




# BMJ Open Out-of-hospital cardiac arrest in Africa: a scoping review

Juliette Thibodeau <sup>1</sup>, Kalin Werner,<sup>2</sup> Lee A Wallis <sup>2</sup>, Willem Stassen <sup>2</sup>

**To cite:** Thibodeau J, Werner K, Wallis LA, *et al.* Out-of-hospital cardiac arrest in Africa: a scoping review. *BMJ Open* 2022;**12**:e055008. doi:10.1136/bmjopen-2021-055008

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2021-055008>).

Received 07 July 2021

Accepted 22 February 2022

## ABSTRACT

**Introduction** Out-of-hospital cardiac arrest (OHCA) is well studied in high-income countries, and research has encouraged the implementation of policy to increase survival rates. On the other hand, comprehensive research on OHCA in Africa is sparse, despite the higher incidence of risk factors. In this vein, structural barriers to OHCA care in Africa must be fully recognised and understood before similar improvements in outcome may be made. The aim of this study was to describe and summarise the body of literature related to OHCA in Africa.

**Methods and analysis** Using an a priori developed search strategy, electronic searches were performed in Medline via Pubmed, Web of Science, Scopus and Google Scholar databases to identify articles published in English between 2000 and 2020 relevant to OHCA in Africa. Titles, abstract and full text were reviewed by two reviewers, with discrepancies handled by an independent reviewer. A summary of the main themes contained in the literature was developed using descriptive analysis on eligible articles.

**Results** A total of 1200 articles were identified. In the screening process, 785 articles were excluded based on title, and a further 127 were excluded following abstract review. During full-text review to determine eligibility, 80 articles were excluded and one was added following references review. A total of 19 articles met the inclusion criteria. During analysis, the following three themes were found: epidemiology and underlying causes for OHCA, first aid training and bystander action, and Emergency Medical Services (EMS) resuscitation and training.

**Conclusions** In order to begin addressing OHCA in Africa, representative research with standardised reporting that complies to data standards is required to understand the full, context-specific picture. Policies and research may then target underlying conditions, improvements in bystander and EMS training, and system improvements that are contextually relevant and ultimately result in better outcomes for OHCA victims.

## INTRODUCTION

Out-of-hospital cardiac arrest (OHCA) is the cessation of cardiac activity that occurs outside of the hospital setting.<sup>1</sup> Although interventions such as bystander cardiopulmonary resuscitation (CPR) and early defibrillation can greatly improve a patient's chance of survival, many of those who experience OHCA do not receive these early interventions.<sup>2</sup> Low survival rates are worsened when the arrival of Emergency Medical Services (EMS) and their provision

## Strengths and limitations of this study

- A scoping review provides the backbone for context-specific research on out-of-hospital cardiac arrest (OHCA) in Africa that can then target interventions which strengthen the entire chain of survival.
- A scoping review providing an overview of the incidence of OHCA in Africa and the factors that contribute to poor outcomes advances the research agenda to provide rigorous epidemiological reporting on OHCA in Africa, evaluate cost-effectiveness of policies to address OHCA and improve Emergency Medical Services and bystander training.
- Limitations lie in the inclusion criteria and the databases interrogated: some papers and grey literature may not have been included, papers in languages other than English may have been missed and non-academic literature such as policy reports was also not included.

of CPR and additional care is delayed.<sup>3</sup> These factors are interrelated as part of the *chain of survival*, comprised of recognition and activation of EMS, early CPR, rapid defibrillation, basic and ALS and postcardiac arrest care.<sup>4</sup> Due to the interconnected nature of these factors, the chain is described as being only as strong as its weakest link, making each link important in OHCA care.<sup>5</sup>

While there is a great deal of information on OHCA in countries from high-income country (HIC) settings, limited information is available regarding Africa, and more broadly low-income and middle-income countries (LMICs). The time sensitive nature of OHCA is well established, and the importance of all links of the chain of survival are well documented.<sup>6-7</sup> As such, HIC settings focus on targeted interventions at each of these stages of care, resulting in significant enhancements in OHCA survival rates.<sup>8-10</sup>

Due to numerous structural factors, such as the absence of formal out-of-hospital emergency care services, longer response times and infrequent bystander intervention, LMICs experience higher mortality rates compared with countries with fewer barriers to care.<sup>11</sup> Moreover, African countries are experiencing



© Author(s) (or their employer(s)) 2022. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

<sup>1</sup>University of Chicago Biological Sciences Division, Chicago, Illinois, USA

<sup>2</sup>Division of Emergency Medicine, University of Cape Town, Rondebosch, Western Cape, South Africa

### Correspondence to

Juliette Thibodeau;  
jthibodeau@uchicago.edu

an increasing incidence of risk factors for OHCA, such as cardiovascular disease (CVD), which makes OHCA care in Africa a particularly important area of study.<sup>12</sup> The Global Burden of Disease Project predicted that by the end of 2020, the CVD burden faced by African countries would have doubled since 1990, yet specific comprehensive data regarding the disease burden in Africa are not readily available.<sup>13</sup>

In order to develop policies to improve OHCA outcomes in Africa and encourage public engagement with the system, the full picture of OHCA in the African setting must first be understood, including factors such as population characteristics and bystander action. To this end, this scoping review describes and summarises the body of literature related to OHCA in Africa, provides an overview of the literature available and points to areas of future research necessary to inform improvements in OHCA care and outcomes.

## METHODOLOGY

### Study design

A scoping review was performed to identify articles relevant to OHCA in Africa. Medline via Pubmed, Web of Science, Scopus and Google Scholar databases were interrogated. The results are contained in online supplemental material 1, while the unpublished search strategy is contained in online supplemental material 2, where relevant keywords were combined with Boolean operators.

Articles were limited to those published in English, between 1 June 2000 and 31 June 2020 that describe or involve OHCA in Africa. Articles published on topics unrelated to OHCA, outside of an African setting or the given timeframes or with abstracts in languages other than English were excluded. Articles where a full text was not available or obtainable were also excluded.

Duplicates were eliminated using the relevant function of Microsoft Excel (Microsoft Corporation, Redmond, Washington, USA). Two reviewers independently assessed articles for eligibility by first reviewing the title, then abstract and finally conducting full-text reviews (JT and WS). Discrepancies were resolved by an independent reviewer (KW). Mendeley Software (Elsevier Publishing Company, London, UK) was used to help screen for inclusion or exclusion among reviewers after in depth full-text review.

### Data extraction and analysis

Extracted information from the included full-text articles were compiled into an Excel spreadsheet using a data extraction matrix (online supplemental material 3). The extraction matrix included key findings related to OHCA: activation of emergency services, CPR quality and duration, bystander action, defibrillation timing, timing of EMS, advanced life support (ALS) and postarrest care, pre-existing conditions, survival rates and morbidity. If the affiliations listed were within Africa, the author was considered as an African author.

Formal risk of bias assessment was not conducted, as is practice with scoping review methodology.<sup>14 15</sup> Results are reported following Preferred Reporting Items for Systematic reviews and Meta-Analyses Extension for Scoping Reviews guidelines.<sup>14</sup>

Following data extraction, a summary of the main themes contained in the literature was developed using descriptive analysis on selected articles.

### Patient and public involvement

Patients or the public were not involved in the design, conduct, reporting, or dissemination plans of this study.

## RESULTS

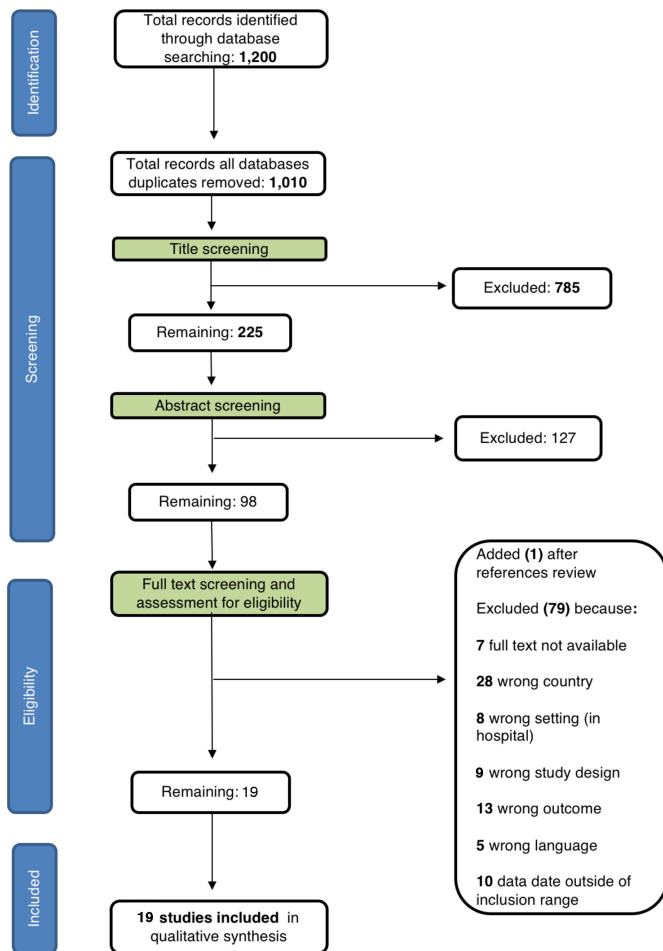
A total of 1200 articles were identified through the database search. In the screening process, 785 articles were excluded based on title, and another 127 articles were excluded following abstract review. During full-text screening to determine eligibility, seven papers were excluded based on the absence of an available full text, 28 papers were from a non-African setting, eight papers were from the hospital setting, nine papers used the wrong study design (not original research), 13 had irrelevant studied outcomes not pertaining to OHCA, five papers were only available in a non-English language and 10 were published outside of the inclusion range. One paper was added after reviewing the references of all included studies. A total of 19 studies were included for analysis (figure 1).

Of the 19 studies included, almost all studies (17/19) were retrospective or qualitative in nature. Of those that were prospective, all (2/19) were observational and no interventional or randomised controlled trials were found. Thus, conclusions of these studies should be interpreted with caution owing to potential bias given the study designs.

The main themes that emerged in the literature were as follows: epidemiology and underlying causes for OHCA, first aid training and bystander action and EMS resuscitation and EMS training (online supplemental material 1). A total of 48% (9/19) of papers failed to report any of the five Utstein variables; 5% (1/19) reported only one of the variables, 26% (5/19) reported two, 16% (3/19) reported three, 5% (1/19) reported four and none (0/19) reported all five of the variables. A total of 32% (6/19) of studies lacked an African primary author, in 32% (6/19) of studies fewer than half of the authorship team represented African authors and 5% (1/19) of studies failed to include a single African author.

### Epidemiology and underlying causes for OHCA

Nine papers reported on epidemiology and underlying causes for OHCA.<sup>16-24</sup> Studies based in Cameroon, Nigeria, Togo, Seychelles, Libya and South Africa found similar results with regard to underlying causes for OHCA. The largest proportion of these studies were based in Nigeria (44%), which is classified as a lower middle-income country by the



**Figure 1** PRISMA diagram of included articles, including identification, screening, eligibility and included stages. PRISMA, Preferred Reporting Items for Systematic reviews and Meta-Analyses.

World Bank. Underlying causes for OHCA were found to be CVDs, including coronary artery disease, hypertensive heart disease, ischaemic heart disease and left ventricular hypertrophy from hypertensive heart disease. Respiratory diseases were also noted as causes of OHCA in South Africa<sup>24</sup> and Libya,<sup>21</sup> and obesity was noted as a potential factor leading to OHCA in Togo.<sup>18</sup>

### First aid training and bystander action

Five papers reported on first aid training and bystander action, identifying the importance of implementing proper CPR training.<sup>25–29</sup> Two of these five papers (40%) were again based in Nigeria. Looking at public attitudes towards performing CPR in Ghana, it was reported that most study participants were willing to perform CPR, and that bystander engagement would likely be increased by contextualised training. More than 90% of participants indicated interest in receiving CPR training.<sup>25</sup> Similarly, a study looking at first aid training for school children in sub-Saharan Africa developed an informed educational training pathway for first aid that was piloted in Zimbabwe and has the potential to ultimately improve outcomes.<sup>26</sup> In Nigeria and South Africa, studies found that most participants felt trainings should

be provided in order to improve resuscitation, especially for teachers in the school setting.<sup>27,29</sup> The South Africa study also identified major barriers to bystander CPR, including fear of being sued if something goes wrong, presence of secretions, fear of injury to the victim, fear of contracting a disease from the victim and belief that someone else would do it. Furthermore, participants were more likely to provide CPR for immediate family or children rather than adult strangers.<sup>29</sup> In investigating the availability of basic life support (BLS) courses for lay people in Nigeria, it was found that there are 21 times fewer courses compared with the UK, and of those available, only seven adhere to American Heart Association (AHA) guidelines. The mean cost of participation was also greater than monthly minimum wage, demonstrating a clear barrier to accessing BLS training.<sup>28</sup>

### EMS resuscitation and training

Five papers reported on EMS resuscitation and EMS training.<sup>30–34</sup> The majority of these five papers (60%) were based in South Africa, classified as an upper middle-income country by the World Bank. One study based in Botswana investigating the needs for training of prehospital providers found that cardiovascular emergencies represented the fourth most frequent reason for response calls.<sup>31</sup> Looking at knowledge of EMS teams in South Africa, it was discovered that the sector of employment (public or private), place of training and type of guidelines according to which participants were trained are the main categorical factors that influenced knowledge of CPR.<sup>32</sup> Skill was influenced by the most recent type of CPR training and guidelines used for training.<sup>32</sup> In Tunisia, quantitative data related to arrival at the scene determined that 8% of OHCA victims received bystander CPR, while median time elapsed to arrive at the scene by EMS was 13 min. The decision to resuscitate was based primarily on no flow time (time between cardiac arrest and initiation of CPR) rather than presumed aetiologies.<sup>34</sup> In South Africa, Stein found that the median response time for OHCA cases was 9 min, and bystander CPR was performed in 36% (n=74) of cases.<sup>23</sup> In a separate paper, he also concluded that exposure of South African paramedic students to prehospital cardiac arrest cases or training for such cases was low, with only 50% of first-year and second-year students and 75% of third-year students having any exposure to adult cardiac arrest cases.<sup>30</sup> In looking at the practice of basic adult or paediatric resuscitation procedures, less than half of the studied paramedic students successfully completed the procedure.<sup>30</sup> Another South African study sought to develop quality indicators (QIs) for prehospital emergency care and included QIs for OHCA. QIs specific to OHCA included process measures related to epidemiology and presentation, CPR and treatment measures and outcome measures.<sup>33</sup>

### DISCUSSION

The aim of this study was to describe and summarise the body of literature pertaining to OHCA in Africa. While



many sources were investigated, there were few papers that addressed the question adequately by reporting on all Utstein variables. The evidence fell into three categories: epidemiology and underlying causes for OHCA, first aid training and bystander action, and EMS resuscitation and training.

Epidemiology is a particularly important category to consider when discussing OHCA in Africa. All papers in this category pointed to CVD as an underlying cause for OHCA. The incidence of CVD is expected to double on the continent, which will invariably result in an increase in the number of victims of OHCA.<sup>13</sup> Evidently, a solution for OHCA in Africa must be developed as it becomes an even more prominent issue. The data on epidemiology and underlying causes for OHCA found in this study, however, are not entirely adequate and do not comply with reporting standards. Utstein reporting is important in that it provides a structured outline of variables to compare systems of care for cardiac arrest.<sup>35</sup> Out of the nine papers in this category, none of them reported on all Utstein variables, and four did not report adequately on any. This demonstrates the need for standardised reporting in literature and standardised OHCA registries, in order to allow for a full, context specific picture of OHCA in Africa. Without the context of the Utstein variables, data can easily be interpreted incorrectly.

The overwhelming evidence for CVD as one of the underlying causes of OHCA also indicates that in order to decrease rates of OHCA, factors contributing to CVD must also be addressed. This may involve targeting structural factors preventing a healthy diet and ability to exercise as well as encouraging individuals to stop smoking or drinking excessively.<sup>36</sup> To this end, controlling chronic diseases and emphasising primary care is also necessary. Cost-effectiveness of implementing such programmes should also be addressed. The likelihood of poor outcomes for OHCA victims, which still persists even in some of the most well-resourced settings, must be taken into consideration. This is especially true in African settings where resource constraints and competing population health issues point to the urgent need for a rational approach to the allocation of limited resources.

The five papers that focused on bystander action and first aid training all pointed towards the potential for training programmes to increase bystander participation and knowledge, which could result in improved outcomes. Most barriers to care (fear of injury to the victim, fear of contracting a disease from the victim and belief that someone else would do it) could be overcome through organised training and courses. In an editorial, Monsell rejects the claim for increased CPR training and argues that it is unethical to teach CPR in a low-resource setting, as the links to the chain of survival in such a setting are absent and resources are diverted from other potentially beneficial healthcare activities. It appears that training programmes and the implementation of policies to increase the amount of appropriate equipment such as defibrillators could address the many deficiencies that

Monsell points out.<sup>37</sup> However, even when CPR is initiated properly by bystanders, concerns regarding the robustness of the chain of survival remain: if this chain cannot be completed, then the effectiveness of CPR to improve patient outcomes is negligible or uncertain at most. Furthermore, the lack of appropriate and affordable BLS courses demonstrates that effective planning of trainings must consider accessibility to the general population, and follow appropriate contextual solutions.

The five papers reporting on EMS resuscitation and training revealed the need for appropriate training and learning environment for paramedic students. The frequency of calls received for cardiovascular emergencies further demonstrates the need for adequate training for response teams, specifically for victims of OHCA and other cardiovascular incidents. Improving response time of EMS would likely improve the number of survivors of OHCA, as would standardising the guidelines that students learn under for context-specific settings. Simply stating the need for the augmentation of effective training, however, does not address the complexities involved. In countries with no out-of-hospital emergency care systems, there are no individuals available to train. There is an existing bias in the papers that have been extracted for this study—only settings with a formal EMS system publish on OHCA. As a result, the existing literature has pointed to the need for training, but countries in which there is no existing system for out-of-hospital care, which may have different needs, do not publish on this topic. Having representation is essential to ensure the recommendations being made are done so with a context-appropriate lens. Two of the papers in this category did not have African primary authors and fewer than half of the authorship team representing Africa. With no representation from the country of study nor statement of dissemination, it is difficult to ascertain if the data were applied towards meaningful changes. This points to a need for efforts to build capacity with local authors to strengthen the sustainability of findings or to guard against the paternalistic application of solutions that are not appropriate.

Overall, the evidence suggests the potential to ultimately reduce poor outcomes of OHCA in Africa through increased efforts to address CVD and to implement proper bystander and EMS training. However, it is important to note that behind this recommendation lies very little evidence, making it difficult to find a basis for policy decisions. Before addressing these factors, there is a need to compile more evidence through clinical or epidemiological studies that follow standardised reporting methods. It is also important that research and policies should continue to be context-specific. Implementation of suggested policies could have a different sociocultural impact in each country, and even within a country itself in rural, peri-urban and urban areas. In order to provide responsible guidance, ethical guidelines must also be followed through strong community engagement and inclusivity.<sup>38</sup> It will likely be a long time before it will be cost-effective and beneficial to invest in policies targeting OHCA.<sup>39</sup> Nonetheless, there is an urgent need

to address the increasing incidence of OHCA in Africa while strengthening all parts of the chain of survival in a context-aware manner that emphasises engagement from community members and is tailored towards the local disease burden—which might not be OHCA.

There are limitations to this study that primarily lie in the inclusion criteria and the databases interrogated. Although four databases were searched, some papers and grey literature may not have been included. However, because the selected collection of databases covers such a wide base, it is likely that few studies are omitted.<sup>40</sup> Only papers published in English were included, meaning we may have missed French, Arabic or other language articles. Furthermore, only academically published literature was included, which overlooks non-academic literature such as policy reports that may speak to the effectiveness of policy implementation targeting OHCA.

## CONCLUSION

There is an ongoing global effort to improve aspects of the chain of survival, but scarce data in Africa makes such improvements difficult. The main themes observed in this study were epidemiology and underlying causes for OHCA, first aid training and bystander action, and EMS resuscitation and training. Future research should endeavour to include local representation in authorship teams and focus on robust routine data collection and compliance with Utstein reporting standards. Once rigorous epidemiological reporting provides data that gives a full picture of OHCA in African countries, context-specific research may then target interventions which strengthen the entire chain of survival. In the interim, it is essential to understand community and EMS provider views on OHCA in order to develop robust, representative ethical guidance on how to proceed.

**Twitter** Willem Stassen @willem\_stassen

**Contributors** The study was conceived by WS. JT, in collaboration with KW and WS, did the analysis and wrote the first draft. All authors (JT, KW, WS and LAW) contributed to the outline and revisions of the manuscript. WS is the guarantor.

**Funding** The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

**Competing interests** None declared.

**Patient and public involvement** Patients and/or the public were not involved in the design, or conduct, or reporting or dissemination plans of this research.

**Ethics approval** This study does not involve human participants.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** All data relevant to the study are included in the article or uploaded as supplementary information.

**Supplemental material** This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

**Open access** This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

## ORCID iDs

Juliette Thibodeau <http://orcid.org/0000-0001-9680-4182>

Lee A Wallis <http://orcid.org/0000-0003-2711-3139>

Willem Stassen <http://orcid.org/0000-0002-1486-4446>

## REFERENCES

- McNally B, Robb R, Mehta M. Out-of-hospital cardiac arrest surveillance - Cardiac Arrest Registry to Enhance Survival (CARES), United States, October 1, 2005-December 31, 2010. *Morbidity and mortality weekly report Surveillance summaries* 2011;1-19.
- Yan S, Gan Y, Jiang N, *et al*. The global survival rate among adult out-of-hospital cardiac arrest patients who received cardiopulmonary resuscitation: a systematic review and meta-analysis. *Crit Care* 2020;24:61.
- Stein C, Wallis L, Adetunji O. Meeting national response time targets for priority 1 incidents in an urban emergency medical services system in South Africa: More ambulances won't help. *S Afr Med J* 2015;105:840-4.
- Tagami T, Hirata K, Takeshige T, *et al*. Implementation of the fifth link of the chain of survival concept for out-of-hospital cardiac arrest. *Circulation* 2012;126:589-97.
- Cummins RO, Ornato JP, Thies WH, *et al*. Improving survival from sudden cardiac arrest: the "chain of survival" concept. A statement for health professionals from the Advanced Cardiac Life Support Subcommittee and the Emergency Cardiac Care Committee, American Heart Association. *Circulation* 1991;83:1832-47.
- Cummins RO, White RD, Pepe PE. Ventricular fibrillation, automatic external defibrillators, and the United States food and drug administration: confrontation without comprehension. *Ann Emerg Med* 1995;26:621-31.
- Deakin CD. The chain of survival: not all links are equal. *Resuscitation* 2018;126:80-2.
- Sidebottom DB, Potter R, Newitt LK, *et al*. Saving lives with public access defibrillation: a deadly game of hide and seek. *Resuscitation* 2018;128:93-6.
- Sunde K, Pytte M, Jacobsen D, *et al*. Implementation of a standardised treatment protocol for post resuscitation care after out-of-hospital cardiac arrest. *Resuscitation* 2007;73:29-39.
- Song J, Guo W, Lu X, *et al*. The effect of bystander cardiopulmonary resuscitation on the survival of out-of-hospital cardiac arrests: a systematic review and meta-analysis. *Scand J Trauma Resusc Emerg Med* 2018;26:86.
- Kironji AG, Hodkinson P, de Ramirez SS, *et al*. Identifying barriers for out of hospital emergency care in low and low-middle income countries: a systematic review. *BMC Health Serv Res* 2018;18:291.
- The Lancet. Out-Of-Hospital cardiac arrest: a unique medical emergency. *Lancet* 2018;391:911.
- Yusuf S, Reddy S, Öunpuu S, *et al*. Global burden of cardiovascular diseases: Part I: general considerations, the epidemiologic transition, risk factors, and impact of urbanization. *Circulation* 2001;104:2746-53.
- Tricco AC, Lillie E, Zarin W, *et al*. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med* 2018;169:467-73.
- Peterson J, Pearce PF, Ferguson LA, *et al*. Understanding scoping reviews. *J Am Assoc Nurse Pract* 2017;29:12-16.
- Rotimi O, Fatusi AO, Odesanmi WO. Sudden cardiac death in Nigerians—the Ile-Ife experience. *West Afr J Med* 2004;23:27-31.
- Ogunlade O. Sudden cardiac death in Nigeria: a health challenge. *International Journal of Health Research* 2011;4:162-8.
- Darre T, Djiwa T, Napo-Koura G. Sudden death of adults in Togo: autopsy results of a series of 318 cases (Published Online First: 4 December 2019).
- Zhao P, Wang J-G, Gao P, *et al*. Sudden unexpected death from natural diseases: fifteen years' experience with 484 cases in Seychelles. *J Forensic Leg Med* 2016;37:33-8.
- Adegoke O, Awolola NA, Ajuluchukwu JN. Prevalence and pattern of cardiovascular-related causes of out-of- Hospital deaths in Lagos, Nigeria. *Afr Health Sci* 2018;18:942-9.
- E-RM A, El B, Fmm D. The application of the International classification of diseases among autopsy cases of sudden death in Tripoli. *Libya J Forensic Crime Investi* 2018;2:102.



- 22 Maduka CJ, Ohagwu KA, Offia E-M. Sudden cardiac death in hypertensive heart disease patients in Umuahia, Abia state, Nigeria: an 18 month case series report. *Int J Med Res Prof* 2017;3:285–7.
- 23 Stein C. Out-Of-Hospital cardiac arrest cases in Johannesburg, South Africa: a first glimpse of short-term outcomes from a paramedic clinical learning database. *Emerg Med J* 2009;26:670–4.
- 24 Appiah JA, Salie S, Argent A, *et al.* Characteristics, course and outcomes of children admitted to a paediatric intensive care unit after cardiac arrest. *Southern African Journal of Critical Care* 2018;34:58–64.
- 25 Anto-Ocrah M, Maxwell N, Cushman J, *et al.* Public knowledge and attitudes towards bystander cardiopulmonary resuscitation (CPR) in Ghana, West Africa. *International Journal of Emergency Medicine* 2020;13.
- 26 De Buck E, Laermans J, Vanhove A-C, *et al.* An educational pathway and teaching materials for first aid training of children in sub-Saharan Africa based on the best available evidence. *BMC Public Health* 2020;20:836.
- 27 Kalu QN, Oku OO, Ilori I-AU. Establishing cardiopulmonary resuscitation services in sub-Saharan Africa: a survey of suggestions made by health care workers in cross river state, Nigeria. *Open Access Maced J Med Sci* 2018;6:944–8.
- 28 Birkun A, Trunkwala F, Gautam A, *et al.* Availability of basic life support courses for the general populations in India, Nigeria and the United Kingdom: an Internet-based analysis. *World J Emerg Med* 2020;11:133.
- 29 Ojifinni K, Motara F, Laher AE. Knowledge, attitudes and perceptions regarding basic life support among teachers in training. *Cureus* 2019;11:e6302.
- 30 Stein C. Student paramedic experience with prehospital cardiac arrest cases in Johannesburg, South Africa. *Prehosp Emerg Care* 2009;13:59–63.
- 31 Glomb NW, Kosoko AA, Doughty CB, *et al.* Needs assessment for simulation training for prehospital providers in Botswana. *Prehosp Disaster Med* 2018;33:621–6.
- 32 Veronese J-P, Wallis L, Allgaier R, *et al.* Cardiopulmonary resuscitation by emergency medical services in South Africa: barriers to achieving high quality performance. *Afr J Emerg Med* 2018;8:6–11.
- 33 Howard I, Cameron P, Wallis L, *et al.* Identifying quality indicators for prehospital emergency care services in the low to middle income setting: the South African perspective. *Afr J Emerg Med* 2019;9:185–92.
- 34 Zelfani S, Manai H, Riahi Y, *et al.* Out of hospital cardiac arrest: when to resuscitate. *Pan African Medical Journal* 2019;33.
- 35 Nolan JP, Berg RA, Andersen LW. Cardiac arrest and cardiopulmonary resuscitation outcome reports: update of the Utstein resuscitation registry template for in-hospital cardiac arrest: a consensus report from a task force of the International liaison Committee on resuscitation (American. *Circulation* 2019;140:e746–57.
- 36 Barquera S, Pedroza-Tobías A, Medina C, *et al.* Global overview of the epidemiology of atherosclerotic cardiovascular disease. *Arch Med Res* 2015;46:328–38.
- 37 Monsell E. Is CPR always appropriate? A personal perspective from working in East Africa. *Br J Nurs* 2017;26:503–4.
- 38 Millum J, Beecroft B, Hardcastle TC, *et al.* Emergency care research ethics in low-income and middle-income countries. *BMJ Glob Health* 2019;4:e001260.
- 39 Friesen J, Patterson D, Munjal K. Cardiopulmonary resuscitation in resource-limited health systems—considerations for training and delivery. *Prehosp Disaster Med* 2015;30:97–101.
- 40 Bramer WM, Rethlefsen ML, Kleijnen J, *et al.* Optimal database combinations for literature searches in systematic reviews: a prospective exploratory study. *Syst Rev* 2017;6:245.

REFERENCE INFORMATION									
Title	Author(s)	Year of Publication	Origin of data	African primary author, senior author, author (1/n)?	Aims/purpose	Study population and sample size (if applicable)	Methodology	Uststein variables reported	Results
<b>Epidemiology and Pre-existing conditions</b>									
Sudden cardiac death in Nigerians--the life-experience	O Rotimi, A O Fatusi, W O Odesanmi	2004	Nigeria	Y (3/3)	To determine the clinico-pathologic features, circumstances of death and related epidemiological variables in cases of sudden cardiac death among Nigerians.	2,529 medico-legal autopsies performed at the Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, Nigeria, on cases of sudden unexpected deaths over a ten-year period (1987-1997)	Retrospective record review: Autopsies on cases of sudden unexpected deaths over a ten-year period (1987-1997)	2/5	Hypertensive heart disease was the cause of death in 66 cases (83.5%), of which only 20 (30.3%) were previously diagnosed. Ischaemic heart disease and cardiomyopathies were next as the most common cause of death with 5 cases (6.3%) each.
Sudden cardiac death in Nigeria: A health challenge	Oluwadare Ogunlade	2011	Nigeria	Y (1/1)	To discuss SCD and the absence of data in Nigeria		Retrospective record review	0/5	The underlying causes were mostly asymptomatic cardiac diseases
Sudden death of adults in Togo: Autopsy results of a series of 318 cases	Tchin Darre, Touklian Djiwa, Gado Napo-Koura	2019	Togo	Y(3/3)	To determine the circumstances of occurrence of sudden deaths in Togo, risk factors, to identify the causes of sudden death in adults at autopsy	318 sudden death cases	Retrospective record review: All cases of autopsies performed from January 2009 to December 2019 (10 years) were included in the study	0/5	Cardiovascular causes excluding cerebral involvement (54%) were the most common cause of sudden death, and obesity was noted in 189 cases (59.4%)
Sudden unexpected death from natural diseases: Fifteen years' experience with 484 cases in Seychelles	Peng Zhao, Ji-Gang Wang, Peng Gao, Xia Li, Rubell Brewer	2016	Seychelles	Y (1/5)	To identify and subclassify sudden natural death cases in Seychelles	484 cases of sudden death	Retrospective record review: 484 sudden natural death cases with autopsy at the Clinical Pathology Laboratory, Victoria Hospital, Seychelles between 1997 through 2012	0/5	The most common finding was cardiovascular diseases (380/484, accounting for 78.5%), which could be observed in almost all age groups
Prevalence and pattern of cardiovascular-related causes of out-of-hospital deaths in Lagos, Nigeria	Adegoke, O; Awolola, NA; Ajuluchukwu, JN	2018	Nigeria	Y(3/3)	To determine the prevalence and pattern of cardiovascular-related causes of out-of-hospital deaths in Lagos, Nigeria.	176 medical brought in dead (BID) cases	Retrospective record review: 176 BID cases from September 1st 2011 to 31st August 2016	0/5	Cardiovascular-related diseases were responsible for 51.1% of all autopsied out-of-hospital medical deaths in the study, many of which led to OHCA. Causes of death were predominantly hypertensive heart disease and heart failure.
The Application of the International Classification of Diseases among Autopsy Cases of Sudden Death in Tripoli, Libya	El-Razik Mashal, Badr El Dine FM, Elmaguid Ahmed R, Fozzi Siala	2018	Libya	Y(4/4)	To assess the pattern of sudden, unexpected deaths in Libya	211 autopsies on sudden death	Retrospective study of forensic autopsy cases from 2011-2015	1/5	Ischemic heart disease was the most noted risk factor, followed by respiratory system diseases
Sudden cardiac death in hypertensive heart disease patients in Umuahia, Abia State, Nigeria: an 18-month case series report	Chiedozie J Maduka, Kenneth A Ohagwu, Eme-Mark Offia, Kelechukwu Uwanuochi, Ogba J Ukpabi	2017	Nigeria	Y (5/5)	Monitor 4 hypertensive heart disease patients who had clinical features of arrhythmias	4 African hypertensive heart disease patients with risk factors for SCD	Case study: patients followed up from hospital to home with the assistance of their relatives for a period of 18 months (between November 2013 to April 2015)	2/5	Left ventricular hypertrophy from hypertensive heart disease predisposed these patients to SCD likely from ventricular arrhythmias
Out-of-hospital cardiac arrest cases in Johannesburg, South Africa: a first glimpse of short-term outcomes from a paramedic clinical learning database	Stein C.	2009	South Africa	Y (1/1)	To describe and assess outcomes of adult out-of-hospital cardiac arrest cases occurring in the greater Johannesburg metropolitan area recorded over a 7-year period in a student paramedic clinical learning database.	63 confirmed cardiac arrest cases with complete Utstein-style data was identified and extracted	Retrospective case review: Outcome measure was return of spontaneous circulation (ROSC)	3/5	The median response time was 9 minutes. In 153 of the 205 cases (75%) the cause of arrest was presumed to be cardiac. 140 of the arrests (88%) were witnessed and bystander cardiopulmonary resuscitation was performed in 74 cases (36%). Forty-seven cases (23%) were found in a shockable rhythm and ROSC occurred in 36 (18%) of resuscitated cases. The only significant predictor of ROSC was the initial rhythm of arrest (p<0.001).
Characteristics, course and outcomes of children admitted to a paediatric intensive care unit after cardiac arrest	Appiah, J; Salie, S; Argent, A; Morrow, B	2018	South Africa	Y(4/4)	To describe the characteristics, course and outcomes of children admitted to an SA paediatric intensive care unit (PICU) following cardiac arrest	110 patients were admitted following cardiac arrest	Retrospective descriptive study: Routinely collected data (January 2010 - December 2011)	3/5	The majority of participants (n=30; 29.1%) had primary respiratory disease underlying their arrest, most commonly associated with acute lower respiratory infections (n=21; 70.0%)
<b>First aid training and Bystander Action</b>									
Public knowledge and attitudes towards bystander cardiopulmonary resuscitation (CPR) in Ghana, West Africa	Anto-Ocrah M, Maxwell N, Cushman J, Acheampong E, Kodam RS, Homan C, Li T.	2020	Ghana	Y (2/7)	To evaluate Ghanaians' knowledge of and attitudes towards bystander CPR	479 survey completions of Ghanaians	Cross-sectional study using self-administered questionnaires assessing knowledge and attitudes regarding BLS and CPR techniques and training	2/5	The majority of study participants were willing to perform CPR. Contextualized training that emphasizes hands-only CPR and builds participants' confidence may increase bystander willingness and engagement. Over 90% of participants were interested in receiving CPR training.
An educational pathway and teaching materials for first aid training of children in sub-Saharan Africa based on the best available evidence	De Buck E, Laermans J, Vanhove AC, Doox K, Vandekerckhove P, Geduld H.	2020	Sub-Saharan Africa	Y (1/6)	To develop an educational pathway for first aid training to children in sub-Saharan Africa, and to create an overview of effective educational methods in the sub-Saharan African context, with the overall aim of developing teaching materials for first aid training of sub-Saharan African children.	58 studies on first aid education for children; 36 studies on different teaching approaches	Systematic literature searches to identify studies on first aid education to children up to 18 years old and studies investigating different teaching approaches in LMIC	0/5	First aid training for children in sub-Saharan Africa should be implemented to ultimately improve outcomes. This study developed an educational pathway for this purpose that has been effectively implemented in a few countries.
Establishing Cardiopulmonary Resuscitation Services in Sub-Saharan Africa: A Survey of Suggestions Made by Health Care Workers in Cross River State, Nigeria. Open Access Maced J Med Sci. 2018 May 20; 6 (5): 944-948	Queeneth Ndukwe Kalu, Oboko Oboko Oku, Ini-Abasi Udo Itoni	2018	Nigeria	Y (3/3)	To assess the perceived need and recommendations for improvement in CPR services in Cross River State	229 questionnaires completed	Cross-sectional, questionnaire-based study	2/5	Some respondents in this study suggested the need to train citizens as a way of improving resuscitation service in the State
Availability of basic life support courses for the general populations in India, Nigeria and the United Kingdom: An internet-based analysis	Birkun A, Trunkwala F, Gautam A, Okoronyanwu M, Oyewumi A.	2020	Nigeria	N (0/5)	To investigate availability and key features of BLS courses proposed for lay people in India, Nigeria and the United Kingdom		Simple, same-day Google search in English	0/5	Bystander training in Nigeria: 29 courses available to the lay public, mostly offered by companies (85%), classroom learning, at a cost of \$25-193, only 7/29 are based on AHA guidelines, 22 not stated
Knowledge, Attitudes and Perceptions Regarding Basic Life Support Among Teachers in Training	Ojifinni K, Motara F, Laher AE.	2019	South Africa	Y (3/3)	To assess the knowledge, attitudes and perceptions of student-teachers pertaining to BLS	316 student-teachers at Wits	Cross-sectional survey	0/5	Only 56 (17.7%) respondents achieved a knowledge score of ≥6 points (half = pass); 28 (8.9%) received formal CPR training; 286 (90.5%) felt CPR training should be mandatory for teachers. BARRIERS: Fear of being sued if something goes wrong 264 (83.5), Presence of blood, vomitus or secretions 206 (65.2), Fear of injury to the victim 238 (75.3), Fear of contracting a disease from the victim 186 (58.9), Belief that someone else will do it 145 (45.9), Would provide CPR for: Immediate family member 285 (90.2), An adult stranger 187 (59.2), A child stranger 234 (74.1), A learner in the school 255 (80.7)
<b>EMS Resuscitation and EMS Training</b>									
Student paramedic experience with prehospital cardiac arrest cases in Johannesburg, South Africa	Stein C.	2009	South Africa	Y (1/1)	To describe the exposure of paramedic students studying at university level to prehospital cardiac arrest cases encountered during clinical learning	563 and 2007	Retrospective record review: Descriptive analysis of prehospital cardiac arrest cases included in an electronic clinical learning database between 2001 and 2007	2/5	50% of first- and second-year students and 75% of third-year students had any exposure to adult cardiac arrest cases. Of these students, first and second years averaged two cases, and third years averaged three cases. There was very low exposure to pediatric cases. The average maximum exposure was four cases for first- and second-year students and six cases for third-year students. Less than half of the students exposed to cardiac arrest cases in any academic year of study were able to practice basic adult or pediatric resuscitation-related procedures. Few students had any experience with management of patients with return of spontaneous circulation or adult or pediatric venous cannulation.

Needs Assessment for Simulation Training for Prehospital Providers in Botswana	Giomb NW, Kosoko AA, Doughty CB, Rus MC, Shah M, Cox M, Galapi C, Parkes PS, Kumar S, Laba B.	2018	Botswana	N (1/7)	To assess the educational needs of the Botswana MoHW EMS providers	1506 response calls reviewed and 18 participants surveyed	Mixed methods combining retrospective review of ambulance equipment inventory and chart reviews and qualitative EMS provider feedback (focus groups, semi-structured interviews, and anonymous surveys)	0/5	Cardiovascular emergencies represented the 4th most frequent reason for response call (7%) – The 6th highest ranked call response training priority (60%) and highest ranked procedure for training priority (72%) in adults, 2nd highest ranked procedure for training priority (78%) in paediatric.
Cardiopulmonary resuscitation by Emergency Medical Services in South Africa: Barriers to achieving high quality performance	Veronese JP, Wallis L, Allgaier R, Botha R.	2018	South Africa	Y (4/4)	To describe the quality of BLS CPR delivered by ILS qualified EMS personnel in a simulated setting, and to determine potential demographic barriers that contribute towards better or worse performance.	114 BLS and ILS providers w/ between 4-19 years experience	Prospective, simulation-based study	0/5	Median knowledge was 50%; median skill 33%; the factors found to be univariately associated with both decreased knowledge and skill were: greater age, greater experience and the more time elapsed since last trained in CPR. However, when these factors were adjusted for, only decreased knowledge was significantly influenced by greater age. Categorical factors that influenced knowledge were: the sector of employment ( $p < 0.001$ ), the place of training ( $p = 0.001$ ), and the type of guidelines participants were trained according to ( $p < 0.001$ ). The categorical factors that influenced skill were: the most recent type of CPR training ( $p = 0.02$ ) as well as the type of guidelines participants were trained according to ( $p = 0.01$ ). In terms of defibrillation, 0.7% ( $n = 35$ ) of participants did not deliver a shock or did not switch on the monitor; Of those that did deliver a shock ( $n = 79$ , 69.3%), the median time from arrival on scene to shock delivery was 4 min 12 s (IQR 3 m 2 s–5 m 14 s).
Identifying quality indicators for prehospital emergency care services in the low to middle income setting: The South African perspective	Howard I, Cameron P, Wallis L, Castren M, Lindstrom V.	2019	South Africa	Y (2/5)	To identify a set of QIs appropriate for use in the South African PEC setting.	N=34, (paramedic 26, nurse 2, physician 7)	Multi-round Delphi: provides consensus quality indicators for OHCA	4/5	104 QIs reached consensus agreement including, 90 clinical QIs, across 15 subcategories, and 14 non-clinical QIs across two subcategories. Amongst the clinical category, airway management ( $n = 13$ QIs; 14%); out-of-hospital cardiac arrest ( $n = 13$ QIs; 14%); and acute coronary syndromes ( $n = 11$ QIs; 12%) made up the majority. Within the non-clinical category, adverse events made up the significant majority with nine QIs (64%).
Out of hospital cardiac arrest: When to resuscitate	Zefani S., Manai H., Riahi Y., Daghtous M.	2019	Tunisia	Y(4/4)	To explore why resuscitation is withheld when mobile emergency medical team arrive at the scene of a cardiac arrest.	228 patients	Prospective, observational study	3/5	18/228 patients (8%) received bystander CPR by witnesses. The median time elapsed to arrive at the scene was 13 [6-25] min. The median "hotflow" was 22 [10-34] min. The resuscitation decision was taken by the mobile EMS staff for 106 patients (46.5%). For other patients, the decision not to resuscitate was motivated solely by the finding of a confirmed state of death in an elderly patient ( $p = 0.045$ ).



## Supplementary Materials 2: Search strategy

### Web of Science (Literature search performed on September 1, 2020)

(TS=(“emergency medical services” OR “emergency medical technicians” OR “emergency treatment” OR “emergency medicine” OR “ambulances” OR “air ambulances” OR “first aid OR military medicine” OR “prehospital” OR “pre-hospital” OR “paramedic” OR “ambulance” OR “out-of-hospital” OR “out of hospital” OR “ems” OR “emt” OR “emergency services” OR “emergency medical service” OR “emergency technician” OR “emergency practitioner” OR “emergency dispatch” OR “first responder” OR “public access defibrillation” OR “emergency rescue” OR “emergency resus” OR “emergency triage” OR “advanced life support” OR “community support co-ordinator” OR “community support coordinator” OR “emergency care practitioner” OR “extended care practitioner” OR “physician assistant”))

#### **OR**

TS=(“Ambulances” OR “Emergency Medical Technicians” OR “Air Ambulances” OR “emergency medical services” OR “paramedic” OR “ems” OR “emt” OR “prehospital” OR “pre-hospital” OR “first responder” OR “emergency medical technicians” OR “emergency services” OR “Ambulance” OR “HEMS” OR “field triage” OR “out-of-hospital”)

#### **OR**

TS=(“emergency medical service communication systems” OR “emergency medical dispatcher” OR “emergency medical dispatch” OR “medical dispatch” OR “911” OR “999” OR “111” OR “telephone triage” OR “EMD” OR “ambulance dispatch” OR “Medical PriORity Dispatch System” OR “MPDS”))

#### **AND**

(TS=(“heart arrest” OR “cardiac arrest” OR “death, sudden, cardiac” OR “cardiovascular arrests” OR “asystole” OR “pulseless electrical activity” OR “ventricular fibrillation” OR “pulseless ventricular tachycardia” OR “cardiopulmonary arrest” OR “cardiopulmonary resuscitation” OR “CPR”))

#### **OR**

TS=( “out of hospital cardiac arrest” OR “out of hospital cardiac arrest” OR “sudden cardiac death” OR “heart arrest” OR “cardiac arrest” OR “OHCA” OR “sudden cardiac arrest” OR “sudden death” OR “cardiac near arrest” OR “cardiopulmonary near arrest” OR “sudden near death” OR “heart standstill” OR “asystole” OR “ventricular fibrillation” OR “ventricular tachycardia” OR “resuscitation” OR “cardiopulmonary resuscitation” OR “CPR” OR “defibrillator” OR “external defibrillator” OR “automated external defibrillator” OR “basic life support”))

#### **AND**

(TS=(“africa” OR “africa” OR “Algeria” OR “Angola” OR “Benin” OR “Botswana” OR “burkina faso” OR “Burundi” OR “Cameroon” OR “canary islands” OR “cape verde”

OR "central african republic" OR "Chad" OR "Comoros" OR "Congo" OR "democratic republic of congo" OR "Djibouti" OR "Egypt" OR "equatorial guinea" OR "Eritrea" OR "Ethiopia" OR "Gabon" OR "Gambia" OR "Ghana" OR "Guinea" OR "guinea bissau" OR "ivory coast" OR "cote d ivoire" OR "Jamahiriya" OR "Jamahiriya" OR "Kenya" OR "Lesotho" OR "Liberia" OR "Libya" OR "Libya" OR "Madagascar" OR "Malawi" OR "Mali" OR "Mauritania" OR "Mauritius" OR "Mayotte" OR "Morocco" OR "Mozambique" OR "Mozambique" OR "Namibia" OR "Niger" OR "Nigeria" OR "Principe" OR "Reunion" OR "Rwanda" OR "sao tome" OR "Senegal" OR "Seychelles" OR "sierra leone" OR "Somalia" OR "south africa" OR "st helena" OR "Sudan" OR "Swaziland" OR "Tanzania" OR "Togo" OR "Tunisia" OR "Uganda" OR "western sahara" OR "Zaire" OR "Zambia" OR "Zimbabwe" OR "central africa" OR "central african" OR "west africa" OR "west african" OR "western africa" OR "western african" OR "east africa" OR "east african" OR "eastern africa" OR "eastern african" OR "north africa" OR "north african" OR "northern africa" OR "northern african" OR "south african" OR "southern africa" OR "southern african" OR "sub saharan africa" OR "sub saharan african" OR "sub saharan african" NOT "guinea pig" OR "guinea pigs" OR "aspergillums" AND "Niger"))

**Scopus: (Literature search performed on September 2, 2020)**

TITLE-ABS-KEY ( {emergency medical services} OR {emergency medical technicians} OR {emergency treatment} OR {emergency medicine} OR {ambulances} OR {air ambulances} OR {first aid OR military medicine} OR {prehospital} OR {pre-hospital} OR {paramedic} OR {ambulance} OR {out-of-hospital} OR {out of hospital} OR {ems} OR {emt} OR {emergency services} OR {emergency medical service} OR {emergency technician} OR {emergency practitioner} OR {emergency dispatch} OR {first responder} OR {public access defibrillation} OR {emergency rescue} OR {emergency resus} OR {emergency triage} OR {advanced life support} OR {community support co-ordinator} OR {community support coordinator} OR {emergency care practitioner} OR {extended care practitioner} OR {physician assistant} OR {Ambulances} OR {Emergency Medical Technicians} OR {Air Ambulances} OR {emergency medical services} OR {paramedic} OR {ems} OR {emt} OR {prehospital} OR {pre-hospital} OR {first responder} OR {emergency medical technicians} OR {emergency services} OR {Ambulance} OR {HEMS} OR {field triage} OR {out-of-hospital} OR {emergency medical service communication systems} OR {emergency medical dispatcher} OR {emergency medical dispatch} OR {medical dispatch} OR {911} OR {999} OR {111} OR {telephone triage} OR {EMD} OR {ambulance dispatch} OR {Medical PriORity Dispatch System} OR {MPDS} ) AND TITLE-ABS-KEY ( {heart arrest} OR {cardiac arrest} OR {death, sudden, cardiac} OR {cardiovascular arrests} OR {asystole} OR {pulseless electrical activity}

OR {ventricular fibrillation} OR {pulseless ventricular tachycardia} OR {cardiopulmonary arrest} OR {cardiopulmonary resuscitation} OR {CPR} OR {out of hospital cardiac arrest} OR {out of hospital cardiac arrest} OR {sudden cardiac death} OR {heart arrest} OR {cardiac arrest} OR {OHCA} OR {sudden cardiac arrest} OR {sudden death} OR {cardiac near arrest} OR {cardiopulmonary near arrest} OR {sudden near death} OR {heart standstill} OR {asystole} OR {ventricular fibrillation} OR {ventricular tachycardia} OR {resuscitation} OR {cardiopulmonary resuscitation} OR {CPR} OR {defibrillator} OR {external defibrillator} OR {automated external defibrillator} OR {basic life support} ) AND TITLE-ABS-KEY ( {africa} OR {africa} OR {Algeria} OR {Angola} OR {Benin} OR {Botswana} OR {burkina faso} OR {Burundi} OR {Cameroon} OR {canary islands} OR {cape verde} OR {central african republic} OR {Chad} OR {Comoros} OR {Congo} OR {democratic republic of congo} OR {Djibouti} OR {Egypt} OR {equatorial guinea} OR {Eritrea} OR {Ethiopia} OR {Gabon} OR {Gambia} OR {Ghana} OR {Guinea} OR {guinea bissau} OR {ivory coast} OR {cote d ivoire} OR {Jamahiriya} OR {Jamahiriya} OR {Kenya} OR {Lesotho} OR {Liberia} OR {Libya} OR {Libya} OR {Madagascar} OR {Malawi} OR {Mali} OR {Mauritania} OR {Mauritius} OR {Mayotte} OR {Morocco} OR {Mozambique} OR {Mozambique} OR {Namibia} OR {Niger} OR {Nigeria} OR {Principe} OR {Reunion} OR {Rwanda} OR {sao tome} OR {Senegal} OR {Seychelles} OR {sierra leone} OR {Somalia} OR {south africa} OR {st helena} OR {Sudan} OR {Swaziland} OR {Tanzania} OR {Togo} OR {Tunisia} OR {Uganda} OR {western sahara} OR {Zaire} OR {Zambia} OR {Zimbabwe} OR {central africa} OR {central african} OR {west africa} OR {west african} OR {western africa} OR {western african} OR {east africa} OR {east african} OR {eastern africa} OR {eastern african} OR {north africa} OR {north african} OR {northern africa} OR {northern african} OR {south african} OR {southern africa} OR {southern african} OR {sub saharan africa} OR {sub saharan african} OR {sub saharan africa} OR {sub saharan african} AND NOT {guinea pig} OR {guinea pigs} OR {aspergillums} OR {Niger} )

### **Pubmed: (Literature search performed on August 10, 2020)**

((((((((((((((((((((((((((((((((((((((("emergency medical services"[MeSH Terms] OR ("emergency"[All Fields] AND "medical"[All Fields] AND "services"[All Fields])) OR "emergency medical services"[All Fields] OR ("emergency medical technicians"[MeSH Terms] OR ("emergency"[All Fields] AND "medical"[All Fields] AND "technicians"[All Fields])) OR "emergency medical technicians"[All Fields])) OR ("emergency treatment"[MeSH Terms] OR ("emergency"[All Fields] AND "treatment"[All Fields])) OR "emergency treatment"[All Fields])) OR ("emergency medicine"[MeSH Terms] OR ("emergency"[All Fields] AND "medicine"[All Fields])) OR "emergency medicine"[All Fields])) OR (((("ambulance s"[All Fields] OR "ambulances"[MeSH Terms]) OR "ambulances"[All Fields]) OR "ambulance"[All Fields])) OR ("air ambulances"[MeSH





"abnormalities"[All Fields] OR "ab"[All Fields])) OR (((((((((((("emerge"[All Fields] OR "emerged"[All Fields] OR "emergence"[All Fields] OR "emergences"[All Fields] OR "emergencies"[MeSH Terms] OR "emergencies"[All Fields] OR "emergency"[All Fields] OR "emergent"[All Fields] OR "emergently"[All Fields] OR "emergents"[All Fields] OR "emerges"[All Fields] OR "emerging"[All Fields] AND ("abnormalities"[MeSH Subheading] OR "abnormalities"[All Fields] OR "ab"[All Fields])) OR ((("first"[All Fields] OR "firsts"[All Fields] AND ("abnormalities"[MeSH Subheading] OR "abnormalities"[All Fields] OR "ab"[All Fields])) OR (((((((((((("public"[All Fields] OR "public s"[All Fields] OR "publically"[All Fields] OR "publication s"[All Fields] OR "publications"[MeSH Terms] OR "publications"[All Fields] OR "publicity"[All Fields] OR "publicize"[All Fields] OR "publicized"[All Fields] OR "publicizing"[All Fields] OR "publics"[All Fields] OR "publishing"[MeSH Terms] OR "publishing"[All Fields] OR "publication"[All Fields] AND (((("access"[All Fields] OR "accessed"[All Fields] OR "accesses"[All Fields] OR "accessibilities"[All Fields] OR "accessibility"[All Fields] OR "accessible"[All Fields] OR "accessing"[All Fields] AND ("abnormalities"[MeSH Subheading] OR "abnormalities"[All Fields] OR "ab"[All Fields])) OR (((((((((((("emerge"[All Fields] OR "emerged"[All Fields] OR "emergence"[All Fields] OR "emergences"[All Fields] OR "emergencies"[MeSH Terms] OR "emergencies"[All Fields] OR "emergency"[All Fields] OR "emergent"[All Fields] OR "emergently"[All Fields] OR "emergents"[All Fields] OR "emerges"[All Fields] OR "emerging"[All Fields] AND ("abnormalities"[MeSH Subheading] OR "abnormalities"[All Fields] OR "ab"[All Fields])) OR (((((((((((("emerge"[All Fields] OR "emerged"[All Fields] OR "emergence"[All Fields] OR "emergences"[All Fields] OR "emergencies"[MeSH Terms] OR "emergencies"[All Fields] OR "emergency"[All Fields] OR "emergent"[All Fields] OR "emergently"[All Fields] OR "emergents"[All Fields] OR "emerges"[All Fields] OR "emerging"[All Fields] AND ("abnormalities"[MeSH Subheading] OR "abnormalities"[All Fields] OR "ab"[All Fields])) OR (((((((((((("emerge"[All Fields] OR "emerged"[All Fields] OR "emergence"[All Fields] OR "emergences"[All Fields] OR "emergencies"[MeSH Terms] OR "emergencies"[All Fields] OR "emergency"[All Fields] OR "emergent"[All Fields] OR "emergently"[All Fields] OR "emergents"[All Fields] OR "emerges"[All Fields] OR "emerging"[All Fields] AND ("abnormalities"[MeSH Subheading] OR "abnormalities"[All Fields] OR "ab"[All Fields])) OR (((("advance"[All Fields] OR "advanced"[All Fields] OR "advancement"[All Fields] OR "advancements"[All Fields] OR "advances"[All Fields] OR "advancing"[All Fields] AND ("life"[MeSH Terms] OR "life"[All Fields] AND ("abnormalities"[MeSH Subheading] OR "abnormalities"[All Fields] OR "ab"[All Fields])) OR (((((((((((("communal"[All Fields] OR "communalism"[All Fields] OR "communalities"[All Fields] OR "communality"[All Fields] OR "communally"[All Fields] OR "commune"[All Fields] OR "communes"[All Fields] OR "community s"[All Fields] OR "communitys"[All Fields] OR "residence characteristics"[MeSH Terms] OR ("residence"[All Fields] AND "characteristics"[All Fields])) OR "residence characteristics"[All Fields] OR "communities"[All Fields] OR "community"[All Fields] AND (((((((("support"[All Fields] OR "support s"[All Fields] OR "supported"[All Fields] OR "supporter"[All Fields] OR "supporter s"[All Fields] OR

"supporters"[All Fields] OR "supporting"[All Fields] OR "supportive"[All Fields] OR "supportiveness"[All Fields] OR "supports"[All Fields] AND (("abnormalities"[MeSH Subheading] OR "abnormalities"[All Fields] OR "ab"[All Fields])) OR (((((((((((("communal"[All Fields] OR "communalism"[All Fields]) OR "communalities"[All Fields] OR "communality"[All Fields] OR "communally"[All Fields] OR "commune"[All Fields] OR "communes"[All Fields] OR "community s"[All Fields] OR "communities"[All Fields] OR "residence characteristics"[MeSH Terms] OR ("residence"[All Fields] AND "characteristics"[All Fields])) OR "residence characteristics"[All Fields] OR "communities"[All Fields] OR "community"[All Fields] AND (((((((("support"[All Fields] OR "support s"[All Fields] OR "supported"[All Fields] OR "supporter"[All Fields] OR "supporter s"[All Fields] OR "supporters"[All Fields] OR "supporting"[All Fields] OR "supportive"[All Fields] OR "supportiveness"[All Fields] OR "supports"[All Fields] AND "coordinator.ti"[All Fields] AND (("abnormalities"[MeSH Subheading] OR "abnormalities"[All Fields] OR "ab"[All Fields])) OR (((((((("emergency treatment"[MeSH Terms] OR ("emergency"[All Fields] AND "treatment"[All Fields])) OR "emergency treatment"[All Fields] OR ("emergency"[All Fields] AND "care"[All Fields])) OR "emergency care"[All Fields] OR "emergency medical services"[MeSH Terms] OR (("emergency"[All Fields] AND "medical"[All Fields] AND "services"[All Fields])) OR "emergency medical services"[All Fields] OR ("emergency"[All Fields] AND "care"[All Fields])) AND (("abnormalities"[MeSH Subheading] OR "abnormalities"[All Fields] OR "ab"[All Fields])) OR (((("long-term care"[MeSH Terms] OR ("long term"[All Fields] AND "care"[All Fields])) OR "long term care"[All Fields] OR ("extended"[All Fields] AND "care"[All Fields])) OR "extended care"[All Fields] AND (("abnormalities"[MeSH Subheading] OR "abnormalities"[All Fields] OR "ab"[All Fields])) OR (((("physician s"[All Fields] OR "physicians"[MeSH Terms] OR "physicians"[All Fields] OR "physician"[All Fields] OR "physicians s"[All Fields] AND (("abnormalities"[MeSH Subheading] OR "abnormalities"[All Fields] OR "ab"[All Fields])) OR (((((((((((((((("ambulance s"[All Fields] OR "ambulances"[MeSH Terms] OR "ambulances"[All Fields] OR "ambulance"[All Fields] OR ("emergency medical technicians"[MeSH Terms] OR ("emergency"[All Fields] AND "medical"[All Fields] AND "technicians"[All Fields])) OR "emergency medical technicians"[All Fields] OR ("air ambulances"[MeSH Terms] OR ("air"[All Fields] AND "ambulances"[All Fields])) OR "air ambulances"[All Fields] OR ("emergency medical services"[MeSH Terms] OR ("emergency"[All Fields] AND "medical"[All Fields] AND "services"[All Fields])) OR "emergency medical services"[All Fields] OR (("abnormalities"[MeSH Subheading] OR "abnormalities"[All Fields] OR "ab"[All Fields])) OR (ems.ti[Author] AND (("abnormalities"[MeSH Subheading] OR "abnormalities"[All Fields] OR "ab"[All Fields])) OR (("abnormalities"[MeSH Subheading] OR "abnormalities"[All Fields] OR "ab"[All Fields] OR ("prehospital"[All Fields] OR "prehospitally"[All Fields] AND ti ab[Author])) OR ("pre-hospital.ti"[All Fields] AND (("abnormalities"[MeSH Subheading] OR "abnormalities"[All Fields] OR "ab"[All Fields])) OR ("first"[All Fields] OR "firsts"[All Fields] AND (("abnormalities"[MeSH Subheading] OR "abnormalities"[All Fields] OR "ab"[All Fields])) OR (((((((((((("emerge"[All Fields] OR "emerged"[All Fields] OR "emergence"[All Fields] OR "emergences"[All Fields] OR "emergencies"[MeSH

Terms]) OR "emergencies"[All Fields]) OR "emergency"[All Fields]) OR "emergent"[All Fields]) OR "emergently"[All Fields]) OR "emergents"[All Fields]) OR "emerges"[All Fields]) OR "emerging"[All Fields]) AND (((((((((((((((("medic"[All Fields] OR "medical"[All Fields]) OR "medicalization"[MeSH Terms]) OR "medicalization"[All Fields]) OR "medicalizations"[All Fields]) OR "medicalize"[All Fields]) OR "medicalized"[All Fields]) OR "medicalizes"[All Fields]) OR "medicalizing"[All Fields]) OR "medically"[All Fields]) OR "medicals"[All Fields]) OR "medicated"[All Fields]) OR "medication s"[All Fields]) OR "medics"[All Fields]) OR "pharmaceutical preparations"[MeSH Terms]) OR ("pharmaceutical"[All Fields] AND "preparations"[All Fields])) OR "pharmaceutical preparations"[All Fields]) OR "medication"[All Fields]) OR "medications"[All Fields]) AND (("abnormalities"[MeSH Subheading] OR "abnormalities"[All Fields]) OR "ab"[All Fields])) OR (((((((((((("emerge"[All Fields] OR "emerged"[All Fields]) OR "emergence"[All Fields]) OR "emergences"[All Fields]) OR "emergencies"[MeSH Terms]) OR "emergencies"[All Fields]) OR "emergency"[All Fields]) OR "emergent"[All Fields]) OR "emergently"[All Fields]) OR "emergents"[All Fields]) OR "emerges"[All Fields]) OR "emerging"[All Fields]) AND (("abnormalities"[MeSH Subheading] OR "abnormalities"[All Fields]) OR "ab"[All Fields])) OR (("abnormalities"[MeSH Subheading] OR "abnormalities"[All Fields]) OR "ab"[All Fields])) OR (("abnormalities"[MeSH Subheading] OR "abnormalities"[All Fields]) OR "ab"[All Fields])) OR (((("field"[All Fields] OR "field s"[All Fields]) OR "fields"[All Fields]) AND (("abnormalities"[MeSH Subheading] OR "abnormalities"[All Fields]) OR "ab"[All Fields])) OR ("out-of-hospital"[All Fields] AND ti ab[Author])) OR (((((((("emergency medical service communication systems"[MeSH Terms] OR (((("emergency"[All Fields] AND "medical"[All Fields]) AND "service"[All Fields]) AND "communication"[All Fields]) AND "systems"[All Fields])) OR "emergency medical service communication systems"[All Fields]) OR ("emergency medical dispatcher"[MeSH Terms] OR ("emergency"[All Fields] AND "medical"[All Fields]) AND "dispatcher"[All Fields])) OR "emergency medical dispatcher"[All Fields])) OR ("emergency medical dispatch"[MeSH Terms] OR ("emergency"[All Fields] AND "medical"[All Fields]) AND "dispatch"[All Fields])) OR "emergency medical dispatch"[All Fields])) OR (((((((((((((((("medic"[All Fields] OR "medical"[All Fields]) OR "medicalization"[MeSH Terms]) OR "medicalization"[All Fields]) OR "medicalizations"[All Fields]) OR "medicalize"[All Fields]) OR "medicalized"[All Fields]) OR "medicalizes"[All Fields]) OR "medicalizing"[All Fields]) OR "medically"[All Fields]) OR "medicals"[All Fields]) OR "medicated"[All Fields]) OR "medication s"[All Fields]) OR "medics"[All Fields]) OR "pharmaceutical preparations"[MeSH Terms]) OR ("pharmaceutical"[All Fields] AND "preparations"[All Fields])) OR "pharmaceutical preparations"[All Fields]) OR "medication"[All Fields]) OR "medications"[All Fields]) AND "dispatch\*"[All Fields])) OR (((((((("telephone"[MeSH Terms] OR "telephone"[All Fields]) OR "telephones"[All Fields]) OR "telephoned"[All Fields]) OR "telephonic"[All Fields]) OR "telephonically"[All Fields]) OR "telephoning"[All Fields]) AND (("abnormalities"[MeSH Subheading] OR "abnormalities"[All Fields]) OR "ab"[All Fields])) OR (((("ambulance s"[All Fields] OR "ambulances"[MeSH Terms]) OR "ambulances"[All Fields]) OR "ambulance"[All Fields]) AND (("abnormalities"[MeSH Subheading] OR "abnormalities"[All Fields]) OR "ab"[All

Fields])) OR (((((((((((((((("medic"[All Fields] OR "medical"[All Fields]) OR "medicalization"[MeSH Terms] OR "medicalization"[All Fields]) OR "medicalizations"[All Fields] OR "medicalize"[All Fields] OR "medicalized"[All Fields] OR "medicalizes"[All Fields] OR "medicalizing"[All Fields] OR "medically"[All Fields] OR "medicals"[All Fields] OR "medicated"[All Fields] OR "medication s"[All Fields] OR "medics"[All Fields] OR "pharmaceutical preparations"[MeSH Terms] OR ("pharmaceutical"[All Fields] AND "preparations"[All Fields])) OR "pharmaceutical preparations"[All Fields] OR "medication"[All Fields] OR "medications"[All Fields] AND ("priorities"[All Fields] OR "priority"[All Fields]) AND (((("dispatch"[All Fields] OR "dispatched"[All Fields]) OR "dispatcher"[All Fields] OR "dispatcher s"[All Fields]) OR "dispatchers"[All Fields] OR "dispatches"[All Fields] OR "dispatching"[All Fields]) AND "System.ti"[All Fields] AND ((("abnormalities"[MeSH Subheading] OR "abnormalities"[All Fields]) OR "ab"[All Fields])) OR ((("abnormalities"[MeSH Subheading] OR "abnormalities"[All Fields]) OR "ab"[All Fields])) AND (((((((((((("heart arrest"[MeSH Terms] OR "cardiac arrest\*"[Text Word]) OR "death, sudden, cardiac"[MeSH Terms] OR (((("cardiovascular system"[MeSH Terms] OR ("cardiovascular"[All Fields] AND "system"[All Fields])) OR "cardiovascular system"[All Fields]) OR "cardiovascular"[All Fields]) OR "cardiovasculars"[All Fields]) AND "arrests"[Text Word])) OR "asystole"[Text Word]) OR "pulseless electrical activity"[Text Word]) OR "ventricular fibrillation"[MeSH Terms] OR "pulseless ventricular tachycardia"[Text Word]) OR "cardiopulmonary arrest\*"[Text Word]) OR "cardiopulmonary resuscitation"[MeSH Terms] OR "CPR"[Text Word] OR (((((((((((((((("out of hospital cardiac arrest"[Text Word] OR "out of hospital cardiac arrest"[Text Word]) OR "sudden cardiac death"[Text Word]) OR "heart arrest"[Text Word]) OR "cardiac arrest"[Text Word]) OR "OHCA"[Text Word]) OR "sudden cardiac arrest"[Text Word]) OR "sudden death"[Text Word]) OR (((("cardiacs"[All Fields] OR "heart"[MeSH Terms] OR "heart"[All Fields]) OR "cardiac"[All Fields]) AND "near arrest"[Text Word])) OR ("cardiopulmonary"[All Fields] AND "near arrest"[Text Word])) OR ((("sudden"[All Fields] OR "suddenness"[All Fields]) AND "near death"[Text Word])) OR "heart standstill"[Text Word]) OR "asystole"[Text Word]) OR "ventricular fibrillation"[Text Word]) OR "ventricular tachycardia"[Text Word]) OR "resuscitation"[Text Word]) OR "cardiopulmonary resuscitation"[Text Word]) OR "CPR"[Text Word] OR "defibrillator\*"[Text Word]) OR "external defibrillator\*"[Text Word]) OR "automated external defibrillator\*"[Text Word]) OR "basic life support"[Text Word])) AND (("africa"[MeSH Terms] OR "africa\*"[Text Word]) OR "Algeria"[Text Word]) OR "Angola"[Text Word]) OR "Benin"[Text Word]) OR "Botswana"[Text Word]) OR "burkina faso"[Text Word]) OR "Burundi"[Text Word]) OR "Cameroon"[Text Word]) OR "canary islands"[Text Word]) OR "cape verde"[Text Word]) OR "central african republic"[Text Word]) OR "Chad"[Text Word]) OR "Comoros"[Text Word]) OR "Congo"[Text Word]) OR "democratic republic of congo"[Text Word]) OR "Djibouti"[Text Word]) OR "Egypt"[Text Word]) OR "equatorial guinea"[Text Word]) OR "Eritrea"[Text Word]) OR "Ethiopia"[Text Word]) OR "Gabon"[Text Word]) OR "Gambia"[Text Word]) OR "Ghana"[Text Word]) OR "Guinea"[Text Word]) OR "guinea bissau"[Text Word]) OR "ivory coast"[Text Word]) OR "cote d ivoire"[Text Word]) OR "Jamahiriya"[Text Word]) OR "Jamahiriya"[Text Word]))



OR "Kenya"[Text Word] OR "Lesotho"[Text Word] OR "Liberia"[Text Word] OR "Libya"[Text Word] OR "Libya"[Text Word] OR "Madagascar"[Text Word] OR "Malawi"[Text Word] OR "Mali"[Text Word] OR "Mauritania"[Text Word] OR "Mauritius"[Text Word] OR "Mayotte"[Text Word] OR "Morocco"[Text Word] OR "Mozambique"[Text Word] OR "Mozambique"[Text Word] OR "Namibia"[Text Word] OR "Niger"[Text Word] OR "Nigeria"[Text Word] OR "Principe"[Text Word] OR "Reunion"[Text Word] OR "Rwanda"[Text Word] OR "sao tome"[Text Word] OR "Senegal"[Text Word] OR "Seychelles"[Text Word] OR "sierra leone"[Text Word] OR "Somalia"[Text Word] OR "south africa"[Text Word] OR "st helena"[Text Word] OR "Sudan"[Text Word] OR "Swaziland"[Text Word] OR "Tanzania"[Text Word] OR "Togo"[Text Word] OR "Tunisia"[Text Word] OR "Uganda"[Text Word] OR "western sahara"[Text Word] OR "Zaire"[Text Word] OR "Zambia"[Text Word] OR "Zimbabwe"[Text Word] OR "central africa"[Text Word] OR "central african"[Text Word] OR "west africa"[Text Word] OR "west african"[Text Word] OR "western africa"[Text Word] OR "western african"[Text Word] OR "east africa"[Text Word] OR "east african"[Text Word] OR "eastern africa"[Text Word] OR "eastern african"[Text Word] OR "north africa"[Text Word] OR "north african"[Text Word] OR "northern africa"[Text Word] OR "northern african"[Text Word] OR "south african"[Text Word] OR "southern africa"[Text Word] OR "southern african"[Text Word] OR "sub saharan africa"[Text Word] OR "sub saharan african"[Text Word] OR "sub saharan africa"[Text Word] OR "sub saharan african"[Text Word] NOT (("guinea pig"[Text Word] OR "guinea pigs"[Text Word]) OR ("aspergillums"[All Fields] AND "Niger"[Text Word]))

**Google Scholar: (Literature search performed on September 3, 2020)**

("heart arrest" OR "cardiac arrest" OR "death, sudden, cardiac" OR "cardiovascular arrests" OR "asystole" OR "pulseless electrical activity" OR "ventricular fibrillation" OR "pulseless ventricular tachycardia" OR "cardiopulmonary arrest" OR "cardiopulmonary resuscitation" OR "CPR"

**OR**

"out of hospital cardiac arrest" OR "out of hospital cardiac arrest" OR "sudden cardiac death" OR "heart arrest" OR "cardiac arrest" OR "OHCA" OR "sudden cardiac arrest" OR "sudden death" OR "cardiac near arrest" OR "cardiopulmonary near arrest" OR "sudden near death" OR "heart standstill" OR "asystole" OR "ventricular fibrillation" OR "ventricular tachycardia" OR "resuscitation" OR "cardiopulmonary resuscitation" OR "CPR" OR "defibrillator" OR "external defibrillator" OR "automated external defibrillator" OR "basic life support")

**AND**

("africa" OR "africa" OR "Algeria" OR "Angola" OR "Benin" OR "Botswana" OR "burkina faso" OR "Burundi" OR "Cameroon" OR "canary islands" OR "cape verde" OR "central african republic" OR "Chad" OR "Comoros" OR "Congo" OR "democratic republic of congo" OR "Djibouti" OR "Egypt" OR "equatorial guinea" OR "Eritrea" OR "Ethiopia" OR "Gabon" OR "Gambia" OR "Ghana" OR "Guinea" OR "guinea bissau"

OR "ivory coast" OR "cote d ivoire" OR "Jamahiriya" OR "Jamahiriya" OR "Kenya"  
OR "Lesotho" OR "Liberia" OR "Libya" OR "Libya" OR "Madagascar" OR "Malawi"  
OR "Mali" OR "Mauritania" OR "Mauritius" OR "Mayotte" OR "Morocco" OR  
"Mozambique" OR "Mozambique" OR "Namibia" OR "Niger" OR "Nigeria" OR  
"Principe" OR "Reunion" OR "Rwanda" OR "sao tome" OR "Senegal" OR  
"Seychelles" OR "sierra leone" OR "Somalia" OR "south africa" OR "st helena" OR  
"Sudan" OR "Swaziland" OR "Tanzania" OR "Togo" OR "Tunisia" OR "Uganda" OR  
"western sahara" OR "Zaire" OR "Zambia" OR "Zimbabwe" OR "central africa" OR  
"central african" OR "west africa" OR "west african" OR "western africa" OR "western  
african" OR "east africa" OR "east african" OR "eastern africa" OR "eastern african"  
OR "north africa" OR "north african" OR "northern africa" OR "northern african" OR  
"south african" OR "southern africa" OR "southern african" OR "sub saharan africa"  
OR "sub saharan african" OR "sub saharan africa" OR "sub saharan african" NOT  
"guinea pig" OR "guinea pigs" OR "aspergillums" AND "Niger")

### Supplementary Materials 3: Extraction Matrix

The following data was extracted from the included articles:

- Author(s)
- Year of publication
- Origin/country of origin (where the study was published or conducted)
- Setting (out-of-hospital or facility-based care)
- Aims/purpose
- Study population and sample size (if applicable)
- Methodology/methods
- Intervention type/duration, comparator, outcome measures (if applicable)
- Key findings that relate to the OHCA in low- to middle-income countries.  
Including but not limited to: <sup>(15)</sup>
  - Activation of emergency services
  - CPR quality and duration
  - Bystander action
  - Defibrillation timing
  - Timing of EMS
  - Advanced life support (ALS) and post-arrest care
  - Underlying causes for OHCA
  - Survival rates (ROSC rates, survival to EC admission, hospital admission, hospital discharge)
  - Morbidity (outcomes and neurological survival)