depending on the context. A swift decision to commence resuscitation in the appropriate context would result in a shorter time to CPR and defibrillation, thereby increasing the patient's chance of survival. (7) On the other hand, the decision not to resuscitate and withhold advanced resuscitation where appropriate would save valuable resources. There do not appear to be clear-cut guidelines for ALS practitioners for when to initiate or withhold CPR, or when to continue or terminate CPR in the prehospital setting in South Africa. Practitioners are often required to make a rapid decision regarding resuscitation and the purpose of this study is to investigate what influences that decision.

Understanding the factors that influence a practitioner's decision to commence or withhold CPR or when to terminate resuscitation could uncover ideas that may be expanded and further explored to contribute to the development of a guideline for decision-making in OHCA for ALS practitioners in LMICs.

Objectives

This literature review aims to:

- Define out-of-hospital cardiac arrest
- Report the current epidemiology of cardiovascular disease and out-of-hospital cardiac arrest in South Africa and the Western Cape
- Illustrate the current best practice recommendations for the management of out-of-hospital cardiac arrest
- Describe the study context and barriers to achieving best-practice out-of-hospital cardiac arrest care in South Africa and the Western Cape
- Review existing literature on out-of-hospital cardiac arrest in South Africa
- Review existing literature on out-of-hospital cardiac arrest decision-making

Search Strategy

On 29 May 2022, a MEDLINE search was conducted via the PubMed database. A filter was applied to include work that was published in the year 2000 or later.

The following Medical Subject Headings (MeSH) terms were identified and used as text words in a general search on the PubMed database:

- Search 1: (Western Cape[Text Word]) AND (resus*[Text Word] OR cardiac arrest[Text Word]) AND (emerg*[Text Word]) AND (prehosp*[Text Word]) AND (clinical decision-making[Text Word])
- Search 2: (South Africa[Text Word]) AND (resus*[Text Word] OR cardiac arrest[Text Word]) AND (emerg*[Text Word]) AND (prehosp*[Text Word]) AND (clinical decision-making[Text Word])
- Search 3: (South Africa[Text Word]) AND (resus*[Text Word] OR cardiac arrest[Text Word]) AND (emerg*[Text Word])
- Search 4: (Africa[Text Word]) AND (resus* [Text Word] OR cardiac arrest[Text Word]) AND (emerg*[Text Word])

Search 4 yielded results from the South African and African setting, but limited results were obtained that are related to decision-making and thus a second search was done to find articles from international literature that specifically speak to the research

question. The second search was also done using Pubmed on 30 May 2022. A filter was applied to include work that was published in the last 10 years (2012).

- Search 5: ((out-of-hospital cardiac arrest) AND (clinical decision-making)) OR ((cardiac arrest) AND (clinical decision-making) AND (prehosp*))

The titles of all articles from search 4 and search 5 were scanned for relevance. The abstracts of the articles that were considered relevant were reviewed and those that did not seem relevant to the topic were excluded. One additional article was found by scanning the reference lists for the included articles. In addition to the eight studies obtained from the search strategy, other studies were also included in the literature review. A diagram of the literature search is illustrated below in figure 1.

The articles included in this literature review are:

- Relevant to decision-making in out-of-hospital cardiac arrest OR provide information about the study context
- Published within the last 10 years (with the exception of one article)
- Relevant to the aim of the study

Diagram of Literature Search Process (Figure 1):

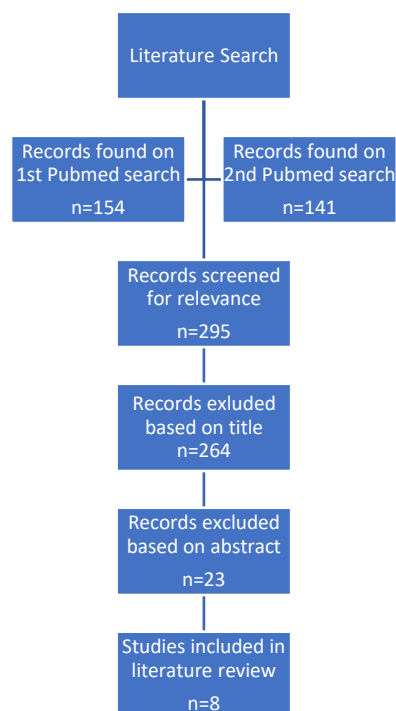


Figure 1: Literature Search Diagram

Definition and Epidemiology of Out-of-Hospital Cardiac Arrest

Out-of-hospital cardiac arrest is defined as the cessation of cardiac activity (confirmed by absent signs of circulation) occurring outside of the hospital setting. (12) It is the leading cause of death worldwide and has a high mortality. (10)

Globally, cardiovascular disease (CVD) is the primary cause of death. Over three quarters of these deaths occur in LMICs. (13) In Africa, the primary causes of OHCA were found to include CVDs such as coronary artery disease, hypertensive cardiac disease, left ventricular hypertrophy caused by hypertensive cardiac disease, and ischemic heart disease. (14) African countries are also seeing a rising incidence of these risk factors for OHCA. (15)

Diseases of the circulatory system were the leading cause of death in South Africa and the Western Cape in 2016, comprising of 18.4% of all deaths in the country. (16) This increased to 18.9% in 2018. (1) It was predicted that by the end of 2020 the CVD burden challenging African countries would have doubled since 1990, but data are not yet readily available. (17) With this prediction, the incidence of OHCA is also expected to increase. (14)

The incidence of OHCA ranges between 28.3 per 100 000 population in Asia and 54.6 per 100 000 population in North America. (10) In Europe, incidence ranges from 53 to 166 per 100 000 population. (18) Data from South Africa suggest an incidence of 6.4 per 100 000 population in Johannesburg and 23.2 per 100 000 population in Cape Town. (9, 10) The data from Cape Town is similar to that reported from Asia but is much lower than North America and Europe. This could be due to the retrospective study design, narrow inclusion criteria and lack of adequate reporting on all Utstein variables on OHCA across systems. (10) The likely underestimated incidence of OHCA reported in Johannesburg is probably attributable to the sample being limited to cases that were attended to by paramedic students.

Metabolic risk factors such as obesity, hypertension, diabetes and hypercholesterolemia contribute to the development of CVD. (13) Modifiable risk factors that also increase the risk of CVD development include tobacco use, alcohol abuse, lack of exercise and a poorly balanced diet. (19)

There is also an association between socioeconomic status, obesity and diabetes possibly due to unhealthy behaviours, limited availability and affordability of nutritious food and greater underlying levels of stress. (20) In South Africa 68% of women and 31% of men are overweight or obese. (21) Each of these factors could be attributable to the increasing CVD burden in the country, and ultimately OHCA.

A recent study showed that the majority of OHCA patients in a Western Cape cohort were adult (96.5%) and male (56.6%) with a median age of 63 (IQR of 26) years and most of the cardiac arrests occurred in private residences. There was an age difference in the patients that were responded to by public and private emergency medical services (59 vs. 75 years; $p < 0.01$). (10)

The overall survival rate in OHCA is poor. Globally, the incidence of return of spontaneous circulation (ROSC) was found to be 29.7% (95% CI 27.6 – 31.7%); survival to hospital was 22% (95% CI 20.7 – 23.4%); survival to hospital discharge was 8.8% (95% CI 8.2 – 9.4%); survival to one-month post-cardiac arrest was 10.7% (95% CI 9.1 – 13.3%); and survival to one year was 7.7% (95% CI 5.8 – 9.5%). (22) Although this large meta-analysis produced useful figures for survival rates of OHCA, they are mostly representative of high-income countries. In low-resource settings, ROSC rates were found to be as low as 0%. (23)

Limited studies have reported on the survival rates of OHCA in South Africa.

In Johannesburg, survival to hospital arrival was reported to be 18%, but there were no data describing longer term survival. (9) In a Cape Town-based cohort, 1.3% of patients had ROSC on scene. There were no reports of survival to hospital or longer-term outcomes. (10) The current paucity of epidemiological data on OHCA from South Africa and Africa highlights the need for more research within this area.

While early initiation of bystander CPR and defibrillation can significantly improve the chance of survival in OHCA, many patients around the world do not receive these interventions. (22) LMICs encounter greater mortality rates when compared with countries that do not have as many structural challenges and barriers to OHCA care. (24)

Current Best-Practice Recommendations

According to the World Health Organisation (WHO), “the state of cardiac arrest and trauma resuscitation is a good reflection of the standard of prehospital and emergency care in any health system.” (25) In addition to being contextually appropriate, directives for OHCA care should be guided by evidence and international best-practice.

The International Liaison Committee on Resuscitation (ILCOR) has a formula for survival that emphasises three crucial constituents for good outcomes in resuscitation: guidelines based on comprehensive resuscitation science; education for bystanders and Emergency Medical Services (EMS); and carrying out an effective Chain of Survival. (26)

A comprehensive review of evidence-based recommendations for resuscitation and emergency cardiovascular care is provided by the AHA and the European Resuscitation Council. (27) In South Africa, AHA courses are followed, and we will therefore focus on the resources provided by the AHA. The AHA guidelines are updated every five years with an aim to review evidence that is of greatest clinical significance, as well as include new evidence. The 2020 update used systematic reviews, scoping reviews and evidence updates in the evidence evaluation process that facilitated the development of the guidelines. (7)

The Chain of Survival, originally conceptualised in 1991, is comprised of the critical acts to be performed in rapid succession that are essential in maximizing the change of survival in OHCA. (28) Since its conception, the Chain of Survival has been reaffirmed and expanded upon and now includes six important links: 1) Activation of Emergency Response; 2) High-Quality CPR; 3) Defibrillation; 4) Advanced Resuscitation; 5) Post-Cardiac Arrest Care; and 6) Recovery. (7) The six links of the chain are depicted in Figure 2 below:



Figure 2: Adult OHCA Chain of Survival (7)

1) Activation of Emergency Response

Activation of the emergency response system signifies the initiation of the resuscitation chain. This link includes early recognition of cardiac arrest; the decision to call for help; time spent locating a telephone and the emergency number; information gathering by emergency call-taker; and the decision to send an ambulance. (28) Lay rescuer training can shorten the time to activation of the emergency response system in the event of an OHCA. (7)

The WHO Emergency Care Systems Framework addresses essential laws and regulations governing access to emergency care. These include a free phone call to a universal access number; bystander protection laws; and access to emergency care regardless of the ability to pay. (29) Furthermore, the 72nd World Health Assembly (WHA) urged member states to promote timely access to emergency care by establishing free universal access numbers. (30)

2) High-Quality CPR

Bystander CPR increases the chance of survival from OHCA by 2-to 3-fold (OR ranging between 1.23 (95% CI, 0.71 to 2.11) and 5.01 (95% CI 2.57 to 9.78). (31) The AHA recommends the initiation of CPR by lay rescuers for patients presumed to be in cardiac arrest. (7) This recommendation is supported by a scoping review that found low risk of harm to patients that are not in cardiac arrest (strong recommendation, very-low-certainty evidence). (32)

Compressions should be performed at a rate of 100 to 120 per minute. This Class IIa recommendation is based on the findings from a 2020 ILCOR scoping review, involving 15164 patients, that showed an association between higher compression rates and improved outcomes, such as ROSC (ROSC =90±17/min vs. no ROSC 79±18/min , p=0.0033), and increased mean end-tidal carbon dioxide (ETCO₂) (13.0±1.8mmHg at a rate of 80 compressions/min vs. 15.0±1.8mmHg at a rate of 120 compressions/min, p<0.001). (33)

Compressions should be performed at a depth of 5-6cm. (34) This is a Class I recommendation based on evidence from the same ILCOR scoping review that included 12664 patients. Improved outcomes were shown when compression

depth was 5cm compared to 4cm. (33) These studies showed an increased survival to emergency department by 50% with a compression depth of 5.38cm and an increased survival to hospital discharge with each 5mm increase in compression depth (aOR=1.29, 95% CI 1.00-1.65). Shock success also increased with increasing compression depth: <26mm = 50%; 26-38mm = 60%; 39-50mm = 88% and >50mm = 100% (p=0.008). (33) These findings have re-affirmed the importance of quality chest compressions.

The WHA 72.16 urges member states “to increase awareness and capacity in communities to deal with emergency situations, including through campaigns, and through training of standard practices across educational and occupational settings, adapted to their corresponding target populations, so they can identify, mitigate and refer potential emergencies.” (30)

Training of lay rescuers and school-age children is recommended with a shift towards self-directed learning in an attempt to increase the number of trained rescuers and increase bystander response. (34)

The AHA recommends that emergency dispatch systems alert bystanders that are willing to assist with CPR and AED application to potential cardiac arrest cases using mobile phone technology. (34) This has been shown to improve bystander response times (very low-certainty evidence), increase bystander response rates (high-certainty evidence), shorten time to defibrillation (very low-certainty evidence), and increase rates of survival to hospital discharge (moderate-certainty evidence). (35)

Another recommendation is to eliminate disparities in CPR training by targeting and tailoring the training to racial and ethnic groups that have previously seen lower rates of bystander CPR training. Training programs should consider language barriers, finances, and access to information. Barriers to bystander CPR for female patients should also be addressed through education. (34)

In addition to clinical best practice, it is also important to strive for optimal accessibility of emergency care. One of the ten principles of good governance applied to emergency care system accessibility is “Equity and Inclusiveness”, stating that “all people, regardless of gender, income, religious affiliation, immigration status or sexual orientation should be able to participate in the emergency care system and receive care for a perceived emergency.” (36)

3) Defibrillation

Early defibrillation is highly effective at terminating ventricular fibrillation, ventricular tachycardia, and other arrhythmias and is recommended by the AHA in conjunction with high-quality CPR. (34) The highest survival of OHCA patients with a shockable rhythm occurs when there is immediate bystander CPR and defibrillation within 3-5 minutes of collapse. (37) ILCOR recommends the implementation of public-access AED programs (very low-quality evidence). (38)

4) Advanced Resuscitation

The early administration of epinephrine in conjunction with high-quality CPR improves survival, predominantly in patients presenting with non-shockable rhythms. (34) This was affirmed by two randomized clinical trials that showed increased rates of ROSC and survival with administration of epinephrine. (39, 40) A double blind randomised placebo-controlled trial of 534 cardiac arrest patients found a ROSC rate of 23.5% in patients that received Epinephrine versus 8.4% in patients that received placebo (OR 3.4, 95% CI 2.0 to 5.6). The survival to hospital discharge rate was 4.0% in patients that received Epinephrine and 1.9% in patients that received placebo (OR 2.2, 95% CI 0.7 to 6.3). (39)

The other double blind randomised placebo-controlled trial involving 8014 OHCA patients found a 30-day survival rate of 3.2% in the Epinephrine group and 2.4% in the placebo group (OR, 95% CI 1.06 to 1.82, P=0.02). (40) This evidence supports the AHA and ILCOR recommendations for Epinephrine to be administered to patients in cardiac arrest (Class I recommendation, LOE B-R) at a dose of 1mg every 3-5 minutes (Class 2a recommendation, LOE B-R). (34, 41)

The AHA has two separate recommendations for termination of resuscitation (TOR). For basic life support (BLS) TOR, the criteria include: 1) Arrest not witnessed by EMS personnel; 2) No ROSC before transport; and 3) No defibrillation before transport. If all three of these criteria are present, TOR may be considered. The criteria for ALS TOR are the same, apart from an addition of one criterion: No bystander CPR. If all four criteria are present, TOR may be considered, but if any criteria are missing, then continuation of resuscitation and transport are recommended. (34)

The AHA have identified OHCA as a resource-intensive condition with low survival rates and highlight the importance of EMS practitioners being able to determine futility. (34) Futility can be defined as less than 1% chance of survival. (42) A valid TOR rule should therefore be highly accurate for predicting futility with the lower confidence limit of more than 99% on external validation. (34)

A recent meta-analysis of seven studies showed that only 0.13% (95% CI 0.03 – 0.58%) of 33 795 patients fulfilling the BLS TOR criteria survived to hospital discharge. The same meta-analysis showed that only 0.01% (95% CI 0.00% - 0.07%) of 10 178 patients from two studies that fulfilled ALS TOR criteria survived to hospital discharge. (43) This evidence supports the AHA recommendation for the use of these BLS and ALS TOR rules.

5) Post-Cardiac Arrest Care

The AHA recommends the implementation of a comprehensive, structured, multidisciplinary system of care for post-cardiac arrest care. (34) This is supported by evidence that there is a logical clinical link between a strong system of care and successful resuscitation and survival. (44)

Post-cardiac arrest care recommendations include standard critical care support, such as mechanical ventilation, seizure management and haemodynamic support, (34) but also include key topics, such as targeted temperature management (strong recommendation, low quality evidence) (45) and percutaneous coronary intervention that evidence suggests will improve outcomes (Class I recommendation, LOE B-NR). (46)

Early percutaneous coronary intervention (PCI) highlights the importance of obtaining a 12-lead electrocardiogram (ECG) early and direct transfer to a PCI facility from the location of the OHCA.

6) Recovery

As the most recent addition to the chain of survival, the recommendations for recovery from OHCA include: 1) Multidisciplinary rehabilitation assessment and treatment for physical, neurological, cardiopulmonary and cognitive impairments prior to hospital discharge; 2) A comprehensive, multidisciplinary discharge structure for OHCA survivors and their caregivers; and 3) Psychological evaluation for anxiety, depression post-traumatic stress, and fatigue for OHCA survivors and their caregivers. (34) Each of these recommendations are supported by Class I evidence. (47)

Each of the factors of the chain of survival are interconnected and the chain can only be as strong as its weakest link, emphasizing the importance of each link in OHCA care. (28) Focusing on targeted interventions within each link has been shown to significantly enhance OHCA survival rates in HICs. (48-50) Strengthening each link of the chain of survival comes at a high price: one that is not affordable or realistic in every context. Comparing OHCA systems is useful, but it is important for the comparison to be context specific.

The Utstein template provides a structured framework of variables and was designed to improve reporting standards to better compare OHCA systems of care. This template is comprised of many variables relating to system, dispatch, patient, process, and outcome. (51) Failure to adequately report on all Utstein variables could result in misinterpretation of data. (14) Unfortunately, most of the literature reviewed here does not adequately report on all Utstein variables, which emphasises the need for standardized reporting. An important Utstein variable is an adequate system description to provide a context-specific picture. The following section will provide a brief overview of the Western Cape, its geographics, population, EMS system, and the barriers to maintaining each link of the chain of survival.

Context and System Description

The Western Cape of South Africa covers a land mass of 129 462km² and has a population of around 6.3 million people (11% of the total population of South Africa). Most of the population (64%) resides within the Cape Town metropole, which is approximately 4 million people. (10) This population is served by a dual prehospital emergency care system. The Western Cape Government (WCG) EMS is a modern prehospital system with 248 ambulances and 1588 personnel, 135 of whom are trained in ALS interventions. (52) The formalized tier two EMS is staffed by BLS, intermediate life support (ILS) and ALS practitioners.

In addition to WCG EMS, there are private ambulance services that attend to members of the population that have medical insurance. The private sector in South Africa, accessed by 17% of the population, spends ten times more per capita on health than the public sector (53, 54). It is served by a large majority of the country's healthcare workers and commands 52% of the total health budget. The remaining 48% of the budget is dedicated to the other 83% of the population without medical insurance. (55) This highlights some of the immense inequities in the South African healthcare system.

Advanced Cardiac Life Support (ACLS) including defibrillation, placement of an advanced airway and administration of pharmacological agents is within the scope of practice of ALS practitioners in South Africa. They are also entrusted with the decision of whether or not to initiate CPR in an OHCA setting and when to terminate resuscitation. ILS practitioners may decide to withhold resuscitation but are not permitted to terminate CPR without seeking clinical advice. BLS may not terminate CPR and may only withhold resuscitation in circumstances of obvious death, such as decapitation, mortal disfigurement, post-mortem lividity and putrefaction. (56)

Resuscitation efforts by EMS in cases of OHCA are infrequent. (10) This could be due to factors affecting patient prognosis influencing the decision by EMS to withhold CPR. To ensure good outcomes from resuscitation, all the links in the chain of survival must be carried out appropriately. Some of the barriers to implementing and maintaining an effective chain of survival in the South African setting are discussed below under the relevant links of the chain.

1) Activation of Emergency Response

Delayed activation of the Emergency Response System affects the chance of survival from OHCA. (57) The lack of a single universal emergency number has been identified as a barrier to access timely EMS care in Cape Town. (58)

In the WCG EMS dispatch centre, the aim is for the call taker to gather information about the case within 90 seconds of receiving the call, assign a priority (P1 or P2) to the case, and send it to the dispatcher who will assign the appropriate unit to respond to the case. (58) This can be a challenge with language barriers, diverse cultures, varying socioeconomic statuses, and different levels of literacy and education among the population. (59)

2) High-Quality CPR

Immediate high-quality CPR improves survival and poor initiation of bystander CPR is likely to lead to poor prognosis, which may affect OHCA decision-making. (10) Less than 40% of adults in OHCA receive bystander CPR. (7) A South African study showed similar numbers with only 36% of OHCA patients having received bystander CPR. (9) Some of the barriers to initiation of CPR by bystanders in South Africa were found to be: 1) Fear of legal action if something goes wrong; 2) Presence of bodily fluids; 3) Fear of injuring the patient; 4) Fear of contracting a disease from the patient; and 4) Belief that somebody else would intervene. (60)

Telephone-assisted CPR (tCPR) refers to telephonic guidance on CPR provided by call centre staff and is an effective method to improve the rate of layperson resuscitation. (61) Not all WCG emergency call takers are medically trained, and they execute their duties without script or any protocols on how to recognize OHCA or telephonically guide bystanders on how to administer CPR. (10) A recent study shows that people calling for an ambulance within the Western Cape use consistent descriptors for OHCA, but a recognition algorithm based on these descriptors that could improve initiation of telephonic CPR has not yet been created. (59)

There is no available literature on the provision of CPR training for the general public and it is not mandated by South African law. (10) It has been argued that teaching CPR in a low-resource setting is unethical, as resources are diverted from other healthcare priorities to enhance one link in a brittle chain of survival. (62) The quality of CPR delivery by EMS personnel in South Africa is poor and there are no known continuous quality improvement initiatives in place to ensure high-quality resuscitation to OHCA victims. Without such initiatives, poor survival rates can be expected. (63)

3) Defibrillation

Shockable cardiac rhythms are responsive to defibrillation, but deterioration to non-shockable rhythms occurs over time. For every minute that defibrillation is delayed, survivability decreases substantially. (64) Patients with a shockable first rhythm that received defibrillation within 0-2 minutes had 71.1% survival with favourable neurological outcome and those that received defibrillation within 10-12 minutes had 27.7% survival with favourable neurological outcome. (65) Fewer than 12% of adult OHCA patients in an HIC setting have an AED applied before EMS arrival. (7) There are no reports from any South African studies of defibrillation occurring prior to EMS arrival or the presence of an AED. Despite the importance of OHCA registries for informing improvements in survival, there are no published registries on OHCA or public access to AEDs in South Africa. (10)

In a Johannesburg study, 23% of patients were found to be in a shockable rhythm upon EMS arrival, but there is no mention of an AED being used or present. In the same study, the presence of a shockable rhythm on EMS arrival was found to be a considerable predictor of ROSC. (9) In Cape Town, only 1.7% of patients presented with a shockable rhythm, but 61.8% of cases in the study had no record of the presenting rhythm. (10) The inevitable decrease in survivability as time to defibrillation increases could affect OHCA resuscitation decision-making.

4) Advanced Resuscitation

Time to EMS arrival on scene is an important component of the chain of survival and prolonged response times may affect the decision made by EMS to withhold resuscitation attempts. (10) The targets for response times in urban areas are to

attend to 90% of P1 cases within 15 minutes, 90% of P2 cases within 30 minutes, and 100% of all cases within 60 minutes. (58) Unfortunately, these targets are not always achievable. EMS response times were found to be an average of 26 minutes in Cape Town. (10)

Users of EMS in Cape Town have reported negative experiences with the service, mainly due to delays in arriving or not arriving at all. (66) This could be due to insufficient ambulances serving the need of the community being studied or threats to EMS personnel's safety when entering certain high-risk areas and having to wait for a police escort. Civil planning infrastructure in Cape Town, such as poor roads and housing with no signage to aid in finding patients within informal settlements, has been identified as a barrier to accessing timely EMS care. (58) Long response times could be an influencing factor in OHCA decision-making, as resuscitation may be considered futile once EMS eventually arrive on scene. (9)

A shortage of ambulances to serve the population needing care, as well as staffing challenges, with particular emphasis on ALS personnel, were perceived as barriers to accessing EMS care in Cape Town. (58) Due to these staffing challenges, as well as miscommunication at the dispatch centre regarding patient acuity and under-triage, there is often an even greater delay in ALS response.

Lack of EMS equipment, such as ventilators, syringe drivers, cardiac monitors, and pulse oximeters, is another perceived barrier to accessing EMS care. (58) In rural areas, there is not only a shortage of human resources and equipment, but higher out-of-pocket expenditure for transport to access public health services when ambulances are not available. (55) ALS resources in the Western Cape are usually centralized to the urban areas, resulting in a delay in delivery of advanced interventions to patients residing outside of these areas.

Newly qualified ALS practitioners in South Africa generally do not have sufficient clinical exposure to OHCA in their training. (67) This could influence their decision-making, as inexperience may lead to fear of consequence when deciding not to initiate resuscitation in patients that have a poor prognosis. This highlights the need for guidelines on OHCA decision-making, particularly for new ALS practitioners.

While South African prehospital clinical decision-making guidelines are user-friendly and pragmatic, they lack transparency on evidence-based development and trustworthiness. (68) There are no guidelines on OHCA decision-making.

5) Post-cardiac arrest care

One of the AHA recommendations is direct post-resuscitation transfer to a PCI facility. Despite 76.1% of the South African population residing within one hour travel distance of a facility that is capable of PCI (69), not everyone has access to these facilities due to lack of medical insurance. (70) Policies and procedures preventing EMS from delivering a patient directly to a PCI facility when it is needed have also been identified as perceived barriers to accessing timely EMS care in Cape Town. (71) These barriers to timeously delivering ROSC patients to a PCI facility could affect OHCA decision-making.

6) Recovery

There is no available literature on OHCA recovery and rehabilitation in South Africa. This is likely due to the extremely low survival to hospital discharge rates. (10) Considering the existing system challenges regarding funding, hospital bed availability and shortage of human resources, it is safe to say that the “recovery” link of the chain of survival would not live up to the recommendations of the AHA. In addition to this, the financial strain brought upon struggling families to fund private rehabilitation could bring about financial ruin.

OHCA in South Africa

Eight studies of relevance were found using the search strategy illustrated in previously in Figure 1. (9, 10, 72-77) Two main studies describing OHCA in South Africa have been published. An observational study by Stassen et. al described OHCA in the Cape Town metropole of South Africa over a period of one year (1 January to 31 December 2018). (10) Apart from the epidemiological data mentioned above, the main findings of relevance to our study were that resuscitation was only attempted by EMS in 7.4% of cases and ROSC was only achieved in 1.3% of all cases. 18.8% of patients that were resuscitated had ROSC, but this does not signify survival to hospital discharge.

A retrospective case review by C Stein focused more on describing and assessing the outcomes of adult OHCA in Johannesburg. (9) This study was also done over a longer period of seven years (1 January 2001 to 31 December 2007). Despite a longer timeframe, the sample size of this study is much smaller than that of the Cape Town study, as the data collection was limited to cases that were attended by students at the University of Johannesburg and not all cases within the city and are thus not representative of the total number of cardiac arrest cases attended to by EMS in Johannesburg during that period.

The Stein paper extracted results with complete Utstein-style data, as the university requires students to enter cardiac arrest data based on the Utstein template. This is likely not the case for the majority of EMS in Johannesburg. The Stassen paper is limited by under-reporting of key Utstein variables, which is due to the country's lack of an OHCA registry and highlights the importance of its development and implementation for informing improvements in survival.

A small percentage of patients (0.75%) in the Stassen paper were transported with ongoing resuscitation. Almost all patients (97.8%) were declared dead on scene.

In cases where resuscitation was attempted, the average response time was 17 minutes and 32 seconds and in cases where resuscitation was not attempted, the average response time was 27 minutes and 13 seconds. (10) This could be an indication of response times affecting the decision of EMS personnel to initiate or withhold CPR.

The study by C Stein reported far shorter response times (median of 9 minutes with an interquartile range of 6-12 minutes). (9) This is because response times were calculated from the time the emergency vehicle received the call to the time of arrival on scene. The Utstein-style definition of response time is when the emergency dispatch centre first receives the call. (51) The Utstein template was used in calculating response times in the Stassen et. al paper, explaining the longer response times recorded in Cape Town when compared to those reported in Johannesburg.

As mentioned previously, there are large disparities in the provision of health care between the public and private sectors in the Western Cape and this is highlighted by the Stassen paper. The public EMS sector represented the majority of the overall OHCA cases (72.2%), but only 3.7% of the 72.2% were treated by EMS. Of the remaining 27.8% of cases represented by the private service, 17.1% of the 27.8% were treated by EMS. (10) This exceptionally larger proportion and the potential reasons behind it are not discussed in detail, but there is mention of response times being considerably shorter in the private sector (10:00 vs. 20:39; $p < 0.01$), as well as the population of patients seen by private EMS being younger. There was no real difference in the percentage of patients that were declared dead on scene in the private sector (94.9%) and the public sector (99%). (10)

Resuscitation rates in Johannesburg were much higher (40%) than those reported in Cape Town (7.4%). (9, 10) This could be due to the smaller sample size; the idea of resuscitation taking place as an educational benefit for the students, or the fact that the Cape Town paper included cases of “declaration of death”, which may not have been included in the Johannesburg study.

The incidence of OHCA in Johannesburg is underestimated by the Stein paper and there is a need for an updated study describing OHCA that is inclusive of all EMS in the city. The incidence of OHCA in Cape Town is in line with other cities in the world, attempts at resuscitation are rare and rates of ROSC are negligible. (10) This could be because of prolonged response times; poor prognosis deemed by EMS or because of an underdeveloped chain of survival and lack of resources. (10) The authors of this paper express the need for a qualitative study on the factors that influence decision-making in OHCA.

Decision-making in OHCA

There are no studies that were found to have investigated decision-making in OHCA in the Western Cape or even South Africa. One African study conducted by Zelfani et. al in Tunisia from January 2015 to December 2016 investigated the factors that influenced the decision of EMS teams to resuscitate OHCA or not. (72) The population of 228 patients (all aged 18 years or older with a suspicion of non-traumatic OHCA) were divided into two groups: those that received ALS care by EMS and those that did not. Resuscitation was performed by EMS teams on 106 patients (46.5%). (72)

Response times were reported to be 13 minutes, but it is not clear how this is measured. A small percentage (8%) of patients received bystander CPR, but each time it was done by medically trained people that witnessed the cardiac arrest (2 rescuers, 4 nurses and 12 doctors). Of this 8%, two patients had ROSC. Of the 16 cases of OHCA that were witnessed by EMS, 7 patients had ROSC. Survival rates were described as 17% of resuscitated patients, but none of the patients survived more than 48 hours. (72)

In a univariate analysis, there were three main predictors that were found to be associated with the decision to resuscitation patients in OHCA or not: 1) Age ≥ 65 years; 2) Bystander CPR; and 3) No-flow duration. A multivariate analysis identified the main predictor of resuscitation to be “no flow duration”. The ROC curve revealed a cut-off value of 18.5 minutes for the decision not to resuscitate with an area under the curve of 0.976. This “no flow duration” likely refers to the down time, but there is no mention of how this is measured. (72)

While this study provides some useful data on OHCA resuscitation by EMS in Tunisia, there are some limitations to the study: 1) The EMS system and the context in which the study took place are not well described. This affects the ability of readers to apply the findings to other contexts. 2) The paper does not adequately report on all Utstein variables, generating risk of misinterpretation of the data. 3) The small sample size affects generalisability of the findings. 4) Independent verification of the data was not done, leaving possible influences unmeasured. 5) The author states that the reason for EMS not resuscitating patients is due to the chance of survival being negligible at

the time of assessment, but this cannot be discerned by the data that has been collected. The authors call for further research that explores OHCA decision-making.

There are few studies from HICs that have explored OHCA decision-making. A study by Brandling et. al was published in the BMC Emergency Medicine Journal in 2017. In an explorative study, the authors aimed to investigate the influences on EMS practitioners' decision-making when commencing and ceasing resuscitation efforts in OHCA in the United Kingdom (UK). The qualitative study utilized focus groups and case vignettes to observe the decision-making of paramedics relating to initiation and termination of CPR in OHCA. (73)

They found there to be three distinct phases in the decision-making process, namely: 1) The call; 2) Arrival on scene; and 3) The protocol. The initial call that usually provides the responding team with information regarding the type of case, age and gender of the patient and location, gives the EMS practitioner information upon which they can start making their decision. When they arrive on scene, EMS practitioners gather more information from bystanders or family and use clinical reasoning to assess feasibility of resuscitation. Resuscitation will commence if there is no clear reason not to or if there is a chance of survival. (73)

Factors presenting at each phase were found to influence the decisions of the practitioners and result in variability in practice. The influences were found to be: 1) Factual information (ECG rhythm, co-morbidities, and presence of an advanced directive with instructions not to resuscitate); 2) Structural factors (protocols, guidelines and policies); 3) Cultural beliefs and values (patient age, with particular emphasis on children); 4) Interpersonal factors (influence from colleagues, bystanders, family or police); 5) Risk factors (safety, injury); and 6) Personal values and beliefs (experience, anxiety over litigation and practitioner fatigue). (73)

In the UK, there are already well-established clinical practice guidelines for EMS practitioners on when to commence and terminate resuscitation in OHCA. (78) Despite this, variability in decision-making exists. (73) While the study provides useful insight into the factors that influence this decision-making, the results cannot be generalized into the South African setting due to contextual differences. The focus groups as the

chosen methodology may have caused responses given by participants to be influenced by others in the group. One-on-one interviews may have been more appropriate for this explorative study to open the topic for unpredicted outcomes.

Anderson et. al interviewed 16 EMS practitioners in New Zealand with the aim of exploring their decisions to commence, continue, withhold, or terminate resuscitation in OHCA patients. The paper was published in the British Medical Journal in 2018. The study found that the factors affecting decision-making, that were beyond the established guidelines and prognostic indicators, were integrated into four phases: 1) Pre-arrival impressions; 2) Immediate on-scene impressions; 3) Piecing together the big picture; and 4) Transition to termination of resuscitation. (74)

The main factors that were found to affect this decision-making were: 1) Factors relating to the chain of survival (witnessed collapse, down time, bystander CPR, shockable presenting rhythm); 2) Setting (old age home, lower socioeconomic areas); 3) Patient assessment (the way the patient looks in the setting, ECG findings – related to less experience); 4) Getting resuscitation under way (taking over and administering interventions before gathering further information); 5) Handover (not stopping ongoing interventions); 6) Doing everything (ensuring that everything that could be done was done, nothing missed, provides peace of mind); 7) Quality of life (advanced age, disability, co-morbidities); 8) Family wishes; and 9) Crew consensus. (74)

The authors also found that commencing or continuing resuscitation was sometimes a default action, particularly when uncertainty was present, and that managing TOR required confidence and experience. (74) Unlike the Brandling et. al paper that used focus groups (73), this study used semi-structured interviews to obtain insight into how EMS practitioners think and make decisions in OHCA. The investigator (experienced in both prehospital emergency care and psychology) encouraged recall and description of real OHCA events to gain insight into the participants' experience of resuscitation decision-making. (74) Although the accuracy of the accounts was not verified, the author found no indication of self-censoring and since the interviews were conducted one-on-one, the risk of responses being influenced by others was negated.

The qualitative nature of both the Anderson and Brandling studies affect the transferability of these studies, as the findings are not relatable to other settings. This is particularly true for the South African setting, as both studies were conducted in HICs with entirely different patient demographics and EMS systems.

Prior to undertaking the above study, Anderson conducted an integrative systematic review of decision-making in OHCA. Studies that met the inclusion criteria consisted of nine quantitative studies, four qualitative studies, and one mixed-methods study all from various locations: United States of America, Canada, UK, Germany, Norway, and Sweden. The earliest study was published in 1981, and the latest was published in 2014. Sample sizes ranged from seven to 1546 participants with varying backgrounds: emergency physicians, junior and senior medical staff, paramedics and ambulance nurses. (75)

The authors identified five main themes under which factors that inform resuscitation decision-making were described: 1) The arrest event; 2) Patient characteristics; 3) The resuscitation scene; 4) Resuscitation provider perspective; 5) Medicolegal concerns. Under the “arrest event” theme, factors included ECG findings, presumed aetiology, signs of life, witnessed arrest, down time, and duration of resuscitation. Under the “patient characteristics” theme, factors such as age, comorbidities, and quality of life were considered. On the “resuscitation scene”, the necessity of resuscitation, resource availability, handover of resuscitation efforts, bystander presence, and scene safety were the aspects that appeared to influence decision-making. (75)

The most frequently reported finding in all the reviewed papers was a lack of consensus between practitioners. The papers that made comparisons between participants reported significant variability in the factors affecting decision-making and their relative importance. Also falling under the “resuscitation provider perspective” theme, an association was found between level of experience and tendency to commence or continue resuscitation. Medicolegal concerns included knowledge and perception of guidelines, advanced directives and fear of litigation. (75)

This study provides useful data from a variety of settings over a long period of time, however exploring clinical and ethical decision-making is not an easy task and each

study reviewed had its own limitations. Almost all the studies used convenience samples that were either homogenous, and/or inadequately described and were susceptible to response biases. Some of the qualitative studies reviewed had responses reported as categorized data and important decision-making factors may have been lost. The author concluded that future research should explore clinical and non-clinical decision-making factors in a more inclusive manner. (75)

The findings of the systematic review (75), the 2018 study (74), and a third study by Anderson (79) were integrated and used to develop a prehospital resuscitation decision making model. Unlike existing prehospital resuscitation decision-making models, this model acknowledges the subjective role of the decision-maker, their uncertainty, lack of information, and the value of adequate preparation and support. The model features key processes for preparation, resuscitation decision-making, and support, as well as facilitators and challenges at each stage of the event. The model also defines OHCA decision-making for what it is: “a high-stakes, ethically, clinically and emotionally demanding aspect of prehospital emergency care.” (76) It highlights preparation and support mechanisms that would be useful in all processes, as well as additional research that is needed.

Another mixed-method systematic review, published by Milling et. al in 2022 explored the influence of non-medical factors on prehospital resuscitators’ decision-making in OHCA. Included in the review were 27 papers (twelve qualitative, two mixed-method, and thirteen quantitative). Five main themes and thirteen subthemes relating to OHCA decision-making were identified: 1) Patient-related factors and perspectives; 2) Bystanders and family members; 3) Resuscitation providers’ personal conditions; 4) External conditions; and 5) Conflicts between key factors. (77)

Subthemes included: 1) Patient characteristics (age, social status); 2) Ethical aspects (perceived prognosis, dignity, patient’s wishes, patient’s best interests); 3) Family wishes and emotions (family wishes, buying time for the family, coping with the family’s emotions, identifying with the family); 4) The presence of bystanders (meeting expectations, respecting bystanders efforts); 5) Characteristics and experience of participants (age, gender, level of education, type of daily work, experience); 6) Emotions and personal values (uncertainty, personal values, fear of consequence); 7)

Team interaction; 8) EMS work environment (EMS system, training purposes, provider fatigue, crew safety, area of service); 9) Legislation (formal guidance); and 10) The arrest setting (location, environment, logistics). An area of tension between the key factors was identified with subthemes of 11) Conflicts with the law and guidelines; and 12) Conflicting values (family wishes, the duty to save lives, team interaction, lack of information). Unfortunately, these findings are not relatable to South Africa, as each of the studies included in the review were conducted in HICs and cannot be translated into our setting.

There are other papers that look at factors affecting the variability of resuscitation by EMS in OHCA, but with a quantitative approach. (80, 81) This does not really tell us the specific factors that influence EMS practitioners' decision-making, but more what factors are presumed to be associated with decision-making. These factors can only really be explored using qualitative research. There are also prognostic tools that exist to predict neurologic recovery after OHCA and help with clinical decision-making, but these were designed for in-hospital use and are not suitable to be used in the prehospital setting. (37, 82) There could be a place for such tools to be used by EMS practitioners to guide OHCA decision-making, but they need to be contextually appropriate and adapted for prehospital use.

The only factor affecting OHCA decision-making that was consistent across all reviewed papers was patient age. Bystander CPR; down time; ECG rhythm; co-morbidities; legislation; bystander presence; safety; fear of consequence; setting; and team consensus were factors that were consistent across most papers. Recently published African and South African papers reviewed within other sections express the need for more OHCA research, with the authors of the Thibodeau et. al paper declaring the importance of understanding EMS practitioners' views on OHCA (14), and the Stassen et. al paper making specific mention of the need for a qualitative study on the factors that influence decision-making in OHCA. (10)

Conclusion

The CVD burden in South Africa is on the rise with a predicted increase in the incidence of OHCA. Associated with a high mortality, survival rates from OHCA are poor. There are limited studies reporting on survival rates in South Africa and the Western Cape, but they are likely to be worse than those reported in HICs.

High-quality CPR and early defibrillation are the interventions most closely related to achieving good outcomes, but many patients do not receive these interventions.

Current international best-practice recommendations are without limit. They encourage optimal care to achieve the best outcome for individual patients, but this is just one (albeit important) element of what OHCA management guidelines should be based on.

All components of the chain of survival must be considered to ensure a high standard of OHCA management and thus a good reflection of the standard of prehospital care in the Western Cape. There are already weak links in this chain, which makes us question its effectiveness within our own setting. The question to be asked is whether we should be investing limited funds into improving certain links in the chain of survival if the other links are not working. Ideally, budget allocation should be guided not only by international best-practice, but the priorities of the province.

ROSC rates in low-resource settings are low. Minimum standards for resuscitation in these settings should be developed by obtaining input from local experts and community leaders, while considering culture and context, as well as balancing other health budget priorities. To do this, we need to ascertain what is currently being done and what factors are influencing OHCA decision-making. Two studies have described OHCA in South Africa, providing useful epidemiological data, recognizing weaknesses in the healthcare system, and identifying research gaps. One African study investigated factors influencing OHCA decision-making by EMS in Tunisia. There were a few studies that explore OHCA decision-making in HICs, but none of these studies have described the views and perceptions of practitioners on OHCA in the unique South African setting, highlighting the need for more research on the topic.

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PART B: Manuscript in Article Format

Title Page

VIEWS AND PERCEPTIONS OF ADVANCED LIFE SUPPORT PRACTITIONERS ON INITIATING, WITHHOLDING AND TERMINATING RESUSCITATION IN OUT- OF-HOSPITAL CARDIAC ARREST IN THE EMERGENCY MEDICAL SERVICES OF THE WESTERN CAPE

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Abstract

Introduction

The incidence of cardiovascular disease, a leading cause of out-of-hospital cardiac arrest (OHCA), is on the rise in Africa. OHCA survival rates are poor and rates of return of spontaneous circulation are reported to be as low as 0% in low-resource settings. Early CPR and defibrillation can significantly increase the chance of survival in OHCA, but many patients do not receive these interventions timeously. Factors affecting prognosis may contribute to clinical decision-making in OHCA. The aim of this study was to explore the views and perceptions of Western Cape Advanced Life Support (ALS) practitioners on initiating, withholding, and terminating resuscitation in OHCA.

Methodology

Semi-structured one-on-one interviews were conducted with operational ALS practitioners that are currently working within the pre-hospital setting in the Western Cape. Recorded interviews were transcribed and subjected to inductive-dominant, manifest content analysis. After familiarization with the data, meaning units were condensed, codes were applied and collated into categories that were then assessed, reviewed, and refined repeatedly.

Results

Five main categories were developed from the data analysis: 1) assessment of prognosis, 2) internal factors affecting decision-making, 3) external factors affecting decision-making, 4) system challenges, and 5) ideas for improvement. Factors influencing the assessment of prognosis were history, clinical presentation, and response to resuscitation. Internal factors affecting decision-making were driven by emotion and contemplation. External factors affecting decision-making included family, safety, and disposition. System challenges relating to bystander response and resources were identified. Ideas for improvement in training and support were brought forward.

Conclusion

There are many factors that influence OHCA decision-making in the Western Cape and numerous system challenges have been identified. The findings of this study can be used as a frame of reference for pre-hospital emergency care personnel that can influence an aspect of their decision-making in OHCA. The ideas uncovered in this study have the potential to contribute to the development of guidelines that are specific to the South African context.

Introduction

Cardiovascular disease (CVD), the predominant cause of out-of-hospital cardiac arrest (OHCA) (1), is on the rise in Africa, including South Africa. (2) Internationally, the prognosis and neurological outcome associated with OHCA are poor with survival rates of approximately 10% following discharge from hospital being reported in high-income countries (HIC), where resuscitation rates are good. (3, 4) Overall survival following OHCA in low-to-middle-income countries (LMIC) has been reported to be poor (5, 6), but studies are limited. In South Africa, two OHCA studies have been done. (7, 8) Stassen et. al found low resuscitation rates for Emergency Medical Services (EMS) in the Western Cape. (8) To explain this, it might be important to understand what influences EMS decision-making, which is the aim of this study.

Response times in South Africa are significantly longer than those reported elsewhere in the world. (7, 8) There is an inadequate number of ambulances in the Western Cape to attend to the rising number of emergency cases (9), resulting in the increased response times. The longer the downtime before CPR is initiated, the less likely a successful resuscitation would be. (10) This highlights not only the importance of a rapid decision upon arrival on scene of whether or not to initiate CPR, but also viability of the resuscitation after a delayed response time.

The benefits of cardiopulmonary resuscitation (CPR) and other interventions are considerable (11), but there is a natural end to life and the existence of modern techniques and interventions may, in some cases, prolong the lives of patients that have very little chance of recovery. The quality of life following cardiac arrest and the subsequent interventions within a system that isn't capable of adequate continuation of care may broach questions regarding whether the initiation and continuation of resuscitation are in the best interest of the patient, their family and the healthcare system.

The decision to either commence or withhold resuscitation is equally important depending on the context. There are no studies that were found to have investigated decision-making in OHCA in the Western Cape or even South Africa. Qualitative studies from HICs explored EMS practitioners decision-making in OHCA. (12, 13) In the United Kingdom, some of the factors influencing decision-making to be ECG

rhythm, co-morbidities, patient age, interpersonal factors, risk factors, and personal values and beliefs. (12) In New Zealand, some of the factors affecting decision-making included down time, bystander CPR, shockable presenting rhythm, setting, quality of life, and family wishes. (13)

Apart from obvious signs of death, there are no clear-cut guidelines for ALS practitioners for when to initiate or withhold CPR, or when to continue or terminate CPR in the prehospital setting in South Africa. Practitioners are often required to make a rapid decision regarding resuscitation and the purpose of this study is to investigate what influences that decision.

Understanding the factors that influence a South African practitioner's decision to commence or withhold CPR or when to terminate resuscitation could uncover ideas that may be expanded and further explored to contribute to the development of a guideline for decision-making in OHCA for ALS practitioners in LMICs.

Methods

This study followed a qualitative descriptive design. Using semi-structured one-on-one interviews, this study explored the views and perceptions of ALS practitioners on initiating, withholding, and terminating resuscitation in OHCA in the EMS of the Western Cape.

Reflexivity

The primary researcher, Sarah Higgins (SH), is a female Emergency Care Practitioner (ECP), currently working as a Critical Care Paramedic in the State of Qatar, but with previous operational experience as an ECP in the Western Cape. Her qualification is a Bachelor of Emergency Medical Care obtained from Cape Peninsula University of Technology in 2017.

The primary researcher has been involved in resuscitation and is, therefore, the same as the sample population. She believes that paramedics base their decision making on futility, as well as external pressures on the scene. She also believes that ECPs in the Western Cape tend to resuscitate patients inappropriately.

Research Paradigm

The study was conducted within the pragmatic paradigm. Pragmatism is a philosophical perspective that emphasises the nature of experience, focuses on the outcomes of action and examines shared beliefs. Pragmatism is a directive to find practical answers to or assist in addressing tangible issues. The researcher strives to gain practical understanding and wisdom to inform action. (14) The intention is to illustrate the views and perceptions held by the participants regarding OHCA within the Western Cape of South Africa.

Study Setting

The participants included in this study are operational ALS practitioners currently working within the prehospital setting in the Western Cape, a province of South Africa which covers a land mass of 129 462km² and with a population of 6.3 million people. (8) The population is distributed in rural and urban areas and is served by a dual prehospital care system where there are private and state ambulance services. To incorporate a variety of perspectives, participants working for different companies (both public and private), and in different settings (both rural and urban) were included in the study.

Sampling

The study made use of convenience sampling to recruit the participants. A brief description of the study was sent to a continuous medical education group on WhatsApp (Meta Platforms, California, United States of America) that has many ALS practitioners as members. Those who were interested in participating in the study and met the inclusion criteria were invited to an interview via e-mail.

ALS practitioners with at least one year of operational experience and registration with the HPCSA as either a Paramedic (ANT) or Emergency Care Practitioner (ECP) were eligible to participate in the study. Basic Ambulance Assistant (BAA), Ambulance Emergency Assistant (ANA) and Emergency Care Technician (ECT) registrations; practitioners without sufficient or recent patient-facing experience; and those not currently practicing within the Western Cape were excluded from the study.

Data Collection Instrument

A discussion schedule (appendix C) was used to guide the interviews. It was developed using published literature with similar research methods to inform the interview questions. (12, 13) Once drafted, the discussion schedule was piloted to confirm its suitability and to ensure consistency. Adjustments were made to the interview style and the discussion schedule based on the feedback provided from the pilot discussion. The data collected from the pilot discussion were included in the results as it was only the approach and wording that changed, rather than the questions themselves.

The discussion schedule contained instructions to the interviewer, statements and questions to be read out loud, and additional prompts. The first question asked participants to elaborate on their demographics and background. The second question was broad, with an aim of inducing a wide range of ideas on OHCA and resuscitation. The third and fourth questions were more focused on the factors that influenced their decision-making. Participants were encouraged to think about considerations that were not related to the COVID-19 pandemic.

Data Collection

Due to the circumstances surrounding the COVID-19 pandemic and the geographic spread of the participants, semi-structured one-on-one interviews were conducted online via Microsoft Teams (Microsoft Corporation, Redmond, Washington, United States of America) by the primary researcher (SH). SH was supported by WS during the first five interviews. Interviews took place between 12 and 27 April 2021.

Interview questions and prompts were guided by the discussion schedule. Field notes were made during the interviews by the primary researcher and additional notes were made during the post-interview reflections between the authors.

Earlier participants were contacted after completion of their initial interview and asked to comment on specific results that had emerged from subsequent interviews, towards saturation. These participants provided their insights via WhatsApp (Meta Platforms, California, United States of America) voice notes which were transcribed and included in the data analysis.

Data Analysis

Audio recorded interviews were transcribed and subjected to inductive-dominant, manifest content analysis. (15) After familiarisation with the data by repeatedly listening to audio recordings of interviews and reading interview transcripts, meaning units were identified from the text, and condensed. Codes that maintained the fundamental concept of the original meaning units were then formulated. These codes were collated into categories to the manifest level and assessed, reviewed, and refined repeatedly until saturation. (16) This was done by the primary researcher (SH) using NVivo Software (QSR International, Doncaster, Australia). Codes and categories were continually refined through investigator triangulation. The coding tree below (table 1) illustrates the categorical development.

Table 1: Category Development		
Meaning Unit	Code	Category
“the down time kind of points to the fact that resuscitation will be of no use”	No Flow Time	Assessment of Prognosis
“there was nothing that could have been done but we still tried, because that’s what we do”	Duty to Act	Internal factors affecting decision-making
“I think it’s where we as practitioners start to think about what the knock-on effect will be on the system”	System Impact	External factors affecting decision-making
“we don’t have public AEDs, we only have a select few in airports and gyms, but it’s not that common like we would like it to be”	Early Defibrillation	System Challenges
“guide on your approach, and a holistic approach and a technical approach to commencement and termination of CPR would be very valuable”	Decision-making Aid	Ideas for Improvement

Qualitative Rigour

To create a trustworthy qualitative study, the Guba framework was used as a guideline to ensure credibility, transferability, dependability and conformability. (17)

Credibility was improved by using established methods (18), through basing the line of interview questioning and data analysis methods off those that were used in previous similar studies (12, 13), through voluntary enrolment of participants that met the defined criteria for inclusion, and piloting the interview schedule prior to initiation of interviews.

Transferability was improved by providing an in-depth description of the study context so that readers may apply findings that are relatable to their context. (18) Established methods (18) were used to improve dependability of the study, through detailed reporting of the study design and provision of a coding tree, enabling future researchers to repeat the study.

In order to improve confirmability , the primary researcher's pre-dispositions were admitted and the research supervisor acted as a secondary data analyser to reduce bias. (18) Ethical approval for this study was granted by the University of Cape Town's Human Research Ethics Committee (HREC Reference 101 / 2021 – Appendix F).

Results

Ten participants with varying backgrounds and with a mean of 8 years of experience (range 1.5 – 18 years) were included in the study. Interview lengths ranged from 28 minutes to 79 minutes (mean 54 minutes) . Their demographics are presented in table 2 below.

Table 2: Participant Details				
Participant	Self-identified Gender	Qualification	Sector of Employment	Experience
P1	M	ECP	Public, Urban	15 years
P2	M	ECP	Private, Urban	2 years
P3	M	ECP	Private, Urban / Rural	10 years
P4	M	ECP	Public, Urban	3 years
P5	M	ECP	Private, Semi-rural	1.5 years
P6	M	ECP	Private, Urban / Rural	2 years
P7	F	ANT	Public, Semi-rural	17 years
P8	M	ANT	Public, Semi-rural	18 years
P9	M	ECP	Public, Urban / Rural	8 years
P10	F	ECP	Private, Urban / Rural	4 years

After analysis, 29 codes, 12 sub-categories, and five categories were developed. When asked what factors influence their decision making, participants said that it was multifactorial and based on patient- and situation-dependent factors. These factors were divided into five categories, being: 1) assessment of prognosis, 2) internal factors affecting decision-making, 3) external factors affecting decision-making, 4) system challenges, and 5) ideas for improvement. The results are summarised in table 3 below.

Table 3: Main Categories, Sub-categories and Codes

Category	Sub-category	Code
Assessment of Prognosis	History	Age
		Medical History
		Cause of Arrest
	Clinical Presentation	First Monitored Rhythm
		No Flow Time
		Duration of Resuscitation
	Response to Resuscitation	ECG Rhythm Changes
		ETCO ₂ Changes
		ROSC
Internal Factors Affecting Decision-Making	Emotion	Duty to Act
		Fear of Litigation
		Empathy
	Contemplation	Buying Time to Make the Decision
		Consequence of Actions
External Factors Affecting Decision-Making	Family	Family Wishes
		Financial Implication on Family
	Safety	Scene Safety
		Safety During Transport
	Disposition	Availability of Resources at Receiving Hospital
		System Impact
System Challenges	Bystander Response	Early Defibrillation
		Bystander CPR
	Resources	Prehospital Resources
		Limited Hospital Resources
		Inequality
Ideas for Improvement	Training	Decision-Making Aid for EMS
		Public CPR Training
	Support	Emotional Support for EMS
		Debrief

Assessment of Prognosis

Assessment of prognosis describes the clinical considerations used to assess the viability of the resuscitation. Factors including history, clinical presentation, and response to resuscitation contributed to assessing whether the prognosis might be positive or negative, and influence survivability or futility respectively.

History

The history obtained by the participants upon arrival on scene consisted of age, medical history, and cause of arrest. Patient age was never mentioned in isolation but emerged as a strong influence on decision-making. There appears to be a link to emotion when it comes to younger patients, and particularly children. *“There’s a lot more of an emotional aspect to why we don’t stop in the younger population when they go into cardiac arrest.”* **Participant P10.** Decision-making was portrayed to be a lot more difficult in cases of paediatric patients. Participants also pronounced their willingness to start resuscitation, *“go all out”* and *“give it a bit more”* when it comes to children and described their cut off time for duration of resuscitation to be *“almost non-existent.”* **Participants P4 and P9.**

There does not appear to be a specific age cut off for resuscitation in paediatric or elderly patients, but older age was linked to poor prognosis: *“prognosis is a lot poorer in someone who is older than someone who is younger”.* **Participant P10.** Advanced age was also a perceived link to little chance of returning to baseline after resuscitation: *“the relatively old and frail... the chances of them going back to the way they were is not that great in my opinion.”* **Participant P9.**

Although not as obvious as the link with children, emotion also seemed to influence decision-making in resuscitation of elderly patients. Upholding patient dignity was more important than the act of CPR in elderly patients, *“rather than crushing this old lady’s chest just because you need to now do CPR and then rather giving her a dignified death or last couple of moments with the family.”* **Participant P3.**

Often combined with patient age, medical history was another factor that determined prognosis. Participants mostly referred to baseline and quality of life, general appearance (emaciated or obese), and the presence of terminal illness as influencers

of their decision-making. *“Higher likelihood of resuscitating a patient that has less pathologies”*. **Participant P6.**

The cause of arrest is the presumed reason that the patient went into cardiac arrest. (19) When speaking about the cause of arrest affecting prognosis, participants gave examples that would sway their decision such as terminal illness, reversible and irreversible causes of cardiac arrest. The irreversible causes mainly referred to trauma which was described as unlikely to result in a successful resuscitation: *“Generally if they’ve gone into a traumatic cardiac arrest, the likelihood of getting them back is very slim”*. **Participant 10.**

Clinical Presentation

The first monitored rhythm, no flow time, and duration of resuscitation determined the clinical presentation. The first monitored rhythm is the patient’s cardiac rhythm when the monitor is first attached following a cardiac arrest. (19) An initial rhythm of asystole, when combined with other factors, was a reported reason to withhold CPR. *“If the patient is asystole when you arrive, we’re not going to be starting.”* **Participant P2.** Asystole was also described as an indicator of prolonged no flow time, which is another factor that influenced participants’ perception of prognosis. *“That usually points towards more of a prolonged down time in cardiac arrest than anything else.”* **Participant P3.**

While the decision to initiate CPR in patients presenting with a shockable first monitored rhythm was unanimous, participants found the decision to be more difficult when the patients present with pulseless electrical activity (PEA). *“With PEA specifically I think it’s a bit of a difficult one to just make a decision.”* **Participant P3.**

The cardiac rhythm was also a factor that influenced the decision to terminate resuscitation with participants stating that a cardiac rhythm regressing from a shockable to a non-shockable rhythm would prompt them to terminate resuscitation.

The duration of no flow time is measured as the time a patient collapses to the time of initiation of CPR. (10) Components of no flow time that affected decision-making were the location of the incident and resultant response time. *“If you respond to areas that are 50, 60 kilometres away for a cardiac arrest... you start asking questions about*

resuscitation and whether it's viable." **Participant P10.** The incidence and quality of bystander CPR were also components of no flow time that affected decision-making. *"Whether there was bystander CPR that was of good quality."* **Participant P8.**

The presence or absence of ongoing CPR on arrival not only affected the initiation or withholding of CPR respectively, but also affected the duration of the resuscitation thereafter. *"If there was [CPR], I'd be inclined to go on a bit longer, if there wasn't, I'd be inclined to not go on longer."* **Participant P8.**

Duration of resuscitation describes the length of time the resuscitation has been ongoing and its effect on prognosis. (20) While there was no consensus on a specific timeframe after which resuscitation becomes futile, prolonged resuscitation efforts were described as *"doing more harm than good."* **Participant P10.** A relationship between the duration of resuscitation and the response to resuscitation was also described. *"It's the relationship between how long we have been going and what the patient has given back to us."* **Participant P7.**

Response to Resuscitation

The response to resuscitation was determined by ET_{CO}₂ and ECG rhythm changes or Return of Spontaneous Circulation (ROSC). *"ET_{CO}₂ can guide whether or not you will have a better possibility for ROSC and a better recovery rate."* **Participant P5.** *"Generally, if the patient never goes into any kind of other rhythm, that's another factor that I would consider."* **Participant P10.** ET_{CO}₂ and its measurement of the response to resuscitation also affected the duration of resuscitation. *"If someone has got higher ET_{CO}₂ levels, then ja, let's give it a bash, give it a longer bash."* **Participant P7.** For practitioners to continue resuscitation, they need to see a meaningful change in response to their resuscitation efforts. *"Resuscitation is a two-way street, and it's what I'm putting into the machine and what the machine is capable of simulating and giving back."* **Participant P8.**

Internal factors affecting decision-making

Internal factors affecting decision-making describe the participants' inherent values and viewpoints that affect their decisions in resuscitation. These factors were divided into those that were driven by emotion and those of contemplation.

Emotion

The emotions affecting decision-making were duty to act, fear of litigation, and empathy. Duty to act describes the participants' drive of wanting to save lives motivating their decision to resuscitate. Participants described wanting to do the most for the patient and doing everything they can. *"You always have this inclination to do the most."* **Participant P1.** *"I'm going to kind of give the best care that I can even if it does end up being futile."* **Participant P2.** One participant also described the failure point of paramedics being when the patient dies. *"Our failure point, our end of game is when they die."* **Participant P8.**

Fear of litigation describes the tendency to initiate or continue resuscitation due to their fear of not being able to justify their decisions. *"You have to think about these things in order to justify why you are terminating."* **Participant P10.** Fear of legal consequence also emerged as an internal factor affecting decision making. *"If you have a slow bradycardia type of PEA or agonal type of PEA, like I said, medicolegally it's not really allowed to just terminate"*. **Participant P3.**

Contemplation

Buying time to contemplate the consequences of their decision was an internal factor affecting decision-making. It describes the initiation and continuation of resuscitation as a means to buy time to find out more information before making a decision to terminate or continue. *"I generally get the engine running while I'm digging into the clinical picture, baseline, family wishes."* **Participant P8.** This initiation of resuscitation for the purpose of obtaining information was also explained as being only at BLS level. *"I would generally go on with the resuscitation, but not to the full extent of advanced life support."* **Participant P9.**

In addition to the legal consequence, participants also considered what the outcome of their decision-making may have on the patient, their family, and the system. *"There's normally some sort of deficit which wasn't there prior to the cardiac arrest... I do think of the burden that you [the patient] might be on the family."* **Participant P9** *"You could get ROSC on that patient and intubate, put them on a ventilator, take them to hospital, but who are you depriving for that patient to be there?"* **Participant P4.**

External factors affecting decision-making

External factors describe the components of decision-making that are not related to the patient or the practitioner, but that may be encountered on a scene and influence the decisions made. These factors include family, safety, and disposition.

Family

Family wishes, as well as the financial implication of the resuscitation on the family were considered. Family wishes describes the verbal or non-verbal communication with the patient's family members to ascertain what it is that they want from the resuscitation. *"There was this expectation that there was more for us to do."*

Participant P5. Certain cues from family members indicated that the family were ready to let their family member go. *"Usually the family are so tired, suffering from so much acopia from tending to their loved one, that they will say I think it's okay, let them go."* **Participant P8.**

There are also occasions in which family members cause the resuscitation to continue beyond the point that it would have been terminated. *"So will it push me to make an extra 2 minute round of CPR? Ja, fair enough, it's not going to cost me anything, if that's what they desire."* **Participant P7.** Allowing family members to be present during resuscitation and see the ongoing efforts by EMS was endorsed by participants as a good way of providing closure. *"They can see that we are doing everything we can."* **Participant P10.** *"You can help them find closure."* **Participant P2.**

The financial implication on the family was a factor considered by participants as the potential financial burden that a survivor of cardiac arrest may place on their family during recovery or once they have returned home with additional care requirements. *"There's normally some sort of deficit which wasn't there prior to the cardiac arrest. I do think of the financial burden, or the burden that you might be on the family."* **Participant P9.** *"It was a low-income family and they also mentioned that the cost on the family itself for therapy is ridiculous. It burdens the family."* **Participant P5.**

Safety

Safety described not only the factors that influenced the decision not to start resuscitation due to the scene not being deemed safe enough to approach the patient,

but also the factors that influenced the decision to initiate or continue resuscitation due to interpersonal threats. *“I think for us especially in the provincial sector for example hazards is a big thing which can lead to the decision not to start or to terminate.”*

Participant P7. *“When it started to look like we weren’t going to resuscitate, they [the family] became very, very aggressive towards us, so it was actually a safer option to resuscitate.”* **Participant P5.**

Safety was also linked to a delay in reaching the patient due to the need to wait for a police escort. *“Will I get a police escort, even though I know that it is going to delay my time at the scene.”* **Participant P10.** Aside from tactical threats, the danger of ongoing resuscitation in the back of an ambulance during transport to hospital was mentioned. *“Performing resuscitation en route, this is not really safe.”* **Participant P3.**

Disposition

Disposition describes the participants’ consideration of the facility to which the patient should be transported to and the capability of the facility to continue care, as well as its distance from the scene. *“Where we’re going will the patient be able to get a ventilator, if the patient is resuscitated successfully, will we have the availability of cardiac support?”* **Participant P3.** Location of the cardiac arrest brought about questions as to whether the patient would survive the journey to the receiving facility where definitive care could be delivered. *“Is the hospital that needs to give you the definitive care kind of close by? Can I get you there within a relatively safe period?”* **Participant P9.**

Also considered as a component of patient disposition, system impact was described as the overall impact on the healthcare system that OHCA decision-making may have. Participants took their setting into consideration when speaking about the impact that their individual decision may make on the system. *“If you look at the systems that need to be in place... chain of survival that needs to occur throughout the entire healthcare system... that becomes a very, very big expenditure on our healthcare GDP.”* **Participant P1.** Individual decision-making was described as having a knock-on effect on the system. *“I think it’s where we as practitioners start to think on what the knock-on effect is going to be on the system.”* **Participant P9.**

System challenges

System challenges is a category that emerged while participants were describing the factors that influence their decision-making. It describes some of the obstacles encountered and how they contribute to the futility of prehospital resuscitation in the Western Cape. These obstacles are sub-divided into components of bystander response and resources.

Bystander Response

Early defibrillation was said to be one of the challenges within the Western Cape. *“Because we don’t have public AEDs – we only have a select few in airports and gyms – but it’s not as common like we would like it to be.”* **Participant P9.** Apart from an unavailability of AEDs and the resultant barrier to early defibrillation, one participant expressed their concern over the absence of defibrillators on some ambulances. *“I think it’s criminal that there aren’t AEDs on every single ambulance.”* **Participant P8.**

Lack of bystander response was highlighted as a challenge within the EMS system in the Western Cape. *“I think there are a lot of people that don’t even start bystander CPR.”* **Participant P2.** The reason was said to be lack of public education and its high cost. *“Education-wise there’s almost nothing... so obviously the cost would be significant.”* **Participant P3.** One participant expressed concern over the suitability of an education program for the public on CPR in the Western Cape. *“I just don’t know if we actually have the correct setting for it to be properly administered.”* **Participant P6.**

Resources

There were many challenges relating to EMS dispatch that were identified. Linked to the lack of bystander CPR, one participant claimed that call-takers and staff in the call centre do not coach CPR. *“Our dispatcher or our call-takers don’t do like that on call how to perform CPR with a patient.”* **Participant P2.** Another participant expressed concern over its efficacy. *“... call-taker headed CPR and that kind of stuff, I don’t know if that’s working.”* **Participant P4.** Obtaining incorrect or incomplete call details and resultant inappropriate resource allocation is also occurring because scripted call-taking is not utilised in the Western Cape EMS call centre. *“we don’t have any scripted call-taking.”* **Participant P9.**

There were conflicting opinions on the resources available prehospitally in the Western Cape. Some participants described the Western Cape EMS as well-resourced in the urban areas. *“I think we’re pretty well-resourced prehospitally in the Western Cape, Cape Town Central.” Participant P1.* *“At the moment in the Western Cape we are actually pretty well sorted with the things that we need.” Participant P4.* Other participants felt that there was a lack of resources prehospitally. *“Prehospitally at the moment we are lacking in resources.” Participant P2.* *“We have an imbalance between the number of calls pending on our board versus available resources.” Participant P9.* It seemed to be unanimous that there is a shortage of ALS practitioners in the Western Cape. *“Usually, the response radius for ALS is quite far, being quite a scarce resource.” Participant P2.*

In-hospital resources were more of a concern than prehospital resources in the Western Cape. Community Healthcare Centres, decentralised primary healthcare facilities located around the province, were described as not being fully equipped and of being incapable of managing ROSC patients appropriately. *“...goes to a clinic where they have no infusion pumps, no ventilator...” Participant P4.* *“They won’t have the capability to actually manage the patient further.” Participant P2.*

The main concern with tertiary hospitals was the availability of ICU beds and the improper allocation of hospital beds. *“The decision is always how many beds are available in the ICU.” Participant P4.* *“There is resuscitation space or areas set up for those patients, that in fact will be occupied by someone that technically does not earn them...” Participant P2.*

Inequality was another system challenge that was identified during the interviews. Disparities in access to care exist between members of the population that have medical insurance and those who do not. *“Access to those PCI facilities becomes limited if you do not have medical insurance.” Participant P1.* *“There was proper post-cardiac care, the cardiologist was involved...[referring to a ROSC patient that was transported to a private hospital]” Participant P5.* In addition to medical insurance, patient location also affects patient access to EMS. The distribution of ALS practitioners and resources was described as unequal and unfair. *“That’s not even*

equally distributed in terms of our population burden, or our population density... even in the metropole those resources aren't distributed fairly or equally." **Participant P1.**

Ideas for improvement

While identifying system challenges, participants also brought forward ideas for system improvement. These ideas included improvements in training for both EMS and bystanders, as well as emotional support and debrief for EMS following a cardiac arrest case.

Training

While most participants found their theoretical and practical resuscitation training to be adequate, training on OHCA decision-making was said to be inadequate. *"You get taught how to do an ALS resuscitation, but you don't get taught when to do an ALS resuscitation, or when to terminate."* **Participant P10.** There was also a notable concern over the lack of an OHCA decision-making guideline. *"I just feel that we don't necessarily have clear guidelines on when, how, where."* **Participant P1.** *"There were no real clear guidelines to say these patients get CPR, these don't get CPR."* **Participant P9.** Participants expressed the need for improved training and a contextually appropriate guideline to assist with decision-making. *"...as a starting point for new practitioners, absolutely the guide on your approach, and a holistic approach, and a technical approach to commencement in termination of CPR would be very valuable."* **Participant P8.** *"...it has to be contextual within the specific geographical area that you work in."* **Participant P9.**

Good-quality bystander CPR and early defibrillation were factors that influenced decision-making in OHCA. Improving bystander CPR was one of the ideas brought forward. *"I think we can do quite a lot more with regards to the first responder bystander CPR."* **Participant P3** Suggestions were made to implement CPR training at a school level. *"I think if we can implement something at school level..."* **Participant P3.** One of the participants drew a connection between the presence of a volunteer community first responder organisation and earlier initiation of CPR from their experience. *"The first responders who go out to all of these calls... CPR is generally started a lot sooner than if they weren't there."* **Participant P10.**

Support

Emotion was evident at various points in every interview. Not only does emotion affect decision-making, but its effect and how it is dealt with was also identified as a challenge within the EMS community. It is clear that certain resuscitation cases have an emotional effect on practitioners. *"I've just been like very upset and despondent afterwards because I had to make a decision to terminate."* **Participant P10.** There appears to be a stigma associated with expressing emotion following a cardiac arrest. *"He's going to tell me but why do you allow it to affect you, you should man up."* **Participant P9.**

Emotional support for EMS staff following a difficult resuscitation case was described as lacking. *"Even though everywhere there are... health and wellness and our care pneumatic and we care about our people and it kind of ends there. It ends on the nice poster."* **Participant P9.** A suggestion was made to establish a team dedicated to regular emotional support. *"For the daily occurrence of those kind of calls we should have an in-service...team which focuses on these kind of things."* **Participant P9**

Debriefing was identified as an important component of a cardiac arrest case. *"....it helps a lot for team cohesion and team development."* **Participant P9.** Debrief was also identified as an opportunity to offer and receive emotional support from colleagues after a difficult case. *"Part of the debrief was: is everyone okay? Is there anything that you want to get off your chest. We know it was a difficult case."* **Participant P10.**

Discussion

The aim of this study was to explore the views and perceptions of ALS practitioners on initiating, withholding, and terminating resuscitation in OHCA in the Emergency Medical Services of the Western Cape. Factors affecting decision-making were often described as multifactorial and based on patient- and situation-dependent factors. These factors included history, clinical presentation, response to resuscitation, emotion, contemplation, family, safety, and disposition. System challenges relating to bystander response and resources were identified and ideas for improvement in training and support were brought forward.

The multifactorial nature of the findings is in line with those of the exploratory study by the Brandling et. al that factors presenting at each phase of the decision-making process resulted in variability of practice amongst prehospital practitioners in the UK. (12) This variability is also consistent with the emotion that was found to affect the decision-making of our participants.

Clinical considerations such as age, medical history, cause of arrest, first-monitored rhythm, no flow time, duration of resuscitation, and response to resuscitation were used to assess prognosis. Brandling et. al also found ECG rhythm, co-morbidities (medical history), and patient age to be factors that influenced practitioner decision-making in OHCA in the UK. (12) Anderson et.al found factors relating to the chain of survival (no flow time, bystander CPR, shockable presenting rhythm, and quality of life (patient age, disability, co-morbidities)) to affect OHCA decision making in New Zealand. (13) These findings are all in line with evidence that the most important predictors of survival in OHCA are the first monitored cardiac rhythm, patient age, and no flow time. (21)

A shockable first monitored cardiac rhythm made the decision to initiate resuscitation easy for participants which is likely due to resounding evidence of patients presenting with a shockable rhythm being more likely to survive to hospital discharge than those who present with a non-shockable rhythm. (21, 22)

The strength of association between a shockable first monitored rhythm and survival to hospital discharge is greater in locations where there is public access to an AED (22, 23), but in resource constrained settings, such as South Africa, the cost of mass public-access AED programs make their implementation difficult. (8) Considering that the overwhelming majority of OHCA in Cape Town occur at home (24), equipping community-based first responders with AEDs could improve the time to defibrillation for OHCA .

No flow time, as a factor of prognosis that influenced practitioner decision-making in OHCA, was consistent with evidence that a “no-flow” time >12 minutes (95% CI 11-13 minutes) and a “low flow” time >33 minutes (CI 29-45 minutes) was associated with a 30-day survival of less than 1%. (25) An extended no flow time could be attributable

to delayed response times in Cape Town (8), lack of telephonic CPR guidance by EMS call-takers (26), and identified barriers to bystander CPR. (27) Each of these components were identified by the participants as system challenges.

Encouraging bystander CPR and improving EMS response times are shown to improve survival. (23) Considering the high costs of implementing mass public CPR campaigns (28), this training could rather be focused in areas with high incidence of OHCA or to family members of high-risk patients. (24) Telephonic CPR is a cost-effective means to increase rates of bystander CPR (29), but this would require call-taker recognition of OHCA to be improved.

Getting resuscitation under way (taking over and administering interventions before gathering further information), was a finding from the Anderson et. al paper (13) that was consistent with our code “buying time to make decision”. Participants often initiated resuscitation to buy time to make a decision because they accept that there is a strong responsibility of the decision that could have a legal consequence. This fear of consequence explains the decision. This finding is similar to that of the Brandling et. al paper which found “fear of litigation” to be one of the personal values and beliefs that influenced practitioner decision-making. (12)

In addition to legal consequence, participants considered the greater consequence of their decision-making on the healthcare system. For many, the decision to resuscitate was not made in isolation or based on the individual patient, but with consideration of the impact that resuscitating a patient with a poor prognosis may have on the system. Patient disposition (availability of hospital beds and continuation of care), financial implication on the family, the patient’s quality of life after resuscitation and their dignity, as well as the system impact (cost of continuation of care and bed availability) were all considered by participants. These considerations are in line with evidence that there are insufficient percutaneous coronary intervention facilities in the Western Cape (30), as well as a national shortage of ICU beds (31) for post-ROSC care. These findings are unique, as most prehospital practitioners would not have to worry about them and none of the literature from HICs included these factors in their findings.

The external factors affecting decision-making were family wishes and safety. This is consistent with the findings of the Brandling et. al paper that interpersonal factors, such as influence from bystanders or family, as well as risk factors, such as safety influenced OHCA decision-making in the UK. (12) Anderson et. al also found family wishes to be a factor affecting decision-making in New Zealand. (13)

Each of these factors are related to emotion. Threats to safety, as well as family wishes could stimulate a decision driven by fear. (13) Participants described situations in which they felt threatened by family members, resulting in an obligation to initiate or continue resuscitation. Fear of legal consequence is also linked to family wishes, as practitioners are fearful of terminating resuscitation when the family is not in agreement. However, participants also described the presence of family members during resuscitation resulting in better acceptance of termination, which is in line with evidence that inviting family members to be present during resuscitation has been shown improve their understanding of the patient's condition and provide closure. (32) Safety was also linked to no flow time and emotion, as participants explained their guilt for delaying response time by having to wait for a police escort to enter certain areas.

The internal factors that affect decision-making were predominantly based on emotion. Similar to the finding of the Anderson et. al paper of "doing everything" (ensuring that everything that could be done was done, nothing missed, provides peace of mind) (13), the code "duty to act" described the participants' emotion of wanting to save lives motivating their decision to resuscitate. The emotion and the identity of a paramedic is seated in wanting to saving patients, but there is a sense of conflict in the emotion between the need to save and the ability to save. (33)

To improve outcomes following OHCA, each component of the chain of survival must be developed (11), but the expense of bolstering OHCA resuscitation efforts in a low-resource setting like South Africa (8) might not be justified, given their cost effectiveness. There is a need for the development of evidence-based, context-specific policies and guidelines relating to OHCA and resuscitation in the Western Cape that are acceptable to the communities, policy-makers and healthcare workers. Resources should be allocated towards addressing the local burden of disease and contextually appropriate interventions to improve outcomes. (8, 24)

Limitations

This study has some important limitations. The findings are specific to the Western Cape, which has a more developed EMS system than the other provinces of the country (34) and this affects transferability of the findings to other provinces. There is an inequitable gender representation with the vast majority of the participants identifying as male. This lack of gender diversity is a study limitation. Components of the introduction that was read to the participants before the interview may have influenced some of their answers, affecting the trustworthiness of the study.

Conclusion

This study explored the views and perceptions ALS practitioners on initiating, withholding, and terminating resuscitation in OHCA in the emergency medical services of the Western Cape.

We found that paramedic decision-making in OHCA was multifactorial and related to both patient and system factors. Some suggestions were made on how to improve this and most importantly is the development of a guideline to support decision-making.

Although this paper provides useful insight into the factors that influence OHCA decision-making in the Western Cape, the findings may not be transferable to all parts of the country due to variability of the capabilities of EMS systems in each province. We suggest that future research should focus on the factors affecting OHCA decision-making in other provinces of the country.

Conflicts of Interest

There are no conflicts of interest to declare.

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PART C: Appendices

Appendix A: Resuscitation Journal – Instructions for Authors

This article was written with the intention to submit to the Resuscitation Journal, as it is open access, and the findings are applicable internationally.

The instructions for authors can be found by following the link below:

<https://www.elsevier.com/journals/resuscitation/0300-9572/guide-for-authors>

Appendix B: Research Proposal

Views and perceptions of Advanced Life Support practitioners on initiating, withholding and terminating resuscitation in out-of-hospital cardiac arrest in the Emergency Medical Services of the Western Cape.

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This study is in partial fulfilment of the MPhil Emergency Medicine degree.

I, Sarah Amy Higgins, hereby declare that the work on which this thesis is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being or is to be submitted for another degree in this or any other university.

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Date: 14 September 2020

1. Title

Views and perceptions of Advanced Life Support practitioners on initiating, withholding and terminating resuscitation in out-of-hospital cardiac arrest in the Emergency Medical Services of the Western Cape.

2. Introduction

Non-communicable disease as a cause of death is on the rise. Cardiovascular disease was the main non-communicable cause of death in South Africa and the Western Cape in 2017, comprising of 18.4% of all deaths in the country. (1) Cardiovascular disease remains the predominant cause of out-of-hospital cardiac arrest (OHCA). (2)

The overall prognosis and neurological outcome associated with OHCA are rather poor and have remained unchanged for the past thirty years. There is a survival rate of approximately 10% following discharge from hospital. (3, 4) This is from the United Kingdom and the United States of America, which are both high-income countries (HIC). Overall survival following OHCA in low-to-middle-income countries (LMIC) has been reported to be poor, but studies are limited. (5, 6) South Africa is an LMIC with a limited healthcare budget and resources and is thus likely to have a lesser survival rate than other HICs.

Immediate Cardiopulmonary Resuscitation (CPR) can double or triple the chances of survival after cardiac arrest. (7) Early defibrillation is a critical component of improving the survival rate in patients in ventricular fibrillation. (8) HICs are more likely to have Automated Electronic Defibrillators (AED) and ambulances within close proximity, thereby increasing the chance of survival in OHCA. It can therefore be assumed that the survival rate of OHCA would be less in our setting.

Response times in South Africa are significantly longer than those reported elsewhere in the world. (9) There is an inadequate number of ambulances in the Western Cape to attend to the rising number of emergency cases (10), resulting in the increased response times. The longer the downtime before CPR is initiated, the less likely a successful resuscitation would be. This highlights the importance of a rapid decision upon arrival on scene of whether or not to initiate CPR, but also the viability of the resuscitation after a delayed response time.

The benefits of CPR and other interventions are considerable, but there is a natural end to life and the existence of modern techniques and interventions may, in some cases, prolong the lives of patients that have very little chance of recovery. The quality of life following cardiac arrest and the subsequent interventions within a system that isn't capable of adequate continuation of care may broach questions regarding whether the initiation and continuation of resuscitation are in the best interest of the patient and their family. (11)

If an ALS practitioner decides to resuscitate a patient, the approach is usually all-or-nothing. (7) The American Heart Association (AHA) Chain of Survival for adult OHCA recommends advanced resuscitation once CPR has commenced. (7) This means that advanced resuscitation will ensue until all reversible causes of cardiac arrest have been accounted for and treated where necessary. This resuscitation not only utilises an assortment of costly equipment but is likely to keep an ambulance crew and ALS practitioner occupied for some time, rendering them unavailable to attend to any other emergencies. This is especially important to consider in the context of LMICs and where a patient likely has a poor prognosis.

The decision to either commence or withhold resuscitation is equally important depending on the context. A swift decision to commence resuscitation in the appropriate context would result in a shorter time to CPR and defibrillation, thereby increasing the patient's chance of survival. (7, 8) On the other hand, the decision not to resuscitate and withhold advanced resuscitation where appropriate would save valuable resources. There do not appear to be clear-cut guidelines for Advanced Life Support practitioners for when to initiate or withhold CPR, or when to continue or terminate CPR in the pre-hospital setting in South Africa. Practitioners are often required to make a rapid decision regarding resuscitation and the purpose of the proposed study is to investigate what influences that decision.

Understanding the factors that influence a practitioner's decision to commence or withhold CPR or when to terminate resuscitation could uncover ideas that may be expanded and further explored to contribute to the development of a guideline for decision-making in OHCA for ALS practitioners in LMICs.

There are some studies from HIC that have explored the decision-making of ALS practitioners in OHCA. A cross-sectional study by Marco and Schears, published in the Journal of Emergency Medicine in 2003, conducted a survey to determine the practices surrounding the initiation, continuation, and termination of CPR in the pre-hospital setting, but with more of a focus on advanced directives. This study found that more experienced practitioners would withhold resuscitation in futile situations or if an unofficial advanced directive was present. (12)

Another study with similar objectives and methods was published in the BMC Emergency Medicine Journal in 2017. Also an explorative study, the authors aimed to explore the influences on decision-making when commencing and ceasing resuscitation efforts in out-of-hospital cardiac arrest. They found there to be three distinct phases in the decision-making process, namely: the call; arrival on scene and the protocol. Factors presenting at each phase influence the decisions of the practitioners and result in variability in practice. The influences were found to be factual information; protocols; research-based guidelines; cultural beliefs; interpersonal factors; risk factors and personal beliefs. (13) The methods used in this study were slightly different in that the authors elected to obtain their information through case discussions within focus groups. The proposed study will be making use of interviews instead, to open the topic for potential unpredicted outcomes.

Two other papers (14, 15) investigated similar topics, but with a quantitative approach. Brooks et. al measured (among other things) the variability in the initiation of CPR in OHCA across various EMS agencies by using a retrospective cohort study. A moderate positive correlation was found between the proportion of patients with resuscitation attempts and survival to hospital discharge.(14)

Herlitz et. al conducted a prospective observational study to evaluate whether or not patients with no chance of survival after OHCA can be defined. Factors associated with a low chance of survival were found to be absence of bystander CPR; non-witnessed cardiac arrest; cardiac arrest at home; increased time between the call for an ambulance and the arrival of EMS; and increased age. (15)

The paper with the most similarities to this proposed study was published in the British Medical Journal in 2018. The authors found that commencing or continuing resuscitation was sometimes a default action and that managing termination of resuscitation required confidence and experience. (16) The purpose of the study, as well as the methods, are the same, but since it was conducted in New Zealand, the content is likely to differ from what we might find in the South African setting.

None of these studies have described the views and perceptions of practitioners on OHCA in the unique South African setting, highlighting the need for more research on the topic.

3. Research Aim

This study aims to explore the views and perceptions of Advanced Life Support practitioners on initiating, withholding and terminating resuscitation in out-of-hospital cardiac arrest in the Emergency Medical Services of the Western Cape.

4. Objectives

This study purposefully has two objectives, which are to explore the views and perceptions of Advanced Life Support (ALS) Emergency Medical Services (EMS) providers relating to 1) initiating and withholding resuscitation efforts and 2) terminating resuscitation in patients with out-of-hospital cardiac arrest (OHCA).

5. Methodology

5.1 Philosophical Assumptions

Epistemologically, the researcher holds a pragmatism stance. Pragmatism is a philosophical perspective that emphasises the nature of experience, focuses on the outcomes of action and examines shared beliefs. Pragmatism is a directive to find practical answers to or assist in addressing tangible issues. The researcher strives to gain practical understanding and wisdom to inform action. (17)

The intention is to illustrate the views and perceptions held by the participants regarding OHCA within the Western Cape of South Africa.

5.2 Reflexivity Statement

I am an ECP myself and have been involved in resuscitation before. I am, therefore, the same as the sample population and believe that paramedics base their decision-making on futility, as well as external pressures on the scene. I also believe that ECPs tend to resuscitate patients inappropriately within the pre-hospital setting.

5.3 Research Design

A qualitative, descriptive design will be used for this study. One-on-one interviews conducted in a semi-structured format will be employed to collect data.

5.4 Study Population

The proposed study population aims to include ALS practitioners that are currently working within the pre-hospital setting in the Western Cape EMS.

Inclusion criteria:

1. Operational ALS practitioners working in Cape Town, Western Cape of South Africa with at least one year of experience in their current position.
2. ALS qualification must include one of the following:
 - Critical Care Assistant (CCA) certificate
 - National Diploma in Emergency Medical Care (N.Dip)
 - Bachelor of Technology in Emergency Medical Care (B.Tech)
 - Bachelor of Emergency Medical Care (B.EMC)

Advanced Cardiac Life Support (ACLS) including defibrillation, placement of an advanced airway and administration of pharmacological agents is within the scope of practice of ALS practitioners in South Africa. They are also entrusted with the decision of whether or not to initiate CPR in an OHCA setting and when to terminate resuscitation. Each of the above-mentioned qualifications consists of training that encourages critical thinking. Thought processes surrounding resuscitation will form the foundation of the proposed study and critical thinking plays a role in decision-making. It is for these reasons that ALS practitioners specifically, have been included in the study.

Exclusion criteria:

1. Basic Life Support (BLS), Intermediate Life Support (ILS) and Emergency Care Technicians (ECT)
2. ALS practitioners that do not yet have one year of operational experience
3. ALS practitioners that are not currently patient facing (e.g. managers, educators) in their position at work

ILS practitioners may decide to withhold resuscitation but are not permitted to terminate CPR without seeking clinical advice. BLS may not terminate CPR and may only withhold resuscitation in circumstances of obvious death, such as decapitation, mortal disfigurement, post-mortem lividity and putrefaction. (18)

The ECT is permitted to withhold and terminate resuscitation, as well as to conduct ALCS resuscitation, but has been excluded from the proposed study for a few reasons. While the ECT scope includes more than the ILS scope, many of the interventions are performed under consultation with a more senior clinician, including termination of resuscitation.

There will be an attempt to gather participants from diverse backgrounds and different organisations (both public and private) to incorporate a variety of perspectives. Once participants have been identified, interviews with ten to fifteen ALS practitioners will be arranged. When the data collected from the interviews has reached a point of saturation, the data will be transcribed. Data saturation is a measure used in qualitative research for discontinuing data collection or analysis. Saturation indicates that, based on data that have been collected and analysed up to a point, no further collection is necessary. (19) In the proposed study, saturation will be defined as the point at which further collection of data would no longer be helpful and no new ideas or perspectives are produced. (19, 20)

5.5 Recruitment of Participants

A brief description of the study will be sent to a continuous medical education group on WhatsApp (Meta Platforms, California, United States of America) that has many ALS practitioners as members. Those who are interested in participating in the study and meet the inclusion criteria will be asked to contact the primary researcher

via e-mail and will be welcomed to ask any questions or voice concerns. If both parties are happy, an interview will be arranged. If there is no interest generated by the initial broadcast message, individuals that meet the inclusion criteria will be approached by the primary researcher. Following the first few interviews, snowball sampling will be used.

5.6 Research Procedures and Data Collection Methods

Due to the current circumstances surrounding the COVID-19 pandemic, interviews will be conducted online via Microsoft Teams (Microsoft Corporation, Redmond, Washington, United States of America) by the primary researcher in a one-on-one meeting. For participants that do not have access to the internet or a laptop, interviews will take place telephonically and be recorded using a mobile application called Automatic Call Recorder. This is following an initial pilot discussion with another ALS provider (that meets the inclusion and exclusion criteria) known to the researcher and the research supervisor to guide the primary researcher, as well as confirm the suitability of the discussion schedule and ensure consistency. The first few interviews will be attended by the supervisor to initially guide and observe the discussions.

One-on-one interviews were selected over a group format, as the researcher believes that participants may be influenced by other members of the group when answering questions. This could be due to peer pressure, pride, or intimidation. She believes that participants may be more willing to openly share their experiences in a more private setting and the aim is to gain individual perceptions, not data gathered from a group conversation.

The interview schedule (Appendix C) will provide the primary researcher with a guide for the interviews to promote consistency throughout the process. It will consist of four questions. The first question refers to the demographics of the participant, qualifications and information pertaining to their experience within the emergency medical services in the Western Cape. The second question asks the participant for a generalized view on resuscitation in OHCA in the setting in which they work. The last two questions are regarding the factors that influence their

decision to commence or to terminate resuscitation in OHCA. Questions and prompts and probes were derived from previous studies on the topic. (12-16)

The role of the primary researcher during the interviews is to listen intently, provide prompts where necessary and offer an environment in which participants are comfortable to speak openly and honestly. The length of each interview is estimated to be one hour. Interviews will be recorded and then transcribed by the primary researcher for analysis. The aim will be to initiate data analysis while data collection is still taking place so that saturation can be established.

5.7 Data Safety and Monitoring

Following each interview, the recording will be transferred to the primary researcher's laptop where it will be backed up to cloud storage (iCloud). The audio recordings will be transcribed (omitting any identifying data) and stored in the same way. Transcriptions will be stored in such a manner that interviewees cannot be identified. The laptop upon which all collected data will be stored, as well as the cloud storage, is password-protected and only accessible by the researcher. The data will only be shared with the research supervisor. Data will be destroyed once the proposed study has been completed and submitted. Recordings and transcripts will be deleted from all devices, as well as from the cloud storage and deleted items folders.

5.8 Data Analysis

The proposed study is descriptive. Analysis of the transcribed data will be to the manifest level and will take an inductive approach, using the methods of Braun and Clarke. NVivo Software (QSR International, Doncaster, Australia) will be used to facilitate analysis. This approach consists of six phases. (21)

1. Familiarisation with the data:

- The researcher will transcribe the data herself
- Repeatedly read the transcribed data
- Note down initial ideas

2. Generating initial codes:
 - Apply notes and headings (meaning units) to sections of the data
3. Searching for categories:
 - Collate similar codes into categories
 - Gather all data relevant to each category
4. Reviewing categories:
 - Assess, review, and refine categories repeatedly
5. Defining and naming categories:
 - Refine specifics of each category
 - Generate clear definitions and names for each category
6. Producing the report:
 - Select gripping extract samples
 - Final analysis of extract samples
 - Relate the analysis to the initial research question and literature

5.9 Trustworthiness

To pursue a trustworthy qualitative study, the Guba framework will be used as a guideline to ensure credibility, transferability, dependability and conformability. (22)

5.9.1 Credibility

The line of questioning followed in the interviews, as well as the methods of data analysis, will stem, where possible, from those that have been used effectively in previous similar studies. (23) The sample of participants will be selected in accordance with the above-mentioned inclusion and exclusion criteria. Their willingness to participate will be indicated by completing the consent form (Appendix D) which states the purpose and aims of the proposed study. This will allow participants to refuse participation and ensure the involvement of only those who are willing to take part and offer information freely. (23) The interview schedule was piloted and adjusted before the initiation of interviews with the enrolled participants.

5.9.2 Transferability

The findings of a qualitative study are only transferable to a small number of specific environments and individuals and it is not possible to prove that the findings and conclusions are relatable to other situations and populations. (23)

The primary researcher will ensure that readers will be able to transfer the findings into their setting by defining the context of the sample. In this way, the reader will have the opportunity to associate the findings of the study with their context, but with the limitations of generalisability of qualitative research in mind. (23)

5.9.3 Dependability

The variable nature of the phenomena analysed by qualitative researchers makes repeatability more of a challenge than in quantitative studies. (24, 25) Demonstrating credibility helps to ensure dependability, as there are close ties between the two. (23) The processes within the study will be reported in detail, which should enable future researchers to repeat it by using the research design as a “prototype model”. (23) A coding tree will be used to show how codes were developed and a reflective appraisal of the project that evaluates the effectiveness of the processes will be included. (23)

5.9.4 Conformability

The intention is to convey the views and perceptions of the participants and not those of the primary researcher. The researcher has admitted her pre-dispositions. The research supervisor will act as a possible secondary data analyser and this will aid in reducing bias. (23) A detailed description of the methodology will be included to enable the reader to determine the extent to which the ideas that emerge from the study can be undertaken. (23)

6. Significance

If this thesis is published, the findings can be used as a frame of reference for pre-hospital emergency care personnel that can influence an aspect of their decision-making in OHCA. In addition to this, the study has the potential to uncover ideas that,

if investigated further, could contribute to the development of guidelines that are specific to the South African setting and even more specifically, the Western Cape.

7. Ethical Considerations

Since the topic being discussed is resuscitation, there is a risk of provoking an emotional response from the participant. In this case, distress protocol 1: the protocol for managing distress in the context of a research focus group/interview from “The distress protocol for qualitative data collection” will be followed. (26) If the participant indicates that they are feeling emotionally distressed or if they begin to cry or shake, the interview will be stopped immediately. The remainder of the stage 1 response and review stage will not be followed, as the primary researcher is not qualified to assess and treat mental health issues. The participant will be encouraged to contact their doctor or a mental health practitioner. The participant will be provided with the contact details for free telephonic psychology consultations via Echo Nova. (See Appendix E). A follow-up courtesy call will be made to the participant (with their consent) at a later stage to ensure that they are coping. Importantly, as ALS providers deal with OHCA on a daily basis, distress is unlikely.

There are no other foreseen risks to the participants and there will be no benefits to or remuneration for their involvement in the study. On the day of the interview, the participant will be informed of the process and assured that anonymity will be maintained throughout. Written consent will then be obtained from the participant to record the interview. This may be withdrawn by the participant at any point.

The identity of all participants must be protected, and confidentiality maintained throughout the process. No names or identifying factors of practitioners or patients will be transcribed from the audio recordings. Participation will be voluntary, and no reimbursement will be offered to participants.

8. Potential Limitations

Since the start of the COVID-19 pandemic, decision-making around resuscitation has changed in all healthcare settings. Concerns of limited availability of hospital beds and ventilators have altered the approach to patients in cardiac arrest, particularly in the out-of-hospital setting. It may be difficult for practitioners to recall what influenced their

decision-making before the pandemic and this could influence the outcome of the study. Yet, it is anticipated that certain principles may still emerge.

9. Dissemination Plan

1. Once the data analysis is complete, we will send out aggregated, anonymised results to the providers that were sampled.
2. The thesis that is produced will be published in OpenUCT, which is the open access institutional repository of the University of Cape Town.
3. We will seek publication preferably in an open access journal.
4. Either the thesis or the publication will be shared with the same Continuous Medical Education (CME) group that will be used to recruit the participants.

10. Project Outline

10.1 Resources

1. iPad with recording capability
2. Call recording application
3. NVivo software (QSR International, Doncaster, Australia) (supplied by UCT)
4. Laptop
5. Printer

The above-mentioned resources are currently in the possession of the primary researcher.

10.2 Project Timeline

Project Phase	Date
EMDRC	January 2021
HREC	February 2021
Data collection (interviews)	April 2021
Transcription	May 2021
Data analysis	June 2021
Write-up	July – January 2022
Final submission	February 2022

10.3 Budget

The estimated costs are calculated below:

Estimated Communication Costs		
Data Cost per GB	Estimated Data required	Total Cost
R80	5GB	R400.00
International call per minute	Estimated Length of Time	Total Cost
R4.00	120 minutes	R480.00
		R880.00

Other Costs			
Description	Cost Per Unit	Number of Units	Total Cost
Automatic Call Recorder App	R259.99	1 month	R259.99
Printing Costs	R1.00 per page	10 pages	R10.00
			R269.99

The total estimated cost is thus $R880 + R269.99 = \mathbf{R1149.99}$ which will be funded by the primary researcher herself.

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Appendix C: Discussion Schedule

Views and perceptions of Advanced Life Support practitioners on initiating, withholding and terminating resuscitation in out-of-hospital cardiac arrest in the Emergency Medical Services of the Western Cape

Notes to the interviewer: Instructions to the interviewer will appear in *italics*. Statements and questions that are required to be read out aloud will appear in **bold**. Additional prompts that may be required and points needing further explanations will appear in a

textbox

Facilitation: *Please read over this document before each interview to familiarise yourself with the process. The primary researcher should conduct each interview. She will be required to guide the discussion, write notes and operate the recording equipment. New information should originate from each interview until a point of saturation has been reached.*

Preparation: *A quiet, private location with a strong and stable internet connection must be available for both parties. The recording equipment will be tested before the interview starts. The participant should have filled in the consent form before the interview, as well as verbally consented to being recorded.*

Statement of Confidentiality: **It is important to note that there is no right or wrong way to answer any of the questions that will be asked in this interview. The purpose is to gain insight into your way of thinking and the factors influencing it. Everything that is said in this interview will remain confidential and you are welcome to withdraw your consent to participate at any time, including during the interview. Provide an opportunity for questions on confidentiality.**

Introduction: *Introduce yourself and thank the participant for their willingness to participate in the interview. Request an introduction from the participant, including a brief background on their involvement in the emergency medical services.*

An example of how to start the interview is as follows:

State the study number and gender of the participant for identification purposes.

My name is Sarah Higgins, an Emergency Care Practitioner, and the primary researcher for the study titled: Views and perceptions of Advanced Life Support practitioners on initiating, withholding and terminating resuscitation in out-of-hospital cardiac arrest in the Emergency Medical Services of the Western Cape. Thank you for agreeing to participate in my study and for making time to meet with me for this interview. I really appreciate it.

The overall prognosis and neurological outcome associated with OHCA are rather poor with very low survival rates. Immediate CPR can double or triple the chances of survival after cardiac arrest and early defibrillation is a critical component of improving the survival rate in patients in ventricular fibrillation. Response times in South Africa are significantly longer than those reported elsewhere in the world. The longer the downtime before CPR is initiated, the less likely a successful resuscitation would be.

The benefits of cardiopulmonary resuscitation (CPR) and other interventions are considerable, but there is a natural end to life and the existence of modern techniques and interventions may, in some cases, prolong the lives of patients that have very little chance of recovery. The quality of life following cardiac arrest and the subsequent interventions within a system that isn't capable of adequate continuation of care may broach questions regarding whether the initiation and continuation of resuscitation are in the best interest of the patient and their family.

The purpose of this interview is to gain insight into your views and perceptions of initiating, withholding and terminating resuscitation in out-of-hospital cardiac arrest in your setting.

Please can you introduce yourself and provide me with some insight into your working background and previous experience within the emergency medical services in the Western Cape. We will then proceed with the main questions of the interview. If I am unclear at any point or if you require further explanation, please don't hesitate to ask and I will clarify.

Please could you elaborate on your experience and background in the emergency medical services with a specific focus on advanced life support resuscitation?

Prompts:
• Demographics: Age and gender • Qualification(s) • Years of experience in current position • Approximate number of ALS resuscitations conducted

What are your views on resuscitation in out-of-hospital cardiac arrest in the setting in which you work?

Prompts:
• Resources available pre-hospitally • Continuation of care • Resources available in hospital • Costs

What would you say influences your decision to commence resuscitation when you arrive on scene to find a patient in cardiac arrest?

Prompts:
• Duration of downtime • Patient age • Presence of family members • Cardiac rhythm

What would you say influences your decision to terminate resuscitation?

Prompts:
• Duration of resuscitation • Cardiac rhythm • Family pressure • Age of patient • Predicted cause of cardiac arrest being irreversible

Conclusion of Interview: *Once there is no new information to be obtained, the interview may be concluded with the following:*

I would like to take the opportunity to thank you for agreeing to participate in my research. The insight into your thought process will add huge value to the study. Please feel free to contact me if anything else pops up after the interview.

Appendix D: Consent Form

Views and perceptions of Advanced Life Support practitioners on initiating, withholding and terminating resuscitation in out-of-hospital cardiac arrest in the Emergency Medical Services of the Western Cape

This form is for English-speaking Advanced Life Support Paramedics who wish to participate in a one-on-one interview (online via Microsoft Teams or telephonically) to discuss their views and perceptions on resuscitation in out-of-hospital cardiac arrest in the emergency medical services on the Western Cape.

Name of Primary Researcher: Sarah Amy Higgins

Name of Affiliations: University of Cape Town

Name of Research Supervisor: Dr Willem Stassen

This form has two parts:

1. Information Sheet (to provide information about the study to the participant)
2. Certificate of Consent (to be signed by the researcher and the participant)

Participants will be provided with a copy of both parts of the form.

Part 1: Information Sheet

Introduction

I, Sarah Amy Higgins, the primary researcher, am currently doing a Master of Philosophy in Emergency Medical Care at the University of Cape Town. As part of this course, students are required to undertake a mini dissertation. I am exploring the decision-making of pre-hospital practitioners on resuscitation in out-of-hospital cardiac arrest in the Western Cape. I am approaching advanced life support practitioners that are currently working within the pre-hospital setting in the Western Cape of South Africa to participate in the interviews. This document will provide participants with information about the study and invite them to take part in the research. If there is any part of this form or the research that is not well explained or easily understood, please do not hesitate to ask. You may contact me by telephone or e-mail on the details provided below and I will respond as soon as I can.

Voluntary Participation

Participation in the study is voluntary and your choice exclusively. There will be no consequences for your decision to participate or not to participate in the study. Even if you agree to participate now, you may withdraw at any point if you change your mind.

The Process

During the data collecting phase of the research, the following will take place:

- A one-on-one interview with the primary researcher will take place via a Zoom call (or telephonically under special circumstances).
- The number of participants to be interviewed will be determined by saturation.
- The length of the interview will be approximately one hour.
- The entire interview will be recorded so that the interviewer can focus on listening and transcription can take place at a later stage.
- Participants will be contacted once the data analysis phase has been completed to corroborate the interpretation of their interview.

Risks or Benefits

There are no predicted risks to participation in this study. If the interview provokes emotional distress, a distress protocol will be followed. There will be no benefit to and no remuneration for your participation in this study.

Confidentiality

All data collected during the research process will be kept confidential. The identity of all participants will remain anonymous throughout the entire process. No names or identifying factors of practitioners or patients will be transcribed from the audio recordings. Both the audio recordings and transcription thereof will be kept on a computer that is password-protected and is only accessible to the primary researcher. Each audio recording and transcription will be deleted after the data analysis phase of the study. If the research supervisor requires access to the transcribed interviews, participant and patient identities will remain anonymous.

Right to Refuse or Withdraw

Participants are not obliged to take part in this study. Participation may be withdrawn at any stage and there will be no consequence to that decision.

Ethics Clearance and Approval

The proposal for this research study has been reviewed and approved by the University of Cape Town's Human Research and Ethics Committee. Their role is to ensure the protection of participants from any research-related harm. The study complies with the ethical codes of the Helsinki Declaration and the South African Good Clinical Practice Guidelines.

Contact Details

If there are any questions you may have, you are welcome to ask them now or at a later stage. If you wish to ask questions at a later stage, you may contact Sarah Higgins on her mobile number: +974 5093 5623 (please note that international rates will apply for regular phone calls) or email address: sarahamyhiggins@icloud.com. You may also contact the UCT Human Research Ethics Committee for any queries relating to ethics approval for this study: hrec-enquiries@uct.ac.za or +2721 650 1236.

Part 2: Consent

Views and perceptions of Advanced Life Support practitioners on initiating, withholding or terminating resuscitation in out-of-hospital cardiac arrest in the Emergency Medical Services of the Western Cape

I have read the preceding information, or it has been read to me. I have been given the chance to ask questions and they have all been answered to my satisfaction. I consent voluntarily to participate in this research study.

The objective of the researcher taking an audio recording, the details of the storage of the recording and its ultimate destruction has been explained to me. An explanation on the recording of the interview has been offered to me and my questions on this have been answered to my satisfaction. I consent voluntarily to being audio recorded for the duration of the interview. I have been provided with a copy of this consent form.

Name of Participant:	
Signature of Participant:	
Date:	

Statement by the primary researcher:

I have read the information regarding the research study to the participant and ensured his or her understanding of the following process:

- A one-on-one interview with the primary researcher will take place via a Zoom call (or telephonically under special circumstances).
- The number of participants to be interviewed will be determined by saturation.
- The length of the interview will be approximately one hour.
- The entire interview will be recorded so that the interviewer can focus on listening and transcription can take place at a later stage.
- Participants will be contacted once the data analysis phase has been completed to corroborate the interpretation of their interview.

I declare than an opportunity to ask questions regarding the study and the process was given to the participant and that all questions have been answered satisfactorily.

I declare that the participant has not been pressured into consenting to any part of this process and that his or her consent has been given willingly.

A copy of this informed consent form has been provided to the participant.

Name of Researcher:	
Signature of Researcher:	
Date:	

Appendix E: Contact Details for Echo Nova



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Appendix F: Ethics Approval



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



Room G50- Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6492
Email: hrec-submissions@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/forms

30 March 2021

HREC REF: 101/2021

Dr W Stassen

Division of Emergency Medicine

F-51 OMB

Email: willem.stassen@uct.ac.za

Student: sarahamyhiggins@icloud.com/hwxsar001@myuct.ac.za

Dear Dr Stassen

PROJECT TITLE: VIEWS AND PERCEPTIONS OF ADVANCED LIFE SUPPORT PRACTITIONERS ON INITIATING, WITHHOLDING AND TERMINATING RESUSCITATION IN OUT-OF-HOSPITAL CARDIAC ARREST (OHCA) IN THE EMERGENCY MEDICAL SERVICES OF THE WESTERN CAPE MASTERS CANDIDATE-MRS SARAH HIGGINS

Thank you for your response letter, addressing the issue raised by the Faculty of Health Sciences Human Research Ethics Committee (HREC).

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

This approval is subject to strict adherence to the HREC recommendations regarding research involving human participants during COVID -19, dated 17 March 2020 & 06 July 2020.

Approval is granted for one year until the 30 March 2022.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.

(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

The HREC acknowledge that the student: Mrs Sarah Higgins will also be involved in this study.

Please quote the HREC REF 101/2021 in all your correspondence.

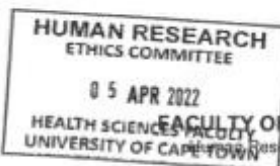
Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

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.

HREC/REF 101/2021sa



UNIVERSITY OF CAPE TOWN
(BUNYWEZITHU) IZAKHAYA • UNIVERSITEIT VAN KAPSTAD



FACULTY OF HEALTH SCIENCES
HEALTH SCIENCES FACULTY
UNIVERSITY OF CAPE TOWN
Research Ethics Committee



FHS016: Annual Progress Report / Renewal

HREC office use only (FWA00001637; IRB00001938)			
This serves as notification of annual approval, including any documentation described below.			
☒ Approved	Annual progress report	Approved until/next renewal date	30.3.23
☐ Not approved	See attached comments		
Signature Chairperson of the HREC/Designee	Signed by candidate		Date Signed 5/4/22
Note: Please email this form and supporting documents (if applicable) in a combined pdf-file to hrec-enquiries@uct.ac.za. Please clarify your plan for research-related activities during COVID-19 lockdown. Please use the latest form found on our website: http://www.health.uct.ac.za/fhs/research/humanethics/forms			
Comments to PI from the HREC			

Principal Investigator to complete the following:

1. Protocol information

Date (when submitting this form)	04 April 2022		
HREC REF Number	101/2021	Current Ethics Approval was granted until	30 March 2022
Protocol title	Views and perceptions of advanced life support practitioners on initiating, withholding and terminating resuscitation in-out-of hospital cardiac arrest (OHCA) in the Emergency Medical services of the Western Cape		
Protocol number (if applicable)			
Are there any sub-studies linked to this study?	☐ Yes	☒ No	
If yes, could you please provide the HREC Reference number for all sub-studies? Note: A separate FHS016 must be submitted for each sub-study.			
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