

Establishing Cardiopulmonary Resuscitation Services in Sub-Saharan Africa: A Survey of Suggestions Made by Health Care Workers in Cross River State, Nigeria

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Abstract

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BACKGROUND: Rising trend in Non-Communicable Diseases (NCDs) in developing countries often result in sudden death, which are largely preventable through effective cardiopulmonary resuscitation (CPR). Most communities in Sub-Saharan Africa, however, lack access to CPR services, due to a deficiency in requirements for the establishment of such services. These requirements can be grouped into a triad of awareness, infrastructure and capacity building.

AIM: This study was aimed at assessing the perceived need and recommendations for improvement in CPR services in Cross River State.

METHODS: Proportionate sampling was used to recruit healthcare workers in this cross-sectional study. Data was obtained using semi-structured open-ended questionnaire consisting of recommendations for improving CPR services. Responses were coded and grouped into three essential areas. Data were entered and analysed using SPSS version 20.0.

RESULT: Two hundred and twenty-nine (229) questionnaires were completed; mean age of respondents was 42.1 ± 11.2 years. The commonest cadre of healthcare worker was nurses (135, 59.0%). One, two, and three areas of suggestions were made by 55.5%, 37.1%, and 7.4% of respondents, respectively. Suggestions included training of health care workers on CPR (111, 48.5%) and provision of resuscitation equipment (95, 41.5%). Sixty-five respondents (29.3%) recommended creating awareness and means of contact, while some respondents recommended capacity building (132, 57.6%) and resuscitation infrastructure set-up (149, 65.1%).

CONCLUSION: Healthcare workers perceive an urgent need for the establishment of CPR services in our health facilities and communities. There is need to address the triad of awareness, infrastructure and capacity building for the establishment of CPR services peculiar to Sub-Saharan Africa.

Introduction

Sudden unexpected death following a witnessed cardiac arrest can be reversed through prompt and effective bystander cardiopulmonary resuscitation (CPR) [1]. This is especially so if it is due to ventricular fibrillation, and the chain of survival including immediate recognition, CPR and prompt defibrillation are instituted by a trained provider [2]. Unfortunately, most communities in Sub-Saharan Africa, lack access to CPR services, due to lack of a triad of awareness, infrastructure and capacity building.

This study was aimed at assessing the perceived need and suggestions for improvement in CPR services among healthcare workers in Cross River State.

Methods

Cross-sectional study design using proportionate sampling technique was used to recruit healthcare workers, from healthcare institutions across the geopolitical regions of Cross River State.

The semi-structured open-ended questionnaire was used to obtain data, essentially consisting of suggestions or recommendations for improving CPR services in their region. Responses were coded and grouped into three essential areas for the establishment of CPR services. These areas were Awareness creation, Provision of infrastructure and Capacity building. Data were entered and analysed using SPSS version 20.0.

Result

Three hundred and thirty-seven health care workers were recruited, but 229 completed their questionnaire, yielding a response rate of 68.0%. Most respondents (162, 70.7%) were female, with a female: male ratio of 1:0.4. Mean age was 42.1 ± 11.2 years, ranging from 19-77 years old. Approximately half of the respondents (117, 51.1%) were within 31-50 years old (Table 1).

One-tenth of respondents worked in private health institution (19, 8.3%) or Non-Governmental Organization (5, 2.2%), while the majority (205, 89.5%) were government healthcare workers. Majority (135, 59.0%) were nurses, followed by doctors (24, 10.5%) and pharmacists (17, 7.4%). Mean some years of practice were 17.3 ± 11.7 years, ranging from 1-43 years. One hundred and forty respondents (61.1%) had previously received training on CPR.

Table 1: Socio-demographic characteristics of respondents (N = 229)

Variable	Frequency	Percent
Sex		
Male	67	29.3
Female	162	70.7
Total	229	100
Age groups (in years)		
≤20	2	0.9
21-30	51	22.3
31-40	47	20.5
41-50	70	30.6
51-60	52	22.7
61-70	6	2.6
71-80	1	0.4
Total	229	100
Institution type		
Government	205	89.5
Private	19	8.3
Non-Governmental Organization	5	2.2
Total	229	100
A cadre of healthcare worker		
Nurse	135	59.0
Doctor	24	10.5
Pharmacist	17	7.4
Physiotherapist	12	5.2
Laboratory scientist	9	3.9
Community health worker	9	3.9
Administrative staff	5	2.2
Others	18	7.9
Total	229	100

Approximately one-fifth of respondents (45, 19.7%) recommended improvement in public awareness on CPR, while 32 (14.0%) recommended activation and/or publicity of medical emergency contact phone number(s) (Table 2).

Table 2: Suggestions/recommendations related to awareness & access (N = 229)

Suggestion	Frequency	Percent
Improvement in public awareness on CPR		
Yes	45	19.7
No	184	80.3
Total	229	100
Activation & publicity of emergency contact		
Yes	32	14.0
No	197	86.0
Total	229	100

The commonest suggestion made, related to capacity building was the training of healthcare workers (111, 48.5%), followed by training of general public (21, 9.2%) on CPR. Other areas related to the capacity building were rarely suggested, including patient education (1, 0.4%), availability and use of CPR guidelines (2, 0.9%) and intersectoral/interdisciplinary collaboration (5, 2.2%) (Table 3).

Table 3: Suggestions/recommendations related to capacity building (N = 229)

Variable	Frequency	Percent
Training of healthcare worker		
Yes	111	48.5
No	118	51.5
Total	229	100
Training of general public		
Yes	21	9.2
No	208	90.8
Total	229	100
Patient education		
Yes	1	0.4
No	228	99.6
Total	229	100
Availability and implementation of guidelines		
Yes	2	0.9
No	227	99.1
Total	229	100
Close monitoring and alertness of patients		
Yes	7	3.1
No	222	96.9
Total	229	100
Collaboration (intersectoral & interdisciplinary)		
Yes	5	2.2
No	224	97.8
Total	229	100

Common suggestions related to resuscitation infrastructure were the provision of resuscitation equipment (95, 41.5%), provision of resuscitation medications and oxygen (29, 12.7%), and having a response team (31, 13.5%) (Table 4). Five respondents (2.2%) suggested the provision of incentives for resuscitation workers, while one respondent (0.4%) suggested having a geographic mapping of the state.

One, two, and three areas of suggestions were made by 55.5%, 37.1%, and 7.4% of respondents, respectively. One hundred and two respondents (44.5%) made suggestions in at least two areas (table 5). Sixty-five respondents (29.3%) made suggestions related to awareness and contact, while most respondents made suggestions related to capacity building (132, 57.6%) and building of resuscitation infrastructure (149, 65.1%).

Discussion

Public awareness of their role in the chain of survival has been shown to increase their confidence and willingness to resuscitate sudden cardiac arrest (SCA) victims. It also improves the outcome of such resuscitation effort. A study in Spain revealed that 94.7% respondents consider training the general population on CPR to be very important [3].

-Table 4: Suggestions/recommendations related to resuscitation infrastructure set-up (N=229)

Variable	Frequency	Percent
Build resuscitation infrastructure		
Yes	19	8.3
No	210	91.7
Total	229	100
Have mobile resuscitation van/ambulances		
Yes	17	7.4
No	212	92.6
Total	229	100
More accident and emergency staffing and service points		
Yes	26	11.4
No	203	88.6
Total	229	100
Provide resuscitation equipment		
Yes	95	41.5
No	134	58.5
Total	229	100
Provide resuscitation medications / oxygen		
Yes	29	12.7
No	200	87.3
Total	229	100
Have response team		
Yes	31	13.5
No	198	86.5
Total	229	100
Geographic mapping of the state		
Yes	1	0.4
No	228	99.6
Total	229	100
Provide incentives for resuscitation workers		
Yes	5	2.2
No	224	97.8
Total	229	100

The same study found that though 37% had received training, only 20.2% considered themselves able to respond appropriately with bystander CPR. This emphasises the need for training and retraining. To ensure prompt defibrillation, bystanders are taught to call for help using an emergency response number. This toll-free number should be easy to remember and well known to the public.

Table 5: Distribution of areas of suggestions/recommendations made (N=229)

Variable	Frequency	Percent
Makes a suggestion(s) related to awareness/contact		
Yes	67	29.3
No	162	70.7
Total	229	100
Makes a suggestion(s) related to capacity building		
Yes	132	57.6
No	97	42.4
Total	229	100
Makes a suggestion(s) related to building resuscitation infrastructure		
Yes	149	65.1
No	80	34.9
Total	229	100
Number of areas suggested		
One	127	55.5
Two	85	37.1
Three	17	7.4
Total	229	100
Suggest at least two areas		
Yes	102	44.5
No	127	55.5
Total	229	100

Three digit numbers such as 112 in the United Kingdom and 911 in North America are easily remembered in the panicky atmosphere usually created by SCA. Respondents in this study believe that such should be the case in our setting and where such a number exists, it should be adequately publicised.

Many respondents indicated their need for capacity building by suggesting regular training of healthcare providers in CPR. Re-certification in basic life support (BLS) and advanced cardiac life support (ACLS) is the basis for the renewal of practising licenses in many countries for health workers. This should be made compulsory particularly for those working in Accident/Emergency and Intensive Care Units (ICU). Training also includes the ethics of resuscitation regarding when to withhold CPR [4]. Anthony-Pillai expressed a personal view about a high court decision around cardiopulmonary resuscitation (CPR) [4]. This opinion identified that the judge failed to recognise the statutory role given to clinicians in identifying when treatment is life sustaining. In failing to recognise the role of the clinician, he felt the ruling in Winspear risks the likelihood of inappropriate CPR attempts.

Given the critical need for bystander CPR, it is not surprising that some respondents in this study suggested the need to train citizens as a way of improving resuscitation service in the State [5]. A study by Weisfeldt and colleagues revealed that training lay responders and involving them in the use of Automated External Defibrillators (AED) in high-risk public settings nearly doubled the survival after the out-of-hospital cardiac arrest. These results reinforce the importance of strategically expanding community-based AED programs [6]. Bystander CPR and early first responder defibrillation were significantly associated with increased survival in a study reported by researchers in Canada [7]. The same researchers reported 56.1% of cardiac arrests in their series to have occurred at home. This further strengthens the importance of lay citizens CPR capacity building as a way of promoting appropriate immediate response for improved outcome.

Patient education though rarely suggested by the respondents' plays a role in directing resuscitation service. A study by Chu and colleagues highlighted the need to train relatives of high-risk patients on CPR [8]. Knowledgeable patients sometimes express their autonomy by accepting CPR in the event of cardiac arrest or refusing it through advance directives and the Do not attempt resuscitation (DNAR) order [9] [10] [11]. After interviewing Cardiac arrest survivors, their families, friends, neighbours and co-workers, Schneider in their study concluded that equipping high-risk patients and their families with AEDs is a viable method of increasing their survival in case of a recurring cardiac arrest [12]. Capacity building is thus essential not just for health workers but also the lay public especially high-risk patients and their relatives.

From the year 2000 to 2010, the International Liaison Committee on Resuscitation (ILCOR) published guidelines on resuscitation. These guidelines were adopted by various resuscitation bodies to suit their infrastructure and local capacity. The American Heart Association Basic Life Support (BLS) and Advanced Cardiac Life Support (ACLS) algorithms are very popular. Similarly, the European Resuscitation Council has her algorithms [13] [14]. There is a need for Low and Medium-Income Countries to develop suitable algorithms adaptable to the realities of near absence of pre-hospital care and first responders to out of hospital SCA situations [15]. Intersectoral/interdisciplinary collaboration has been shown to improve CPR outcome. In Seattle, Firefighters who were more likely to arrive the scene of cardiac arrest within the first 4 critical minutes were commissioned to be the first responders, and this gave rise to the concept of Citizens CPR. Such collaboration will be an advantage in LMIC. Aguilera-Campos et al. found that police arrived at the scene of SCA before the ambulance [16]. Similarly, a study in Canton of Ticino found the use of an App by Emergency dispatchers recruited both the traditional (police and fire brigade) first responders and lay responders leading to more prompt initiation of CPR with better outcomes [17].

In this study, most respondents suggested the need for availability of resuscitation infrastructure. Equipment as Automated External Defibrillators (AED), Self-inflating Bags must be available and readily accessible to all healthcare providers. Also, BLS and ACLS ambulance vehicles are required for pre-hospital care and inter-hospital transfers. This is unfortunately not the case in many LMIC. There is a need for political will in making resuscitation equipment available for improved outcome. Emergency drug carts, an oxygen source and a means of giving it should also be available.

The need for a response team both for out of the hospital and an in-hospital cardiac arrest has been proven to increase survival. This recommendation was made by 13.4% of our respondents. Some hospitals do not just have a cardiac arrest team but a Medical Emergency Team (MET) that watches out for patients with physiological derangement who are likely to deteriorate to a cardiac arrest. Early Warning Scores have been used in such instances to enhance the early recognition arm of the chain of survival [18] [19]. Roberts and Baxter in separate studies comparing pre and post introduction of MET found a reduction in cardiac arrests, postoperative complications, and hospital mortality as well as better ICU resource utilisation. Geographic mapping will be useful when there is an active medical emergency response team for out of hospital cardiac arrests. Only one responder in this series recommended this. Researchers in Sao Paulo confirmed this in their study [20].

It is worrisome that no respondent mentioned

the need for dispatcher directed CPR. This is a common practice in developed countries where a trained dispatcher receives the distress call, dispatches the ambulance to the scene of SCA and guides the caller through appropriate CPR technique [21]. Not surprisingly most respondents want to build their capacity and have better resuscitation infrastructure. This will improve the service for most of the patients who come to us in the hospital and for those outside. There is a call by respondents for an emergency response number. It is time for the operators of the global system of mobile technologies to add to their corporate social responsibility the creation of a simple toll-free number for emergency use and publicise it.

In conclusion, healthcare workers perceive an urgent need for the establishment of organised resuscitation services in our health facilities and communities. However, only a few of these potential future healthcare leaders and policymakers, have an understanding of all the areas or requirements for establishment of such services in our setting. There is need to create awareness among healthcare workers, citizens, patients and their relatives. There is also an urgent need for political will in ensuring availability of resuscitation infrastructure and building the capacity of healthcare workers.

References

1. Bohn A, Seewald S, Wnent J. Resuscitation-Basic Life Support in adults and application of automatic external defibrillators. *Anesthesiologie, Intensivmedizin, Notfallmedizin, Schmerztherapie. AINS.* 2016; 51:178-86. PMID:27022697
2. Alonso E, Eftestøl T, Aramendi E, Kramer-Johansen J, Skogvoll E, Nordseth T. Beyond ventricular fibrillation analysis: Comprehensive waveform analysis for all cardiac rhythms occurring during resuscitation. *Resuscitation.* 2014; 85:1541-8. <https://doi.org/10.1016/j.resuscitation.2014.08.022> PMID:25195072
3. Ballesteros-Pena S, Fernández-Aedo I, Pérez-Urdiales I, García-Azpiazu Z, Unanue-Arza S. Knowledge and attitudes of citizens in the Basque Country (Spain) towards cardiopulmonary resuscitation and automatic external defibrillators. *Medicina Intensiva (English Edition).* 2016; 40:75-83. <https://doi.org/10.1016/j.medicine.2015.10.002>
4. Anthony-Pillai R. CPR decision making: why Winspear needs to be challenged? *Journal of medical ethics.* 2017;medethics-2016-103628.
5. Ro YS, Do Shin S, Song KJ, et al. Public awareness and self-efficacy of cardiopulmonary resuscitation in communities and outcomes of out-of-hospital cardiac arrest: a multi-level analysis. *Resuscitation.* 2016; 102:17-24. <https://doi.org/10.1016/j.resuscitation.2016.02.004> PMID:26898411
6. Weisfeldt ML, Sittani CM, Ornato JP, et al. Survival after application of automatic external defibrillators before arrival of the emergency medical system: evaluation in the resuscitation outcomes consortium population of 21 million. *Journal of the American College of Cardiology.* 2010; 55:1713-20. <https://doi.org/10.1016/j.jacc.2009.11.077> PMID:20394876 PMID:PMC3008654
7. Vaillancourt C, Stiell IG. Cardiac arrest care and emergency

- medical services in Canada. *The Canadian journal of cardiology*. 2004; 20:1081-90. PMID:15457303
8. Chu KH, May CR, Clark MJ, Breeze KM. CPR training in households of patients with chest pain. *Resuscitation*. 2003; 57:257-68. [https://doi.org/10.1016/S0300-9572\(03\)00039-X](https://doi.org/10.1016/S0300-9572(03)00039-X)
9. Becerra M, Hurst SA, Perron NJ, Cochet S, Elger BS. 'Do not attempt resuscitation' and 'cardiopulmonary resuscitation' in an inpatient setting: factors influencing physicians' decisions in Switzerland. *Gerontology*. 2011; 57:414-21. PMID:21099190
10. Allen JY, Hilgeman MM, Allen RS. Prospective end-of-life treatment decisions and perceived vulnerability: Future time left to live and memory self-efficacy. *Aging & mental health*. 2011; 15:122-31. <https://doi.org/10.1080/13607863.2010.505229> PMID:20924818
11. Freeman K, Field RA, Perkins GD. Variation in local trust Do Not Attempt Cardiopulmonary Resuscitation (DNACPR) policies: a review of 48 English healthcare trusts. *BMJ Open*. 2015; 5:e006517. <https://doi.org/10.1136/bmjopen-2014-006517> PMID:25586369 PMCID:PMC4298091
12. Schneider L, Sterz F, Haugk M, et al. CPR courses and semi-automatic defibrillators—life saving in cardiac arrest? *Resuscitation*. 2004; 63:295-303. <https://doi.org/10.1016/j.resuscitation.2004.06.005> PMID:15582765
13. Finn JC, Jacobs IG. Cardiac arrest resuscitation policies and practices: a survey of Australian hospitals. *Medical Journal of Australia*. 2003; 179:470-4. PMID:14583077
14. Fontana A, Zancaner S. The early semiautomatic defibrillation: legislative Italian framing and medical-legal aspects. *Italian heart journal Supplement: official journal of the Italian Federation of Cardiology*. 2004; 5:785-93.
15. Callaway CW, Schmicker R, Kampmeyer M, et al. Receiving hospital characteristics associated with survival after out-of-hospital cardiac arrest. *Resuscitation*. 2010; 81:524-9. <https://doi.org/10.1016/j.resuscitation.2009.12.006> PMID:20071070 PMCID:PMC2856722
16. Aguilera-Campos A, Asensio-Lafuente E, Fraga-Sastrías JM. Analysis of the inclusion of police personnel on the out of hospital cardiac arrest emergency response. *Salud publica de Mexico*. 2012; 54:60-7. PMID:22286829
17. Caputo ML, Muschietti S, Burkart R, et al. Lay persons alerted by mobile application system initiate earlier cardio-pulmonary resuscitation: A comparison with SMS-based system notification. *Resuscitation*. 2017; 114:73-8. <https://doi.org/10.1016/j.resuscitation.2017.03.003> PMID:28268186
18. Roberts D, Djärv T. Preceding national early warnings scores among in-hospital cardiac arrests and their impact on survival. *The American journal of emergency medicine*. 2017; 35:1601-6. <https://doi.org/10.1016/j.ajem.2017.04.072> PMID:28476552
19. Baxter AD, Cardinal P, Hooper J, Patel R. Medical emergency teams at The Ottawa Hospital: the first two years. *Canadian Journal of Anesthesia*. 2008; 55:223. <https://doi.org/10.1007/BF03021506> PMID:18378967
20. Gonçalves PDS, Polessi JA, Bass LM, et al. Reduced frequency of cardiopulmonary arrests by rapid response teams. *Einstein (São Paulo)*. 2012; 10:442-8. <https://doi.org/10.1590/S1679-45082012000400009>
21. Bolle SR, Scholl J, Gilbert M. Can video mobile phones improve CPR quality when used for dispatcher assistance during simulated cardiac arrest? *Acta Anaesthesiologica Scandinavica*. 2009; 53:116-20. <https://doi.org/10.1111/j.1399-6576.2008.01779.x> PMID:19032569 PMCID:PMC2659378