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Clinical paper

The barriers and facilitators to initiation of telephone-assisted bystander cardiopulmonary resuscitation for patients experiencing out-of-hospital cardiac arrest in a private emergency dispatch centre in South Africa



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Abstract

Background: The incidence of cardiovascular diseases, and with it out-of-hospital cardiac arrest (OHCA), is on the increase in low- to middle-income countries (LMICs), like South Africa. Interventions such as mass public cardiopulmonary resuscitation (CPR) training campaigns and public access defibrillators are expensive and out of reach for many LMICs. Telephone-assisted CPR (tCPR) is a cost-effective, scalable alternative. This study explored the barriers and facilitators to tCPR uptake in OHCA in a private South African emergency dispatch centre.

Methods: This qualitative study applied inductive dominant content analysis to emergency call recordings of OHCA cases into a private emergency dispatch centre. Calls were analysed to the latent level to identify barriers and facilitators. Cases were sampled randomly, until data saturation.

Results: Saturation occurred after the analysis of 25 recordings. A further three recordings were analysed to confirm saturation of the facilitators; yielding a final sample size of 28 calls. Overall, t-CPR was offered in 23 (82.1%) cases, but only initiated in 8 (34.8%) of these calls. Five barriers (“Poor Communication”; “Lack of Support”; “Caller Hesitance or Uncertainty”; “Emotionality”; and “Practical Barriers”) and three facilitators (“Caller Willingness”; “Support” and “CPR in Progress”) were extracted.

Conclusion: Numerous barriers limit the initiation of tCPR in the South African private sector EMS. It is crucial to address these barriers and leverage the facilitators in order to improve tCPR uptake. This study highlights the importance of using specific language techniques and developing tailored tCPR algorithms to overcome these barriers, which is underpinned by standardised training of call-takers.

Keywords: Out-of-Hospital Cardiac Arrest, Emergency Medical Dispatch, South Africa, Cardiopulmonary Resuscitation

Introduction

Out-of-hospital cardiac arrest (OHCA) is the cessation of cardiac activity and output that occurs outside of the hospital.¹ While there is generally a lack of African data on OHCA,² the incidence ranges between 6.4/100 000³ and 23.2/100 000 in South Africa⁴ to 31.3/100 000 in Cameroon.⁵ One of the leading causes of OHCA is cardiovascular disease, and more specifically ischaemic heart disease.^{6–7} Considering that the burden of cardiovascular disease in

Africa was expected to double between 1990 and 2020,⁸ it can be argued that similar trends could be anticipated in OHCA, even though data are sparse.

OHCA carries a high mortality rate, with survival rates ranging from 4.3% – 11%^{9–13} in high income countries (HICs), to as low as 0% in low-resource settings (LRS).¹⁴ In order to maximise survival with good neurological outcome a series of interventions, organised along a “Chain of Survival,” has been recommended.¹⁵ The Chain of Survival comprises six consecutive components: 1) early recognition and activation of emergency medical services (EMS), 2) early

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<https://doi.org/10.1016/j.resplu.2023.100543>

Received 3 October 2023; Received in revised form 28 November 2023; Accepted 14 December 2023

(bystander) cardiopulmonary resuscitation (CPR), 3) early defibrillation, 4) advanced resuscitation, 5) post-cardiac arrest care, and 6) recovery.¹⁵

By far one of the most important interventions towards improving survival following OHCA, is CPR.¹⁶ The efficacy of CPR in contributing to survival is time-dependent with every minute of delay in providing CPR and defibrillation decreasing the chances of survival by 7–10%.¹⁷ In order to increase the probability of victims of OHCA receiving bystander CPR or early defibrillation, international resuscitation organisations recommend mass CPR training campaigns of laypersons and the deployment of public access automated external defibrillators (AEDs).¹⁸ These interventions, however, come at a tremendous cost. Mass CPR training campaigns cost between \$22 539¹⁹ and \$62 600²⁰ per quality-adjusted life year (QALY) gained; public access AED deployment, on the other hand, has been shown to cost between \$30 000²¹ and \$1 102 473²² per QALY gained.

Such costs cannot be justified in low resource (African) settings with a limited fiscus, competing health priorities and larger burdens of disease and injury. The Chain of Survival is also considerably under-developed in Africa.² Against this backdrop, and considering a likely increase in the incidence of cardiovascular disease and OHCA in Africa,⁸ it is essential that these low- to middle income countries (LMICs) prioritise those interventions that have been proven to be cost effective.

One such intervention is telephone-assisted bystander cardiopulmonary resuscitation (tCPR).^{23,24} The implementation of tCPR has been associated with increased odds of initiating bystander chest compressions,^{25,26} often doubling the rate of bystander CPR.²⁴ The improvements in bystander CPR rates have resulted in improved survival to hospital arrival^{26,27} and 30-day survival rates.^{25,26} However, numerous barriers exist to the successful implementation of tCPR programmes and ultimately, to mobilise the bystander to administer CPR to a victim of OHCA.²⁸ This may include fear, anxiety, lack of confidence²⁸ or language proficiency.²⁹ South Africa is a middle-income country, with a multicultural society; and varying degrees of English language proficiency, education, and income. To our knowledge, no studies have looked at barriers and facilitators to the initiation of tCPR in this context. While limited data are available on OHCA from South Africa (and Africa),^{2–4} it has been demonstrated that bystander CPR rates are low.³

By understanding the barriers and facilitators to the initiation of tCPR, one could systematically develop strategies to overcome these barriers and exploit the facilitators. This may result in greater uptake, and perhaps improved survival without neurological deficit. The aim of this study was therefore to explore the barriers and facilitators to the initiation of tCPR for patients experiencing OHCA in a private South African emergency dispatch centre.

Methods

Study design

This qualitative study employed inductive dominant content analysis to determine the barriers and facilitators to the successful initiation of telephone-guided cardiopulmonary resuscitation for patients who have experienced out-of-hospital cardiac arrest. Ethical approval for this study was obtained from the University of Johannesburg's Research Ethics Committee (reference number: REC-1008–2021).

Study setting

South Africa has a formalised, tier 2³⁰ out-of-hospital emergency care system. Emergency Medical Services (EMS) in South Africa is provided by public, private and volunteer organisations. Private EMS mostly treat and transport the insured population, which accounts for 16% of the South African population.³¹ This study was conducted by analysing the emergency call recordings of a private EMS that operates nationally within South Africa. The emergency dispatch centre receives an average of 1500 calls per day. In this call centre, emergency call-takers generally do not have a medical background but receive in-house training on the call-taking systems and basic medical literacy. Out-of-hospital cardiac arrest is identified in this call centre by asking scripted questions related to consciousness and any signs of abnormal breathing. Depending on the answer to this question, the call-taker will be prompted to offer the caller tCPR instructions. If the offer is accepted, the caller will be transferred to a trained nurse that will facilitate. tCPR has been implemented in this emergency dispatch centre for several years.

Sample and sampling

Out-of-hospital cardiac arrest was defined as any call where a call-taker selected the incident type as “Cardiac Arrest,” and indicated that the patient was unconscious and not breathing. “Initiation of tCPR” was defined as agreement by the caller to be transferred to the nurse or to initiate CPR on the victim. Only incidents that occurred between 1 January 2019 and 31 December 2019 were included in the sampled population, in order to mitigate against potential confounding during the COVID-19 pandemic (2020–2022).

All instances of call category “Cardiac Arrest” as selected by the call-taker on the computer-aided dispatch system (CAD) were identified, exported and anonymised along with CAD notes. Anonymised exports were provided by the private EMS in a data spreadsheet (Microsoft Excel, Microsoft Corp. Richmond, WA, USA). From here, a filter was applied for unconsciousness and apnoea in order to confirm OHCA. Using the randomisation feature of Excel (“=RAND()”), an initial random sample of 50 calls were selected. In order of randomisation, the corresponding audio recording of the initial call was then retrieved from the audio archive for analysis. Sampling continued until data saturation. In this study, we defined data saturation as informational redundancy where new calls did not result in any new codes being generated.³²

Data analysis

Inductive dominant content analysis, to the latent level, was employed to identify barriers and facilitators to the initiation of tCPR.³³ After repeatedly listening to the audio recordings, field notes were made, and selected dialogue (containing meaning units relevant to the research question) was transcribed verbatim. No identifying information was transcribed. Audio recordings were tagged as instances where tCPR was initiated and where it was not. Meaning units from call recordings, field notes, and transcripts were manually coded in Microsoft Excel (Microsoft Corp. Richmond, WA, USA). Coding was done in duplicate by SC and HS. Once recordings were coded, codes were categorised and combined with latent data from the recordings (e.g. emotion) to generate themes. Themes underwent numerous iterations of refinement and revision through researcher triangulation between SC/HS and ET/WS.

The approach to content analysis as described by Erlingsson and Brysiewicz³⁴ had to be modified in this manner in order to

comply with local privacy regulations as stipulated by the private EMS. All data collection and analysis had to remain on site and no full transcriptions were allowable. All analyses were later reviewed and verified on site by the senior author (WS) who reviewed all transcripts, field notes, and codes alongside the original audio recordings.

Qualitative rigour

Trustworthiness of the research was ensured by considering credibility, transferability, confirmability and dependability.³⁵

Credibility was ensured by using established methods to answer the research question,³⁶ through random sampling, double coding, researcher triangulation and frequent debriefing sessions.³⁵ Two members of the research team (ET and WS) have formal training in qualitative research, HS has experience in qualitative research, and SC was given ad hoc training for the project. Confirmability was ensured through the bolstering of credibility and by transparent reporting of code and theme generation from the data (Table 1).³⁵ Dependability was improved through the use of established methods and detailed reporting of the research process according to an accepted reporting checklist, Consolidated criteria for reporting qualitative research (COREQ).³⁷ Lastly, transferability may be limited given that this study was only conducted in a single, private EMS however, a description of the setting is provided in order to allow the reader to make judgment on transferability of the results to their own setting.

Results

A total of 281 incidents were eligible for inclusion. Data saturation (as defined) occurred after the analysis of 25 audio recordings selected at random. A further three recordings were randomly sampled and analysed to confirm saturation of the facilitators, owing to low rates of tCPR initiation; yielding a final sample size of 28 calls. Overall, t-CPR was offered by the call-taker in 23 (82.1%) cases, but only initiated in 8 (34.8%) of these calls. In 6 (21.4%) cases CPR was already in progress when the call was made, and 8 (28.6%) cases had a previous CPR attempt on scene. In most instances, the caller was a family member ($n = 18$, 64.3%) or an acquaintance ($n = 4$, 14.3%) of the victim. The average (range; mm:ss) length of calls was 03:30 (00:36 – 13:09).

Regarding barriers (Table 2), a total of five themes were developed: “Poor Communication”; “Lack of Support”; “Caller Hesitation or Uncertainty”; “Emotionality”; and “Practical Barriers.” Table 3 outlines the facilitators identified, which were developed into three themes: “Caller Willingness”; “Support” and “CPR in Progress”.

Barriers to initiating tCPR

The theme “Poor Communication” was defined as communication that was disrupted by either bad signal or an absence of active listening (identified by phrases like “Sorry! Say again.” – **Caller (C) 22** and “I can’t hear you” – **C18, C19**); or passing the phone to a second caller due to the inability to adequately communicate the required information. Language discordance between the caller and call-taker also hindered communication and resulted in frequent interruption or passing the phone to someone else on scene or in the dispatch centre. Poor communication resulted in frustration and emotionality for callers and call-takers, “[caller swears] is that so hard for you to understand?!” – **C8**.

The theme “Lack of Support” was defined as any call where the latent impression was created that the call taker didn’t interact with the caller and wasn’t eager to help or support them (for instance, instead of offering CPR assistance the call taker would say “you want us to come do a declaration of death?” – **Call-taker (CT) 9**). This subsequently led to poor rapport.

The theme “Caller Hesitation or Uncertainty” was defined by the caller’s unwillingness to help the patient, or the lack of knowledge required to help the patient (“I don’t know if I can touch her or what” – **C3**). This theme also included any identifying factors that may have dissuaded the caller, including the category “a sense of finality” for patients where the caller had already decided the condition is irreversible, with phrases like “It’s too late, we’ve tried everything” – **C10**. This sense of finality (or acceptance) was also evident in instances of terminal illness, “I think, well I know, my wife died about an hour ago. . . she had terminal cancer, she was very frail.” – **C16** In other instances, the hesitation was expressed as rather wanting to wait for emergency services to arrive, “I’d rather wait for the paramedics” – **C21**.

The theme “Emotionality” was defined as too little or too much emotion expressed from the caller or call taker, identified by words like “we are all panicked” – **C24** or latent analysis of the caller’s tone being emotional. Lack of empathy displayed by the call-taker also resulted in poor communication or compliance with call-taker instructions. Lack of empathy was also manifest by discussing the cost of an emergency response during a stressful and emotional event, “there is a callout fee on our side. . .” – **CT8**.

The theme “Practical Barriers” was defined as any call where there were physical barriers to the initiation of CPR, for instance physical injury (“I’m in bed with a damaged back” – **C19**) or where the caller was not on scene. Another important category was instances where the private service is called after waiting a protracted time for a public ambulance service response, “I phoned [state service], but I’m still waiting. It’s been an hour already.” – **C15** These prolonged waiting times resulted in a sense of finality.

Table 1 – Thematic development process.

Meaning unit	Code	Theme
“I’d rather wait for the paramedics”	Not willing to intervene	Caller hesitation or uncertainty (B)
“We are all panicked”	Caller is panicked	Emotionality (B)
“I’ve never tried this before but I’ve looked it up”	Eager to help	Caller willingness (F)
“Yes, that is fine, that is normal”	Reassurance	Good communication (F)
“I’d like you to assist with CPR over the phone”	CPR coaching	Support (F)
“Yes, he’s a qualified doctor”	Qualified bystander	CPR in progress (F)

B: Barrier; F: Facilitator.

Table 2 – Barriers to initiating CPR.

Theme	Category	Description
Poor communication	Frequent interruption	Callers pass the phone around to different people to talk to the call taker or talking to people in the background.
	No active listening	Call taker misses important cues from caller and doesn't show interest.
	Connectivity and communication	Caller and call taker struggle to hear, leading to miscommunication.
Caller hesitation or uncertainty	Language barriers	Calls aren't made in the mother tongue creating barriers to communication.
	Unwillingness	Callers don't want to assist and just want the call taker to send help.
	Hesitation	Doubt is noted in the caller's speech and latent analysis.
Lack of support	A sense of finality	The inevitable is accepted owing to futility, poor prognosis or terminal illness.
	Previous CPR attempt	Caller creates the impression that they have given up after a previous attempt.
Practical barriers	No coaching	Call taker doesn't send the call to a nurse for CPR instructions.
	Poor rapport	Caller and call taker don't meaningfully engage with each other.
Emotionality	Caller not on scene	Caller can't assist due to proximity.
	Initial call to public EMS	Caller identifies the lack of public access to emergency health care and prolonged waiting times.
	Physically incapable	Caller has an injury that prevents the initiation of CPR.
Emotionality	Lack of empathy	Call taker is harsh towards caller with no empathetic words expressed.
	Frustration	Call taker and callers get agitated by the poor communication.
	Caller distraught	Caller has heightened emotions that prevent effective communication.

Table 3 – Facilitators to initiating CPR.

Theme	Category	Description
Caller willingness	Eager to help	Caller wants to assist the patient.
CPR in progress	Ongoing CPR	CPR is currently ongoing at the time of the call or the offer for tCPR.
	Qualified bystander	Caller says there is a professional doing CPR.
Support	CPR coaching	Caller gets told how to do CPR with step-by-step instructions.
	Reassurance	Call taker encourages caller.
	Empathy	Call taker talks with empathetic words.

Facilitators to initiating tCPR

The theme "Caller Willingness" was defined by a general eagerness or inclination to comply with instructions and initiate tCPR, in order to assist the victim "whatever it takes" – C13. This theme also outlines instances of positive or enthusiastic agreement when tCPR is offered, such as "Yes, I can do that!" – C2.

The theme "CPR in Progress" describes instances where a bystander was already attempting CPR when this was offered by a call-taker, for example "someone is doing CPR" – C22 or "we are trying CPR but he is unresponsive at the moment." – C27 The bystander doing CPR seemed to be a professional with the requisite training in cardiac arrest resuscitation, such as "... he's a qualified doctor" – C22 or "[The] Teachers are doing CPR" – C24. Additionally, previous CPR attempts also bore a relation to the barrier "A Sense of Futility" in that callers felt like their attempts were not working ("We did CPR, it didn't help" – C6) and that they have tried already, not willing to continue ("we've done it already" – C4). This led to bystanders giving-up, "It's too late, we've tried everything" – C10.

The theme "Support" was defined as when any form of successful assistance occurred like "I would like to assist with CPR over the phone until the ambulance gets there" – CT28; or reassurance and comforting of callers by call takers, for instance in response to

"while I was doing that thing, I felt like something was breaking inside" – C26, "Yes that is fine, that is normal" – CT26.

Discussion

This study aimed to explore the barriers and facilitators to the initiation of tCPR for patients experiencing OHCA in a private South African emergency dispatch centre. Following analysis, a total of five barriers and three facilitators were developed. Considering that the incidence of CVD and OHCA is increasing on the continent,⁸ and that very few OHCA interventions are as cost effective as tCPR,^{19–20,23–24} it is essential to investigate means to overcome barriers and exploit facilitators in order to improve uptake. This is especially important in contexts with low resources where training in basic life-saving skills is uncommon.³⁸

We found poor uptake of tCPR by bystanders despite call-takers offering tCPR often. Notwithstanding the barriers noted, poor uptake may be as a result of the way in which the call taker expressed the conditions of tCPR (i.e. language modality).³⁹ In instances where tCPR was expressed as dependent on the desire of the caller it has been found to decrease uptake, while when expressed as

imminent or an obligation it was found to improve uptake.³⁹ Considering language modality in the expression of tCPR conditions may assist with overcoming hesitancy and improving willingness in future interventions.

Poor communication was a prominent barrier to initiating tCPR, including language barriers. A recent tCPR study from South Africa found that 94% of participants felt that tCPR instructions should be provided in their home language.⁴⁰ In a multilingual country such as South Africa, this may not always be possible and previous research has shown that seeking an interpreter may cause delays in initiating tCPR⁴¹, which could influence outcome. Instead, the development of bespoke, contextual tCPR algorithms have been found to effectively overcome language barriers and result in expedited recognition of OHCA and improved tCPR uptake in callers with limited English-language proficiency.⁴²

Emotionality as a barrier to tCPR has been demonstrated in other high-income contexts, such as the United States,⁴³ Australia,⁴⁴ and Singapore.⁴⁵ In instances where an arrest is in a private location, there seems to be a greater tendency for emotionality on the part of the caller,^{44,46} which may be because the OHCA victim is known to the caller. In our study, the victim was known to the caller in the vast majority of instances, which might explain the heightened emotionality. Emotionality may be managed through active and empathic listening,⁴⁷ and regular encouragement.⁴⁸ In fact, encouragement was seen as a major facilitator in our study, and this should be cemented further through training.

Training has also been found to improve expressions of empathy during call-taking procedures.⁴⁹ Lack of empathy was a major barrier in tCPR uptake in our study, and resulted in frustration and heightened emotion – exacerbating the barriers of poor communication and emotionality. Lack of empathy has also been found to influence the ability to apply screening for stroke and other prioritisation tools in South African emergency call centres,³⁶ highlighting this as a key area for intervention. In South Africa, there is currently no standardised training programmes for emergency call centre staff. Future work should focus on developing curricula and training standards for this important component of the emergency care system.

Limitations

This study is limited by its retrospective nature. Transferability to other settings may be limited because this study was completed in a single, centre private EMS which is not representative of the entire country or other LMICs. However, given limited implementation of tCPR programmes in South Africa, the private sector presents one of the only opportunities to study tCPR. This study only investigated cases where OHCA was recognised and confirmed not breathing. Future work should establish the accuracy and timing with which call-takers can identify OHCA. This is especially true for cases where agonal breathing complicates recognition, but who have the highest probability of survival with good neurological outcome. It has been demonstrated that successful tCPR instruction is affected by emergency medical dispatch inbound call volumes and this might have affected our results,⁵⁰ which we did not record. However, we believe that this confounder would have been mitigated through random sampling. Lastly, we did not assess the transcript of the actual tCPR instruction, which could reveal additional barriers and facilitators, which should be evaluated in future work.

Conclusion

Numerous barriers exist to the initiation of tCPR in the South African private sector EMS. Given an epidemiological transition to CVD, it is crucial to address these barriers and leverage the facilitators in order to improve tCPR uptake, a cost-effective intervention for OHCA. This study highlights the importance of using specific language techniques and developing tailored tCPR algorithms to overcome these barriers, which should be underpinned by standardised training of call-takers.

CRedit authorship contribution statement

S. Crause: Data curation, Formal analysis, Methodology, Project administration, Writing – review & editing. **H. Slabber:** Data curation, Formal analysis, Methodology, Project administration, Writing – review & editing, Supervision. **E. Theron:** Conceptualization, Formal analysis, Methodology, Writing – review & editing. **W. Stassen:** Conceptualization, Formal analysis, Funding acquisition, Methodology, Supervision, Validation, Writing – original draft, Writing – review & editing.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Willem Stassen reports financial support was provided by National Research Foundation of South Africa.

Acknowledgements

We would like to acknowledge the private sector Emergency Medical Service for granting access to the call recordings and data.

Funding

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

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