

**ADAPTING A COMMUNITY FIRST AID RESPONDER PROGRAMME
TO INCREASE OUT-OF-HOSPITAL CAPACITY IN KINSHASA,
DEMOCRATIC REPUBLIC OF CONGO**

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2. Diango K, Pigoga J, Mafuta E, Yangongo J, Wallis L, Cunningham C, Hodkinson P. Needs assessment and Acceptability of a Community First Aid Responder programme to increase Out-of-hospital capacity in Kinshasa, Democratic Republic of Congo: A qualitative study. *Afr J Emerg Med*. 2025 Mar;15(1):526-534. doi: 10.1016/j.afjem.2024.12.003. Epub 2025 Jan 8. PMID: 39885960; PMCID: PMC11780095.
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ABSTRACT

Background:

In 2023, the seventy-sixth World Health Assembly passed a significant resolution – WHA76.2 – calling for global efforts to strengthen the provision of quality Emergency, Critical, and Operative care (ECO) to address the growing burden of acute and critical illnesses, particularly in low- and middle-income countries (LMICs). In areas where formalised prehospital care systems are being established to improve outcomes, the incorporation of a layperson first responder programme could facilitate greater access to care for individuals in need and serve as an effective initial intervention to bolster out-of-hospital emergency care (OHEC) capacity. WHO developed the Community First Aid Response (CFAR) training program to support this approach. For the course to be appropriately and sustainably implemented, contextual adaptations are necessary. The prerequisites for this country-specific adaptation include, among other factors, a systematic evaluation of the country's emergency care landscape, a needs assessment and an understanding the acceptability of the proposed intervention.

Aim and Objectives:

The aim of the thesis was to adapt a country-specific CFAR program for the Democratic Republic of Congo (DRC) as an initial intervention to increase OHEC capacity. Four studies were planned to fulfil the main objectives. The first was to outline the key functions and related components of the country's Emergency Care System (ECS), identify the gaps, and define priority areas for strengthening. The second was to evaluate community needs and the availability of Emergency Care services in Kinshasa, DRC, to determine the nature and magnitude of unmet needs, especially in OHEC. The third study was to assess the usefulness and acceptability of an adapted CFAR program designed to strengthen OHEC capacity in Kinshasa. The final study was to describe and assess a pilot CFAR course, including the process, resources, curriculum, and teaching methods, while also capturing the knowledge and confidence gains from the perspectives of both organisers and participants.

Methods:

A series of four studies was carried out in Kinshasa, DRC. The first study used a consensus method to describe essential components of the country's emergency care system utilizing the WHO Emergency Care System Assessment (ECSA) tool. The second study involved a household survey that contrasted the needs and the availability of Emergency Care services

within Kinshasa's communities. The third utilized focus groups to evaluate the usefulness and acceptability of an adapted CFAR programme. The final study consisted of a small-scale feasibility assessment using mixed methods analysis to describe and assess core elements of the implementation of a pilot CFAR training and provide key outcomes.

Results:

The evaluation of the DRC ECSA revealed several gaps, including an inadequate OHEC capacity. The household survey indicated significant unmet needs in the provision of Emergency Care, particularly regarding out-of-hospital services. An adapted CFAR programme was recognised as a suitable and acceptable strategy to increased OHEC capacity in Kinshasa. Finally, a CFAR pilot was successfully conducted and found to be contextually relevant, representing a potential initial step to address the existing OHEC capacity shortfalls in Kinshasa.

Conclusion and relevance:

This dissertation offers significant conceptual, analytical, and empirical insights into the context-specific adaptation of a CFAR programme as an initial intervention to increase OHEC capacity in a nascent ECS of a resource-constrained setting. Our results suggest that a comprehensively implemented tailored system could potentially enhance OHEC capacity in low-resource settings and likely impact outcomes.

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ACRONYMS AND ABBREVIATIONS

AFEM	African Federation for Emergency Medicine
AFJEM	African Journal of Emergency Medicine
AMURDC	Association de Médecine d’Urgence de la République Démocratique du Congo
BEC	Basic Emergency Care
CEA	Cost-Effectiveness Analysis
CBHI	Community-Based Health Intervention
CHW	Community Health Worker
CFAR	Community First Aid Responder
DAH	Development Assistance for Health
DALYs	Disability-adjusted life years
DCP	Disease Control Priorities
DRC	Democratic Republic of Congo
EC	Emergency Care
ECO	Emergency, Critical and Operative care
ECS	Emergency Care System
EM	Emergency Medicine
EMS	Emergency Medical Services
EU	Emergency Unit
FA	First Aid
GDP	Gross Domestic Product
GNI	Gross National Income
HICs	High-income countries
HCS	Healthcare system
HDI	Human Development Index
HREC	Human Research Ethics Committee
ICER	Incremental Cost-Effectiveness Ratios
LICs	Low-income countries
LFR	Layperson first responders
LMICs	Low- and middle-income countries
LRS	Low resource settings
LYS	Life years saved
MoH	Ministry of Health

NGO	Non-Governmental Organisation
OHEC	Out-of-Hospital Emergency Care
OOP	Out-of-pocket payments
PNDS	Plan National de Développement Sanitaire
PNUAH	Programme National d'Urgence, de catastrophe et Action Humanitaire
PPH	Post-partum haemorrhage
PPP	Public-Private Partnership
QALYs	Quality-adjusted life years
REDCAP	Research Electronic Data Capture
RTC	Road Traffic Crash
SSA	Sub Saharan Africa
TEH	Total Expenditure on Health
UCT	University of Cape Town
UHC	Universal Health Coverage
UNIKIN	University of Kinshasa
WB	World Bank
WHO	World Health Organization
YLL	Years of Life Lost

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CHAPTER I. INTRODUCTION

1.1. BACKGROUND

Improving the provision of emergency care (EC) in health systems of low and middle-income countries (LMICs) can have a significant impact on morbidity and mortality and well-being of populations^{1 2}. Despite this evidence, most LMICs lack organised Emergency Care Systems (ECS), hence experience substantial preventable death and disability³. Despite recording concerning health indicators data, the Democratic Republic of Congo (DRC), like many African countries, has no formal Emergency Medical Services (EMS)⁴ and needs an array of interventions to develop and strengthen its ECS, including its Out-of-Hospital Emergency care (OHEC) component. Since community members are often the earliest responders to an emergency, they can be included in the development of the overall system in an effective manner and ultimately improve patients' outcomes⁵.

The World Health Organization (WHO) therefore recommends training lay responders as a first step toward formal EMS development⁶ and initiated the Community First Aid Responder (CFAR) learning program in support of this system development. The WHO CFAR course, like many other LFR courses, emphasises community participation and empowers people to initiate emergency care in the community. The strategy is to train selected community members and integrate them into a despatch and response system, reducing time to arrival of a trained responder at the scene of an emergency^{7 8}.

Considering the unique context of Kinshasa, the capital city of the DRC, it is essential to first methodically evaluate the broader country ECS to gauge amongst others its OHEC capacity, and secondly ascertain the community's EC needs, particularly regarding prehospital services. The identification of the specific gaps both at system and health consumers' levels will help determine how the introduction of a CFAR programme could represent an efficient initial step to increasing OHEC capacity and likely improve outcomes for patients with medical emergencies. Like most health interventions, the successful implementation of a country-specific CFAR programme requires context-specific adaptations⁹, a comprehensive needs assessment¹⁰ and acceptability in order to contribute to strengthening the ECS and to reduce morbidity and mortality due to medical emergencies.

1.2. STUDY MOTIVATION

Through the World Health Assembly, WHO strongly recommends to all its Member States to invest more resources to build and scale up Emergency, Operative and Critical care (ECO) systems to respond to acute care needs in communities, particularly in Low-Resource Settings (LRS)¹¹. The DRC health authorities are increasingly cognisant of the value of ECO systems strengthening and have undertaken to develop systems and implement the WHO-recommended Universal Health Coverage (UHC)¹². Several gaps in the key components of both the OHEC and facility-based systems have been identified, including governance and financing issues¹³. Additionally, there is a significant shortage of skilled emergency care providers, emergency units are struggling to provide the full breadth of essential services and resources and infrastructures are lacking¹³. There is a need to develop a sustainable, cost-effective and locally relevant system and identify the key components of a framework from which it will develop. CFAR is a concept which could provide the building blocks for an adapted OHEC system and has been validated by WHO⁶. However, to ensure its success in a sustainable manner, the current ECS gaps need to be methodically identified through mapping, and a thorough needs assessment done to comprehend the nature and magnitude of the burden of acute diseases in the country. From there, CFAR usefulness and acceptability in the specific DRC context need to be gauged, and an implementation framework comprising details on resources, community participation, training and quality assurance worked out. This research is a compass to guide stakeholders towards achieving the goal of developing an OHEC system in DRC using CFAR as first layer of the chain of care.

The research question that this dissertation set out to answer was to ascertain if a locally appropriate community-based first aid responder programme could represent an effective intervention to improve access to, and quality of OHEC in Kinshasa, DRC.

1.3. AIMS AND OBJECTIVES

The overarching aim of this PhD is to assess how the development of a country-specific community-based first aid responder programme could increase OHEC capacity in Kinshasa, DRC.

To achieve this aim, the research has the following objectives:

- 1) To describe the primary functions and respective components of the country's ECS, identify main gaps and determine priority areas for development or improvement.
- 2) To assess communities' needs and supply of Emergency Medical Services in DRC in order to ascertain the nature and magnitude of the unmet needs.
- 3) To ascertain the need for, and acceptability of, an adapted CFAR programme aiming at increasing OHEC capacity in Kinshasa, DRC.
- 4) To pilot an adapted CFAR course in Kinshasa as a small-scale feasibility assessment aimed to describe and evaluate the process, resources, course content and teaching methodology, as well as capturing the perceived knowledge and self-confidence gain from the perspectives of both organisers and participants in order to inform future rollouts.

1.4. METHODOLOGY AND ETHICS OVERVIEW

Methodology

Table 1. Thesis methodology summary

Study	Chapter	Methodology	Aim
Study 1	Chapter 3	Consensus method	To describe the primary functions and respective components of the DRC ECS, identify main gaps and determine priority areas for development.
Study 2	Chapter 4	Household survey	To assess communities' needs and supply of EMS to ascertain the nature and magnitude of unmet needs.
Study 3	Chapter 5	Qualitative interviews : focus group discussions	To ascertain the need for, and the acceptability of an adapted CFAR programme aiming to increase OHEC capacity in Kinshasa, DRC.
Study 4	Chapter 6	Mixed methods analysis	Small-scale feasibility assessment to describe and evaluate key aspects of the implementation of a pilot WHO CFAR course.

Ethics

Ethical approvals for each of the four studies conducted as part of this thesis were granted by the University of Cape Town Human Research Ethics Committee (UCT HREC). Additionally, as all the studies (Chapters 3,4, 5 and 6) took place in the DRC, ethical approvals were sought

and granted by the Ethics Committee of School of Public Health of the University of Kinshasa (ESPK) (Table 2):

Table 2. Ethics approvals summary

Study	University of Cape Town HREC approval	School of Public Health of Kinshasa Ethics Committee approval
Study 1 (DRC ECSA)	HREC REF 086/2021	REF ESP/CE/077/2021
Study 2 (Household survey)	HREC REF: 087/2021	
Study 3 (Needs assessment)	HREC REF 088/2021	
Study 4 (CFAR pilot in DRC)	HREC REF 056/2023	REF ESP/CE/160/2022

All the above ethics approval letters are included in Appendices (Appendix 1-6). In addition to the HREC and ESPK ethics approvals, the DRC MoH has given its formal authorisation for the ECSA report to be included in this thesis (Appendix 7).

Three of the four studies received financial support as summarized Table 3, but none of them influenced the studies outcome.

Table 3. Studies funding

Study	Funding organisation
Study 1 (DRC ECSA)	WHO (through DRC Ministry of Health)
Study 2 (Household survey)	Royal College of Emergency Medicine
Study 3 (Needs assessment)	Self-funded
Study 4 (CFAR pilot in DRC)	African Federation for Emergency Medicine

None of the studies involved patients or minors. All participants to the studies conducted did formally consent (Appendix 8-11). To protect confidentiality, all data collected were anonymised and data securely stored. There are no known conflicts of interest associated with this research work. The publications arising from this dissertation received the approval of all

named co-authors (Table 4). There are no other persons who satisfied the criteria for authorship that are not listed. Consideration has been given to the protection of intellectual property associated with this work.

Moreover, there are no impediments for inclusion of the published work in this thesis and the UCT Doctoral Degree Board gave a formal approval for the inclusion of published work in this thesis. None of the co-authors was a registered student during the thesis and all formally consented to not include any part of this work in their own future studies.

Table 4. Co-authors and publication journals

Study	Co-authors	Publication
Study 1 (DRC ECSA)	• Ken Diango (Main author) • Lee Wallis • Pontien Bilomba • Mwaluka Kiembe • Ange Karume • Lucy Obgood-Brown	DRC Ministry of Health Technical Report
Study 2 (Household survey)	• Ken Diango (Main author) • John Yangongo • Vera Sistenich • Peter Hodgkinson • Eric Mafuta • Lee Wallis	BMJ Open
Study 3 (Needs assessment and acceptability)	• Ken Diango (Main author) • Jennifer Pigoga • Eric Mafuta • John Yangongo • Lee Wallis • Charmaine Cunningham • Peter Hodgkinson	AfJEM
Study 4 (CFAR pilot in DRC)	• Ken Diango (Main author) • Eric Mafuta • Lee Wallis • Charmaine Cunningham • Peter Hodgkinson	AfJEM

1.5. OVERVIEW OF THE RESEARCH SETTING

1.5.1. Low-resource settings

This research focuses specifically on EC in LRS. It is therefore vital to understand the details of the geographic, demographic, and socio-economic features of the setting of the studies, and get an accurate picture of the healthcare systems and their capacities in these settings. The classification of countries by income was introduced by the World Bank in its first World Development Report in 1978¹⁴, and these thresholds are updated yearly.

Table 5. The World Bank classification of countries by income in 2024

Countries classification in 2024	GNI per capita in 2022	World population %
Low-income countries	US\$ 1,135 or less	9%
Lower middle-income countries	US\$ 1136-4465	75%
Upper middle-income countries	US\$4466-13,845	
High income countries	US\$ 13,846 or more	16%

Source: <https://www.worldbank.org/en/country/mic/overview>

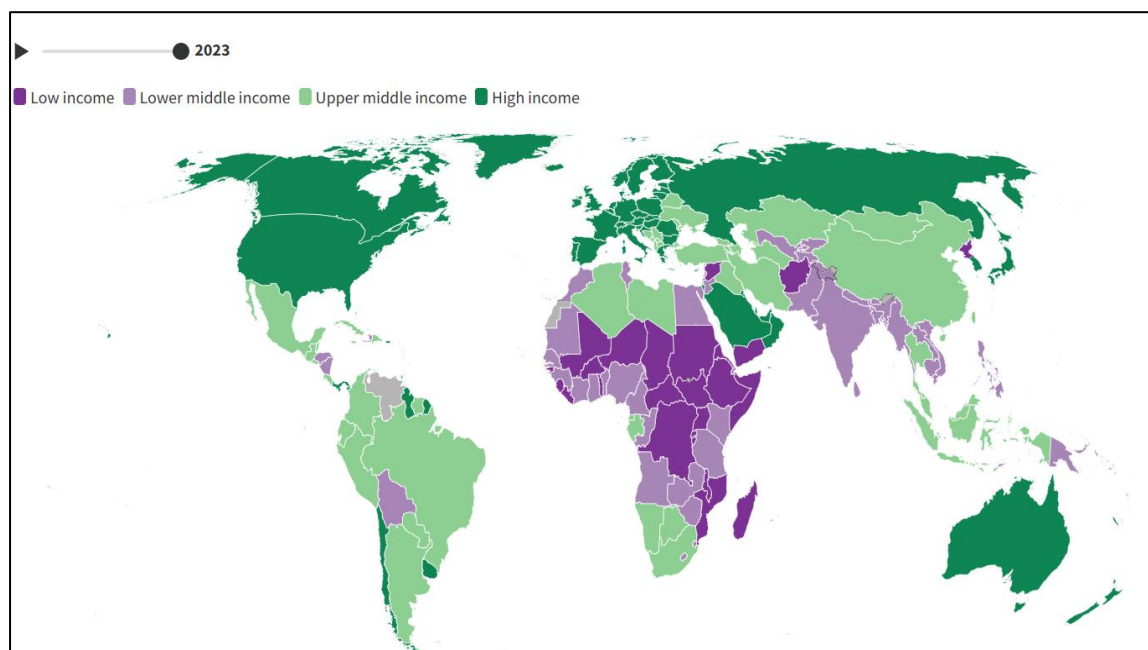


Figure 1. World Bank classification of countries by income (2024)

Source: <https://datatopics.worldbank.org/world-development-indicators/the-world-by-income-and-region.html/>

Healthcare financing challenges

Income is only one of many ways to categorise countries, but it is this characterisation that best reveals the strain experienced by these countries in providing public services to their populations¹⁵, including in the health sector. It identifies nation-states that are likely to experience hardships and difficulties in providing social services¹⁵. According to the latest World Population Review, all but four out of 26 countries ranked by the World Bank as low-income economies are in Sub-Saharan Africa (SSA)¹⁶. Africa also includes 23 of the world's 54 LMICs¹⁶. The World Bank Poverty, Prosperity, and Planet Report of 2024 revealed that SSA accounted for 2/3 of people living in extreme poverty (on less than \$2.15 per day) while being home to only 16% of the world's population¹⁷.

However, LMICs are different in many perspectives. In fact, they form a heterogeneous group comprising nations with diverse socio-economic and epidemiological characteristics, with varied health systems structures. Note that the nomenclature LMICs is utilised throughout this dissertation while term LIC/LRS (the context of resource constraint) is engaged only when referenced specifically in published works in this thesis, despite the ambiguity and controversy surrounding such a classification¹⁸. LMICs populations are mostly young¹⁹ and faced with a high burden of both communicable and non-communicable diseases²⁰. These regions confront multiple health challenges requiring a multisectoral approach in order to achieve the United Nations Sustainable Development Goals (SDGs)²¹. The key challenges include among others persistent shortfalls in financing for health system development and the subsequent social impact on the population²².

Nearly half of all healthcare provided in LRS is financed from out-of-pocket payments (OPP) by patients, while over a quarter is financed from global donors via development assistance for health, and the remaining quarter by governments²³. A WHO report showed catastrophic health spending in these settings as OPP health spending mostly exceeded 10% or 25% of total household consumption or income²⁴. Patterns of high impoverishing health spending were also shown, capturing the impact of out-of-pocket payments health spending on poverty to demonstrate the implications of such expenditures on households²³. The underpinning reality in most LMICs is that very little financial protection exists for those seeking care, and particularly emergency care which is typically unplanned.

Challenges to access to care

Beyond issues pertaining to financing, challenges in healthcare delivery in LMICs are numerous and mostly stem from resources scarcity²⁵. Impediments to accessing healthcare in a timely manner in LMICs are illustrated in the “Three delays framework”²⁶, which lists the delay in seeking care (financial, geographical, educational, cultural reasons...), the delay in reaching care (transport, distance to facility...) and the delay in receiving care, (hospital capacity, personnel and skills availability, resources...). In some cases, rather than a delay, it is simply impossible to access care.

Health system governance issues

Sound governance plays a central role in optimising service delivery and healthcare outcomes, particularly in the context of less resilient health systems in LMICs²⁷. Poor decision-making in managing and overseeing the multiple aspects of a healthcare system, including the planning, structure, processes, programmes implementation and evaluation is a key contributing factor to the shortfalls of LMICs healthcare system²⁸. Alongside deficient governance, corruption undermines the delivery of essential healthcare services and results in poor outcomes²⁹.

Deficient health infrastructure and chronic health workforce shortage

The inadequate health infrastructure in most LMICs has a negative impact on the delivery and quality of care^{30 31}. Adequate health infrastructure and equipment availability are key determinants of good medical care in resource-constrained settings²⁷. Here as well, resources scarcity is a limiting factor, as demonstrated by the chronic shortage of trained health professionals, another key factor impeding optimal delivery of care in LMICs³². This situation is compounded by the continuing brain drain of health professionals to high-income settings³³.

The above non-exhaustive list of challenges related to access to and delivery of healthcare in LMICs highlight the need for a comprehensive and sustainable strategy, coupled with the involvement of multiple stakeholders in order to achieve the WHO objective of one billion more people (mostly in LMICs) to have access to quality health services without financial hardship by 2025³⁴.

1.5.2. The Democratic Republic of Congo



Figure 2. Democratic Republic Congo in Africa

Source: <https://invest-in-africa.co/drc-map-in-africa/>

Country general profile and population

The Democratic Republic of Congo (DRC, DR Congo, Congo-Kinshasa, and sometimes simply referred to as The Congo) is located in Central Africa³⁵. Named after Africa's second longest river that crosses its vast territory, the DRC must be distinguished from the neighbouring Republic of Congo (Congo-Brazzaville). With a land area of 2.345.409 km², it is the largest country in SSA and the 11th largest in the world^{34 36}. With a multi-ethnic population of around 127 million (of which 46% are below the age of 14), the DRC is the fourth-most-populous country in Africa^{37 38}. With an estimated annual population growth of

3% corresponding to an annual increase of approximately 3 million people, the country is expected to double its population and reach 200 million people by 2050^{34, 37}. This exponential population growth poses serious problems regarding provision of healthcare. The DRC is a constitutional democracy and unitary state encompassing 26 provinces (including the capital city Kinshasa) and 145 territories (districts). French is its official language while Swahili, Lingala, Kikongo and Luba are the four national languages. For many decades, the country has been faced with political, economic and security instability³⁴ which have had serious consequences on the health sector.

The DRC boasts of exceptional natural resources, including several minerals such as copper (world second largest producer), cobalt (world largest producer, with more than 70% of world production), gold, diamond and many strategic minerals critical for the world energy transition. The DRC is also endowed with unmatched hydropower potential, more than 80 million hectares of arable land and an enormous biodiversity³⁴. In contrast, the country remains one of the poorest in the world, with close to $\frac{3}{4}$ of Congolese living on less than \$2.15 a day³⁴ and one of the lowest Human Development Index (HDI) at 0.481³⁹, despite the country's robust Gross Domestic Product (GDP) growth at 8.4%, reaching 72.48 billion USD in 2024⁴⁰.

Health indicators

According to the latest WHO data, the health of Congolese people remains concerning in several aspects. The country life expectancy at birth for male/female is 57/62 years³⁶ and the childhood mortality rate, though steadily decreasing, remains high at 62.4 per 1,000 live births³⁶. Alongside malaria, deaths related to acute respiratory and diarrheal diseases are an important cause of infant mortality. Most of these potentially fatal conditions often present as emergencies. The probability of dying between 15- and 60-year is high at 281/232 m/f per 1000 population: one out of four people is at risk of dying prematurely due to injury, acute illness, or exacerbation of a chronic illness³⁶. According to the WHO 2023 Malaria Report, the DRC is, after Nigeria, the second of the top four countries that accounted for over half of malaria cases worldwide⁴¹. The country's estimated deaths related to malaria in the last decade, probably an underestimation due to underreporting, is one of the highest in the world⁴⁰. This mortality is often due to severe cases presenting as emergencies. The United Nations AIDS

program latest data show a relatively low prevalence of HIV infection at 0.7%⁴². However, the DRC remains a high-burden Tuberculosis country⁴³.

Though improving, the DRC maternal mortality ratio of 547 for 100,000 live births remains higher than the regional average⁴⁴. This represents a key indicator of the weakness of the health system and its inability to adequately manage obstetrics emergencies such as eclampsia, ante- and post-partum haemorrhages. The burden of injury in the country is constantly growing, in keeping with trends in SSA and most LMICs, especially regarding Road Traffic Crashes (RTCs). The latest WHO Global Status Report on Road Safety for the DRC shows an increase in reported fatalities from RTCs⁴⁵; road traffic injuries are now one of the leading causes of death of children and young adults, with the SSA region (including the DRC) being the worst performer. The poor state of the country's road infrastructure, its less stringent road legislation, the documented road users' risky behaviour and the lack of formal prehospital trauma care system all make RTCs one of the most important causes of injury related morbidity, disability and deaths in the country⁴⁴. By their very nature, these injuries present as emergencies and require adequate trauma care starting at the scene, during transport and at the hospital.

Recurrent epidemic outbreaks

A fraction of the global mortality data in the DRC is related to recurrent epidemics such as Ebola Viral Disease, cholera, measles and more recently Mpox^{46 47 48 49 50}. There are likely a few countries that dealt with as many public health threats as the DRC in the past decades. Several lessons have been learnt and efforts made to improve the multisectoral response to these outbreaks, but major gaps persist, as revealed by the Covid-19 pandemic⁴⁹. These outbreaks consistently bring to light the country's healthcare system lack of capacity in public health, primary healthcare, emergency care, mother and childcare, mostly due to inadequate governance and preparedness, the reliance on foreign financial assistance and inadequate infrastructure among others.

Burden of Non-Communicable Disease (NCD)

Like most LMICs, the country has not been spared by the recent rise in the burden of non-communicable diseases (NCD), with increased prevalence of diabetes, hypertension, cardiac

conditions, and cancers^{51 52}. Despite paucity of data regarding cardiovascular diseases, current trends point towards a steady increase of arterial hypertension and other complications such as strokes^{53 54}. Due to the insufficiencies of the healthcare system, and particularly the lack of UHC, a good proportion of these NCDs first present at a late stage as emergencies.

While several effective interventions exist to reduce this triple burden of diseases – communicable diseases, NCDs and injuries – a robust EMS is the common safety net that provides lifesaving interventions regardless of the cause of the acute condition. An in-depth analysis of this component alongside the whole DRC healthcare system is provided in the following sections of the thesis.

The city of Kinshasa

Kinshasa is the capital city of the DRC. Though no recent census data is available, several concordant sources estimate its population between 15 to 17 million^{55 56 57}, making it one of the most populous cities in the world. Located about 500kms from the Atlantic Ocean, on the south bank of the Congo River, with the city of Brazzaville just across, it is one of the world's fastest growing megacities⁴⁹. It's also one of the DRC's 26 provinces and is administratively divided into 4 districts (Tshangu, Mont-Amba, Funa and Lukunga) encompassing a total of 24 subdistricts (“communes”). With administrative boundaries expanding on 9.965km², a large section of the city's land is rural in nature and sparsely populated⁵⁸. The rural subdistrict of Maluku alone covers more than half of Kinshasa's total area⁵⁷. Like the country it is the political and economic heart of, Kinshasa's population is multi-ethnic, mostly young, poor and faced with the same socioeconomic challenges as the rest of the nation⁵⁴.

Kinshasa epitomises the challenges facing rapidly growing cities in LMICs, resulting from unchecked massive rural exodus exceeding the infrastructure and services delivery capacity, including health services⁵⁹. The consequences of Kinshasa uncontrolled urbanization are multiple and include poor social standards, a housing crisis and dire living conditions for the majority, as demonstrated by the development of suburbs with inadequate sanitation conditions and proliferation of slums⁶⁰. With increased poverty rate come increased unmet social needs, particularly health needs. Kinshasa's health system is currently organised around 35 health operational units called “zones de santé”, encompassing both public and private healthcare

facilities struggling to adequately respond to the challenges the city's fast expansion brings, both quantitatively and qualitatively^{58 59}. An analysis of four LMICs cities elsewhere highlighted similar health system challenges, including the struggle to tackle a growing burden of NCDs, the difficulty of setting up efficient health governance framework and improve access to quality primary healthcare in a context of resource scarcity⁵⁹. In this perspective, provision of adequate EC services in Kinshasa is even more challenging, especially considering that EC is not yet prioritised in the country's main health policy document, the National Health Development Strategic Plan. However, an overview of this main health policy document allows a better understanding of the overall health system strengthening strategy.

Overview of the DRC National Health Development Strategic Plan 2024-2033

The DRC core national health policy is outlined in the latest version of the National Health Development Strategic Plan for 2024-2033 (*Plan National de Développement Sanitaire et de Prévoyance Sociale 2024-2033; PNDS-PS 2024-2033*)⁶¹ adopted by the Ministry of Health in 2023. Several SSA countries develop and implement such core health policies to capture their goals and strategy for the development of the health sector over a decade. The PNDS outlines the DRC government's firm political will and tangible undertakings for the progressive implementation of UHC in the country⁶⁰. Its sound implementation will likely have profound implications among others in the healthcare delivery system, the purses of households and ultimately on patients' outcomes. However, like in many LMICs, the country may struggle to effectively implement the key aspects of this core policy for a variety of reasons, including resource scarcity, poor policy dissemination, or lack of buy-in on the part of those responsible for implementation at different levels⁶².

The plan is aligned with the second ten-year plan 2024-2033 of the African Union's Agenda 2063⁶³ and aims to contribute to the operationalization of the National Strategic Development Plan 2024-2028 and the National Strategic Plan for UHC 2021-2030. This plan is also in line with the DRC's commitments to abide to several international declarations and acts on health. Its stated goal is to contribute to the well-being of the Congolese people to gain 20 years of life expectancy in 10 years and for the health sector to be one of the conduits for socio-economic development in the DRC⁶⁰.

It is structured around 3 strategic goals:

- 1) To contribute to the reduction of morbidity and mortality of the population
- 2) To promote social protection and financial risk mitigation to improve access to quality health services and care
- 3) To contribute to the socio-economic development of the country in a multisectoral framework

To achieve this triple goal, the PNDS outlines 6 strategic areas of intervention⁶⁰:

- Improving the provision of quality health services and continuity of care in a primary health care approach with a focus on community health.
- Increasing funding and other investments for better performance of the health system.
- Improving the resilience of the health system to health emergencies and risks.
- Extending social protection and mitigating financial risk.
- Improving the functionality of the health sector and creating jobs in collaboration with other sectors (Public, private).
- Strengthening the governance of the health system and social welfare.

The roles and responsibilities of stakeholders involved in the implementation of the PNDS 2024-2033 fall under the different levels of the national health system, provinces, territories, districts, private for-profit and non-profit organizations, each in their own area and with the support of public health institutions. Other sectors and civil society are expected support the health sector through interventions that require multisectoral approaches in their implementation⁶⁴. Regarding the monitoring and evaluation mechanism, it focuses mainly on monitoring the implementation of the operational action plan and supported by quarterly work plans, process indicators and outcomes. This monitoring and evaluation process is as vital as the policy adoption itself as it embodies the focus on tangible improvements the policy yields⁶⁵. The PNDS-PS 2024-2033 represents a key medium term reference framework for planning, implementing and monitoring and evaluating all health development and social welfare interventions in the country. The effectiveness of its implementation largely depends on a series of necessary reforms to be undertaken over a decade. Unfortunately, the PNDS doesn't particularly make an explicit reference to emergency care, and there is no specific strategy for its strengthening. This is an indication of the road that remains to be travelled for the prioritisation of ECS strengthening in the country.

1.6. STRUCTURE OF THE THESIS

To achieve the assigned objectives, this dissertation encompasses an initial guiding conceptual framework and baseline theoretical knowledge presented in Chapter 1 and Chapter 2, followed by empirical studies presented in Chapters 3, 4, 5 and 6. These studies are in the format of a technical report and three published papers, and verbatim copies are included here with the permission of the UCT Doctoral Degrees Board. Therefore, some concepts and facts outlined in earlier chapters may be repeatedly defined in these selected chapters to maintain an exact reproduction of the published text. The two final chapters (Chapters 7 and 8) of the thesis discuss the implications of this work and conclude with some recommendations to health authorities and for further research.

Table 6. Dissertation structure

Thesis chapter	Overview
Chapter 1 (Introduction)	• Introductory overview and the motivation for the research, the aim, objectives and the DRC, the country where the research was conducted.
Chapter 2 (Literature review)	• Lays out the theoretical frameworks and foundational knowledge on the topic of OHEC systems and lay first responder systems at the core of this dissertation. • Provides a background on healthcare in LRS (including OHEC), key facts on community-based health interventions, descriptive pointers about LRS and details about.
Chapter 3 (DRC ECSA)	• Findings of the DRC ECS assessment are presented; they clearly map the current state of each of the core components of the system. • The need for a community-based first responder system is identified as a possible intervention to strengthen the emergency care system and address the gap in community-based emergency care response system
Chapter 4 (Household survey)	• Documents access to, utilisation of, and barriers to emergency care in households of the city of Kinshasa, DRC. • Demonstrates from the community perspective how a first responder system could address the health system lack of OHEC capacity
Chapter 5 (CFAR needs assessment)	• Identifies the need for, and acceptability of an adapted first responder programme as an initial step to increase OHEC capacity in the DRC. • Key potential facilitators and barriers to its implementation and sustainability are identified.
Chapter 6 (DRC CFAR pilot)	• Findings from the evaluation of a pilot WHO CFAR course in Kinshasa are presented and give an insight on the training potential results, including the prospect that a comprehensively rolled out adapted system could potentially increase OHEC capacity and affect outcomes.
Chapter 7 (Discussion)	• Discussion on the research findings and the contributions to the literature, as well as the implications for decision-makers regarding the development of layperson first responders' programmes. • Limitations of the thesis are outlined and discussed
Chapter 8 (Conclusion)	• Recommendations to health authorities and for future research are made, and conclusions drawn.

CHAPTER II. LITERATURE REVIEW

2.1. INTRODUCTION: THEORETICAL FRAMEWORKS

Emergency care (EC) is a vital component of healthcare systems that aims to delivering prompt medical assistance for acute illnesses and sometimes life-threatening situations⁶⁶. In LMICs, the delivery of EMS encounters various obstacles, including a lack of resources, inadequate healthcare infrastructure, and a deficit of trained staff⁶⁷. Despite these challenges, the establishment of efficient ECS is crucial for lowering mortality and morbidity rates, especially for conditions like trauma, sepsis, and obstetric emergencies, which heavily affect populations in these settings⁶⁸.

The body of research on EC in LMICs has expanded considerably in recent years⁶⁹, showing a growing awareness of its significance in achieving global health systems strengthening. This review intends to summarize the existing evidence on the status of ECS in LMICs, with a particular focus on strategies to strengthen them, including community-based interventions such as LFR programs. It also provides an understanding of the context of LMICs, and the DRC in particular. Finally, it investigates a few community-based first responders programmes models and some aspects such as cost-effectiveness and sustainability. By deliberately documenting in an extensive way the existing evidence, showcasing effective strategies and pinpointing gaps in the research, this discussion provides an understanding of the background of the implementation of LFR programmes as a possible solution to increase OHEC capacity in LMICs.

Prior to embarking in a wide-ranging review of the breadth of available evidence, it is essential to understand the theoretical frameworks and conceptual approaches this thesis was firmly cast on and should be appraised⁷⁰.

2.1.1. Theoretical frameworks

To explore the topic of the implementation of community-based health intervention (CBHI) aimed to improve OHEC system in a LMIC, this research adopted a multifaceted theoretical framework. The outline integrates health systems strengthening, community-based participatory approaches, and implementation science. These frameworks were used to variable

extent and collectively guided the design, implementation, and evaluation of the CFAR programme in Kinshasa. Sustainably strengthening OHEC in LMICs requires a conceptual understanding of systemic barriers, community engagement, and the crucial role of context-specific adaptation.

This thesis therefore utilized to a variable extent the following key theoretical building blocks:

- 1) WHO Health Systems framework⁷¹ which emphasizes service delivery, governance, financing, health workforce, and community engagement. It provides a macro-level understanding of systemic challenges.
- 2) Community-Based Participatory Research (CBPR) framework⁷² that underpins community buy-in and ownership, sustainability, and cultural relevance.
- 3) Implementation Science framework⁷³ which focuses on adapting evidence-informed interventions to complex settings and highlights the iterative process of contextualization and stakeholder involvement. The Active Implementation Framework is a specific and more structured approach within the broader field of Implementation Science which emphasizes active, staged, and systematic implementation through core components like implementation teams, improvement cycles, and implementation drivers⁷³.

By integrating these frameworks, this thesis provides a comprehensive foundation for addressing the systemic and contextual challenges associated with strengthening OHEC in LMICs.

Health systems strengthening framework

The WHO Health Systems Framework serves as a foundational theory for understanding the multidimensional challenges in healthcare and particularly EC in LMICs⁷¹. This framework identifies six building blocks for health systems: service delivery, health workforce, information systems, medical products, financing, and leadership/governance⁷¹.

When applied to ECS and particularly a CFAR programme:

- Service Delivery: The CFAR programme could potentially fill critical gaps in OHEC by availing trained laypersons to act as first aid responders.

- Health Workforce: The CFAR programme could leverage existing community health worker networks to address chronic shortages of qualified EC professionals.
- Governance: Poor health system governance in some LMICs could necessitate Public-Private Partnerships (PPP) for effective program implementation.
- Financing: Considering LMICs limited health budgets, the programme could represent a cost-effective solution and an opportunity to explore innovative alternative funding mechanisms.
- Community engagement that ensures that interventions are culturally sensitive and locally accepted.

While the WHO Health Systems framework provides a comprehensive perspective, its application in non-resilient health systems requires context-specific adaptation. This research adapts these building blocks by incorporating community and system-specific priorities, such as governance challenges, language barriers and specific social health determinants in LRS communities.

Community-Based Participatory Research framework

The CBPR framework emphasizes collaboration and partnership between health systems stakeholders at all levels with communities to co-develop solutions that are both effective and culturally appropriate⁷². By engaging community leaders, advisers and influencers in every stage of a health project implementation, CBPR enhances the relevance, acceptability and sustainability of interventions⁷².

Regarding the context of a CFAR programme:

- Community engagement and buy-in should start with a collaboration for the needs assessment and acceptability and continue during the pilot and subsequent implementation phases and involve the monitoring and evaluation phase. Community leaders, advisers and health volunteers' involvement could be instrumental in adapting training modules to ensure alignment with local needs and cultural practices.
- Empowerment of members of the public: Training CFARs could empower communities to take ownership of EC initial presentations, reducing reliance on under-resourced formal healthcare systems and mitigating delay in care.

- Iterative feedbacks through post-training evaluations and focus group discussions enhance continuous refinement of the programme to better meet community needs.

We hypothesised that the CBPR approach was essential in addressing several barriers to top-to-bottom EC in a LMIC. By involving the community from the onset, the CFAR programme is expected to foster trust and collaboration, key ingredients for sustainable health interventions.

Implementation science framework and adaptation of health interventions

Implementation Science frameworks such as the RE-AIM (Reach, Effectiveness, Adoption, Implementation, Maintenance) model or the CFIR (Consolidated Framework for Implementation Research – not utilised for this thesis), provide tools for evaluating the applicability of evidence-based interventions^{73 74 75}.

The use of the RE-AIM framework ensures that programs like CFAR are contextually adapted and sustainably integrated into existing health systems. The below key components of the RE-AIM implementation framework⁷³ help to better grasp the nuances of a CFAR programme rollout in a LMIC like DRC:

- Reach: Ensuring the program extends to the largest target, including vulnerable populations in Kinshasa's peri-urban and urban areas.
- Effectiveness: Measuring outcomes such as EC access improvement and better linkage to formal EC system.
- Adoption: Building local support base among policymakers, healthcare providers, and community leaders.
- Implementation: Tailoring the program to local contexts through piloting and feedback.
- Maintenance: Ensuring long-term sustainability by integrating the program into local governance and funding mechanisms.

This DRC ECSA which involved a variety of stakeholders, the household survey as well as the pilot CFAR training conducted as part of this thesis all incorporated implementation science principles in many ways, including (1) aligning with national health priorities identified

through the WHO ECSA, (2) using survey responses to understand the specific unmet EC needs and (3) and analysing CHW feedback to refine training materials.

Adaptation is another important aspect in Implementation Science. Defined as the process of applying intentional modifications of an intervention previously implemented in a different context, it is intended to achieve better fit in a new setting⁷⁶. Tailoring health interventions in LMICs requires a robust theoretical foundation that accounts for systemic, community, and contextual variables. It is critical to bridge the gap between evidence-informed interventions and their practical application in real-world settings⁷⁶. Regardless of the implementation framework, its core principles include contextualization, stakeholder engagement, and iterative assessment and refinement⁷⁶.

The adaptation of the CFAR training as a health intervention hinges on a multidimensional approach that combines theoretical rigor with practical insights. By integrating frameworks such as implementation science, health systems strengthening, and CBPR, the CFAR program demonstrates how context-specific strategies can strengthen ECS in LMICs. These approaches underscore the importance of community engagement, iterative processes, and systemic alignment in creating sustainable health interventions.

The synergistic application of frameworks used to a variable extent in this thesis reinforces both the conceptual implications and the empirical evidence collected. In combining these frameworks, the CFAR programme's integrated approach demonstrates the importance of merging macro-level systems thinking with community-level engagement. It provides a replicable model for strengthening ECS in LMICs, emphasizing the need for contextual adaptation and stakeholder collaboration.

2.1.2. Conceptual approaches

Theory of Change

This approach was not fully utilized as its reach mostly applies to long-term outcomes our research didn't set out to achieve. However, some aspects of this concept, even in early stages of a project implementation, do provide a useful indication on outcomes trends. This concept

describes how a programme brings about specific long-term outcomes through a logical sequence of intermediate outcomes^{77 78}. It was applied to map the CFAR programme initial pathways from intervention planning to pilot implementation. Key components include inputs (burden of disease data, unmet health needs, training materials, community health worker networks...); activities (surveys, CFAR training sessions, course evaluations...); early outputs (pool of trained first responders, knowledge and confidence gains, increased community awareness...). No outcomes (such as increased access to EC, increased frequency of out-of-hospital case initial management...) were considered as they go beyond the objectives set out. By integrating systemic, community, and individual-level factors, the Theory of Change approach ensures that interventions are both effective and sustainable.

The PRECEDE-PROCEED concept

It is a model that provides a structured approach to designing and evaluating health interventions by incorporating community needs, behavioural determinants, and environmental factors⁷⁹. We used the PRECEDE-PROCEED model to obtain a granular, participatory roadmap for adapting CFAR to the DRC unique features. It emphasizes community engagement, data-driven planning, and iterative evaluation, aligning with the thesis's emphasis on sustainable, context-specific health interventions⁷⁹. It is especially relevant to the CFAR program implementation as it emphasizes participatory planning and adaptation to local contexts.

- a) PRECEDE Phase (Predisposing, Reinforcing, and Enabling Constructs in Educational Diagnosis and Evaluation):

The social diagnosis involves steps such as assessment of household unmet needs, perceptions of EC gaps, and barriers to OHEC in Kinshasa while the epidemiological diagnosis evaluate the burden of disease in the setting (e.g., trauma, cardiovascular and maternal emergencies) and the role of OHEC as a solution. The behavioural and environmental diagnosis relate to predominant behaviour patterns (e.g., self-medication) and environmental constraints (e.g., shortage of ambulances) impacting EC. The educational and organizational diagnosis determine knowledge gaps, cultural norms, and institutional readiness for implementing CFAR.

b) PROCEED Phase (Policy, Regulatory, and Organizational Constructs in Educational and Environmental Development):

The implementation involves an adaptation of the CFAR programme to the socio-cultural and linguistic context of Kinshasa. This is also achieved through iterative feedback mechanisms to refine training and delivery. The process evaluation monitors variables such as the implementation fidelity, community engagement, and participation rates...The impact evaluation consists in an assessment of parameters such as changes in knowledge and confidence among trained responders while the outcome evaluation is about gauging long-term outcomes such mortality impact and improved health system resilience (beyond the scope of this research).

LITERATURE SEARCH METHODOLOGY AND MAIN THEMES

ScienceDirect, PubMed and Google Scholar were searched for papers relevant to the research topic using numerous search strategies. Using keywords, terms and phrases derived from the research questions, search strategies were developed and refined as needed. The search was mostly limited to articles published in English between 1st January 2000 and 31st December 2024 but was also extended to few key references in French from the DRC official sources. Most articles included focused on LMICs setting and were sourced from peer-reviewed journals, and with others obtained from trustworthy official governmental or international bodies sources such as WHO or the World Bank. In addition, a few articles suggested by co-authors judged relevant to the topic of LFR in LMICs setting were added to the literature review at a later stage.

The search of literature was organized around the following main themes:

- A summary of the status and broad challenges of healthcare systems in LMICs (including OHEC), and review of the ECS assessment and gaps identification.
- A summary of available evidence on strategies for health systems strengthening, including OHEC and CBHI.
- A review of the LFR programmes, including their implementation, cost-effectiveness and sustainability in LMICs.

Table 7. Search terms per literature review topics

Topics	Search words/terms/phrases
Low- and middle-country characteristics	Countries AND classification AND characteristics AND poverty AND Africa AND low resource setting
Democratic Republic of Congo setting: general profile, socio-economic data, healthcare system, health indicators, city of Kinshasa...	Congo (or DRC or DR Congo) AND Population AND Economy AND Healthcare AND Health Development Plan Kinshasa (or city of Kinshasa) AND population AND administration AND challenges
Healthcare challenges in low and middle-income countries	Healthcare AND challenges (or difficulties) AND low- and middle-income country (or low resource settings)
Emergency care in low-and-middle income countries	Emergency care (or medical emergencies) AND low- and middle-income country (or low resource setting)
Approaches to healthcare systems assessment: WHO ECSA concept	World Health Organisation (or WHO) AND emergency care AND assessment (or evaluation) AND ECSA
Approaches to EC systems strengthening	Emergency care AND strengthening (or development or improvement)
Prehospital emergency care system strengthening	Prehospital system (or out-of-hospital) AND (or development or improvement)
Community-based health Interventions and adaptation	Community AND health intervention (or community health project) AND adaptations
The Community First Aid Responder programme	Community AND first aid AND responder (or layperson first responder) AND programme (or system)
Out-of-hospital emergency care in low-resource settings	Out-of-hospital (or prehospital) emergency care AND low-resource settings (or low- and middle-income country or resource constrained setting)
Access to out-of-hospital emergency care in Africa	Access (or availability) AND Out-of-hospital (or prehospital) emergency care AND Africa
Cost-effectiveness of lay first responder systems	Cost-effectiveness (or financing or low cost) AND layperson first responder system (or first aid responder)
Sustainability of layperson first responder systems	Sustainability (or long-term implementation or durability) AND layperson first responder system (or first aid responder)

2.2. HEALTHCARE CHALLENGES IN LOW- AND MIDDLE-INCOME COUNTRIES

Challenges regarding supply of EC in LMICs are multiple and rooted in the general deficiencies of healthcare systems⁸⁰. Access to quality healthcare services is recognised as a basic human right⁸¹, yet LMICs face significant challenges in providing accessible, affordable, and quality healthcare services to their populations. These challenges are multifaceted and encompass various dimensions such as infrastructure, funding, workforce shortages, social determinants of health, and governance^{82 83}. Poor infrastructure is one of the primary obstacles to healthcare in LMICs⁸⁴. Insufficient healthcare facilities, including hospitals, clinics, and diagnostic centres, hinder the delivery of essential healthcare services. Inadequate transportation systems and road networks further limit access to healthcare facilities, particularly in remote and rural areas⁸⁵.

Inadequate funding due to limited financial resources and competing priorities among others remains one of the main healthcare challenges in these settings^{86 87}. Insufficient investment in healthcare infrastructure, medical equipment, and pharmaceutical supplies result in substandard services and limited access to essential medicines. Furthermore, the lack of health insurance coverage exacerbates financial barriers to healthcare, forcing individuals to bear the burden of out-of-pocket expenses^{88 89}.

Workforce shortages, including physicians, nurses, and other healthcare professionals, significantly impact healthcare delivery in LMICs⁹⁰. The scarcity of skilled healthcare workers leads to increased workloads, burnout, and compromises the quality of care provided⁹¹. Brain drain exacerbates this issue⁹². Addressing healthcare workforce shortages requires a multi-pronged approach which includes increasing training opportunities. Additionally, LMICs often face a complex interplay of social determinants of health, including poverty, limited education, inadequate sanitation, and malnutrition⁹³. These factors contribute to a higher burden of preventable diseases, reduced healthcare-seeking behaviour, and poorer health outcomes. Addressing social determinants of health is crucial for improving healthcare delivery in these settings⁹⁴.

Therefore, efforts to strengthen healthcare systems in general and EC in particular should focus on improving governance, regulatory frameworks, health infrastructure, including the construction of healthcare facilities and exploring of avenues such as telemedicine to enhance

accessibility⁹⁵. Additionally, implementing health financing reforms, such as expanding health insurance coverage and exploring innovative funding mechanisms, can improve financial protection⁹⁶. Strengthening primary healthcare services, including preventive care, health promotion, and disease management, can alleviate the burden on secondary and tertiary care facilities⁹⁷. This can be achieved through cost-effective community-based approaches, task-shifting to non-physician healthcare providers, and the integration of technology for remote consultations and health education⁹⁷.

By implementing comprehensive and sustainable approaches, LMICs can strive towards achieving equitable healthcare for all⁹⁸, including in out-of-hospital services. It is vital for healthcare planners in these settings to explore community-based interventions with documented health consumers buy-in and integrate them into the larger framework of sustainable strategies for a global healthcare system strengthening.

2.3. EMERGENCY CARE IN LOW-AND-MIDDLE INCOME COUNTRIES

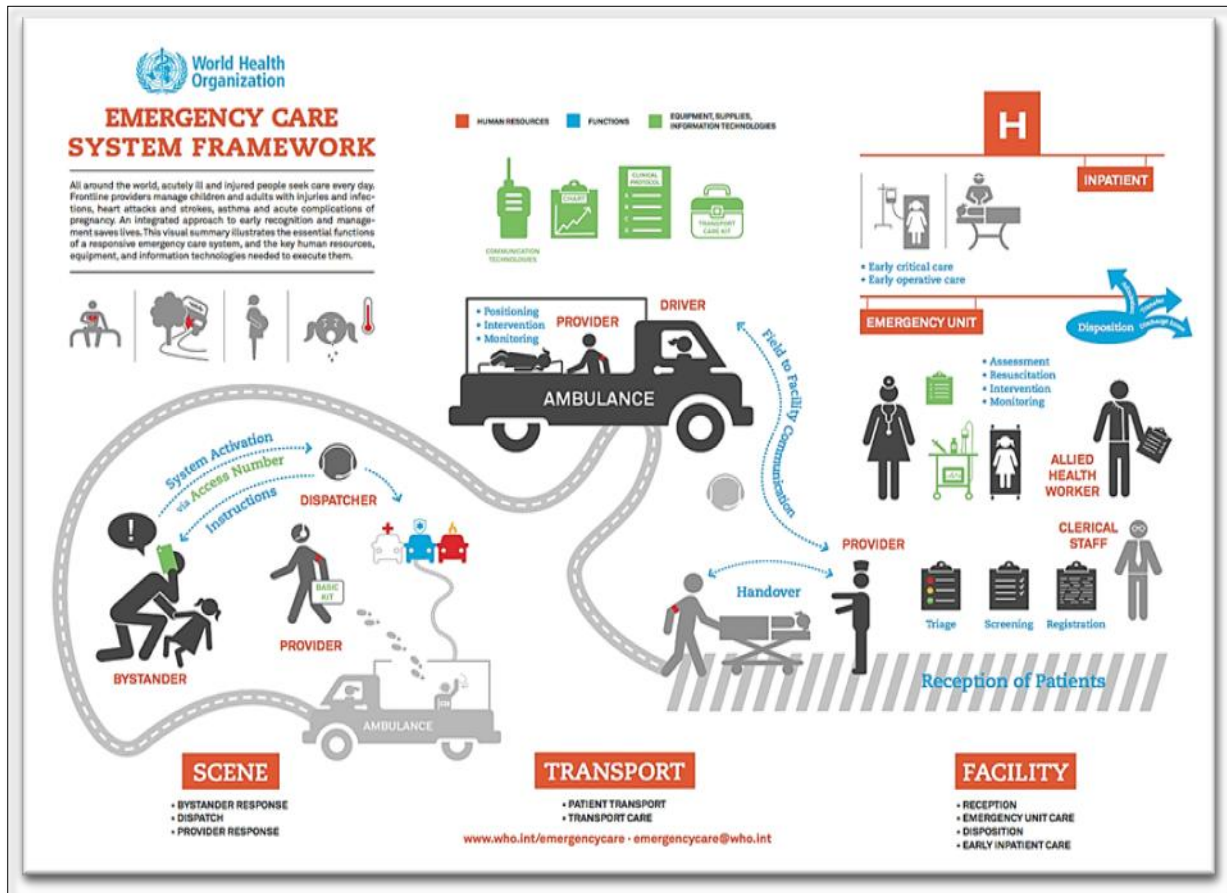


Figure 3. WHO Emergency Care System Framework infographic

(Source: The World Health Organization)

The latest Global Burden of Disease Report showed increased trends of injury and non-communicable diseases, with the greatest proportion in LMICs⁹⁹. Available data indicate significant mortality in these countries, particularly in SSA where a substantial proportion of deaths occur in the acute phase of illness or injury¹⁰⁰. Injuries and other time-sensitive illnesses such as cardiac arrest, stroke, sepsis, obstetric emergencies, and many more are significant contributors to premature mortality and disability and are the result of inadequate pre-hospital care¹⁰¹. Of the 45 million deaths every year in LMICs, 54% are due to conditions addressable by EC¹⁰². From a global perspective, EC has the potential to be a major driver towards the successful completion of 10 health-related United Nations Sustainable Development Goals¹⁰³. Regarding trauma for example, prehospital care is one of the most efficient and cost-effective platforms for reducing deaths. There is strong evidence indicating that well organised trauma care saves lives¹⁰⁴.

Resolution WHA 72.6 defines EC as “an integrated platform for delivering accessible, quality, time-sensitive health care services for acute illness and injury across the life course”^{11 105}. EC can simply be understood as the care delivered in the first few hours after the onset of an acute medical condition, such as an injury, heart attack, childbirth complication or any health problem that reaches an acute stage³. As shown in the WHO Emergency Care System framework (Figure 3), this care can take place at three levels: at the scene, during transportation and in health facilities¹⁰⁶.

Out-of-hospital emergency care (OHEC) and prehospital care are often used interchangeably; there is however a subtle nuance¹⁰⁷. Care can sometime be provided at a scene outside traditional health facilities (“out-of-hospital”) and not necessarily involve transportation for definitive care in a health facility^{105 108}. As only a portion of paramedic practice can now be referred to as prehospital care, out-of-hospital care appears more and more as a more inclusive and accurate term¹⁰⁵. EMS are services dedicated to providing out-of-hospital acute medical care and eventually transport to definitive care^{109 110}. They are also the foundation for effective disaster response and management of mass casualty incidents¹¹¹. This provision of EMS requires a system set up to organise all aspects of care provided in the out-of-hospital and health facility environments¹⁰⁵.

While regular and timely access to medical care should be of utmost importance in LMICs, numerous barriers, including rural living and negative financial implications, prevent this from occurring in a manner envisaged by the longitudinal primary care model⁶⁷. As a result, EC is the safety net and the first point of contact with the health system for many people worldwide (including the poor and uninsured in high-income countries). Hence the vital importance to strengthen it in order to expect sizeable gain throughout the whole healthcare system. The development and strengthening of ECS in LRS brings improvements in structure, process, and health outcomes, even with severe resource limitations².

Healthcare in LMICs has not however traditionally focused on EC¹¹². Less than one in three African countries has OHEC system in place⁴, with limited capacity to provide the necessary response in all the steps of the prehospital chain. Despite research showing that incorporating a basic level of EC into healthcare systems has a significant impact on the well-being of populations, EC is seldom prioritised⁹⁶.

Faced with this unfortunate reality and conscious of the numerous benefits of efficient EC, WHO drove a push for renewed focus on EC among Member States, an endeavour which culminated with a declaration at the 72nd World Health Assembly in 2019, urging states to prioritise ECS for Universal Health Coverage¹⁰⁵. Four years later, another significant and more comprehensive resolution calling for global efforts to strengthen the provision of quality ECO care was passed by the 76th World Health Assembly to address the growing burden of acute and critical illnesses in LMICs and strengthened health systems for better outcomes¹¹³.

Any sustainable EC improvement initiative needs to be contextually relevant, and research can play a crucial role in driving the development. There are however limited contextually appropriate studies currently performed in LMICs involving the clinical care and healthcare systems in EC, and studies conducted in high-income countries are simply not adapted¹¹⁴. Hence the importance of focusing on research prioritisation in LMICs in general and more specifically African regions to guide evidence-informed interventions aimed at strengthening EC¹¹⁵. The initial step of this process is perhaps conducting a comprehensive baseline assessment of a region or country's EC landscape, identify the deficiencies, and tailor context-appropriate solutions for implementation. One of the suggested methodical processes for accomplishing this is represented by the WHO Emergency Care System Assessment (ECSA).

2.4. APPROACHES TO HEALTHCARE SYSTEMS ASSESSMENT AND STRENGTHENING

2.4.1. The WHO Emergency Care System Assessment (ECSA) concept

The ECSA is a strategic planning tool initially designed by WHO to help policymakers and planners assess a national or regional emergency care system, identify gaps, and set priorities for system development in the following domains^{116 117}: (1) System organization, governance, financing; (2) Emergency care data and quality improvement; (3) Scene care, transport, transfer, referral; (4) Facility-based care and (6) Emergency preparedness.

WHO has expanded it to now covered critical care as well, therefore becoming the “Emergency and Critical Care System Assessment (Full ECSA concept note in Appendix 7). The ECSA questionnaire is a readily available document (open source) that leads to the identification of a set of gaps in EC with its associated priority actions that the Ministry of Health (MoH) may use for its strategic planning¹¹⁷. Additionally, WHO can support a follow-up process to develop an implementation roadmap for the highest-priority actions. The ECSA process starts with a web-based survey and then proceeds to a consensus meeting¹¹⁷ (in-person, virtual or hybrid). The details of steps of conducting ECSA in a country or region are summarised in Appendix 7.



Figure 4. WHO ECSA process

Over 50 LMICs such as Madagascar, Nepal, Timor Leste, Uganda, Tanzania and many more have conducted ECSA processes¹¹⁷ that yielded informative data applicable in many aspects to others LMICs.

Lessons from the Uganda ECSA process

In a recent past, Uganda's ECS was faced with similar challenges as identified in many LMICs: governance issues, financing barriers, resource scarcity contrasting with a high burden of disease addressable by EC, limited medical supplies and equipment, inadequately trained personnel, poor infrastructure¹¹⁷.

Attempts as early as 2007 to implement a national ECS were unsuccessful due to a lack of understanding of the concept of EC, poor coordination and buy-in of key stakeholders¹¹⁷. The MoH therefore conducted in 2017 a system-level assessment using the ECSA tool, with the technical guidance of WHO¹¹⁷. This multidisciplinary and more inclusive approach ensured buy-in from the members who participated from across the country, ultimately making them advocates and ambassadors for ECS development in their respective fields.

Many tangible results quickly resulted from the consensus meeting and prioritisation of listed actions aimed at strengthening the Uganda ECS¹¹⁷, including:

- Creation within the MoH of a department exclusively dedicated to EMS
- A law was voted to reinforce the national policy on EMS
- A unique free access emergency number for EMS was set up.
- An Ambulance Association gathering both public and private ambulance providers was created
- EC specific data points were added in the country Health Management Information system
- EC Services started to be covered by the National Health Insurance Scheme
- Curricula, Standards and Guidelines for Emergency Nurses and Emergency Medical Technicians were developed
- Residency training programs for emergency physicians were started at two universities, etc.

Following the ECSA and the roadmap meeting that ensued, Uganda has continued to make steady and exemplary progress in the development of its ECS¹¹⁷. Achievements shown post ECSA implementation in several LMICs led WHO to expand the scope of a country's healthcare system analysis beyond its ECS; it now proposes the Integrated Emergency, Critical and Operative Systems Assessment for an all-encompassing acute care system evaluation¹¹⁸.

2.4.2. Emergency care (and critical and operative) systems strengthening

General principles regarding healthcare systems strengthening apply to ECO. However, there are EC particularities in LMICs that require special considerations regarding development strategies for more accessible and resilient ECO systems. WHO has long recognised that EC is an integrated platform for delivering accessible, quality and time-sensitive health care services for acute illness/injury and asserted that quality care implies aspects of timeliness^{105 118}. As such, EC related morbidity and mortality could be reduced each year if quality ECO services exist, and patients have early non-discriminatory access¹¹⁸. It is to this effect that it endeavours to provide a range of guidance materials that allow policymakers to develop action plans best suited to their specific contexts, including training resources and standards¹¹⁹.

Amongst several recommendations made by Resolution WHA 72.6 to achieve this goal, and in line with many key recommendations from the LMICs EC research context, the following are worth noting:

a) Sustainable financing and free access to care through implementation of UHC

Sustainable health financing mechanisms are critical for LMICs to achieve adequate healthcare delivery and much needed UHC²³. Governments more and more recognise the need to prioritize healthcare in national budgets by steadily increasing the total expenditure on health as a percentage of the country's Gross Domestic Product (GDP)²³, and explore innovative funding models, such as public-private partnerships, social health insurance, community-based health financing, etc. Efficient resource allocation and sound financial management systems are essential to ensure equitable access to healthcare services. WHO recommends the creation of national policies for sustainable funding and universal access to needs-based ECO care for all, without any discrimination or requirement for upfront payment for life-saving EC, and within a broader health system that provides quality essential care with financial risk protection¹¹⁹.

b) Effective health governance

Sound governance plays a central role in optimising ECO care. Poor planning and oversight of healthcare delivery and development have been identified as one of the biggest hinderances to

quality and accessible care^{26 27}. Governments are urged to optimise the planning, structure, processes, programmes implementation and evaluation to steadily improve ECO care delivery¹¹⁹. Tackling systemic corruption is another dimension worth focusing on²⁸.

c) Investing in system components integration

ECO care cannot efficiently and sustainably be strengthened in an isolated manner. The development of primary healthcare services has been suggested as a key pillar for overall healthcare system strengthening in LMICs¹²⁰. This involves enhancing the capacity of community health centres and clinics to provide comprehensive and preventive care. Additionally, the Covid-19 pandemic has shown that developing more resilient public health systems alongside acute care is vital for LMICs¹²¹. In fact, health education and implementation of preventive strategies at the grassroots level has yielded several benefits¹²², including reducing the burden of acute illness and injury, improving the early detection and management of diseases, and reducing the burden on secondary and tertiary care facilities. For a robust disaster and outbreak preparedness and response for example, WHO recommends that national, regional and facility-level governance mechanisms be put in place alongside the ECO care services, patient transfer and referral services, especially in fragile settings and conflict-affected areas¹¹⁹.

d) Data-driven ECO care development

Robust health information systems are an essential component of healthcare strengthening; they enable efficient monitoring of diseases trends, managing healthcare resources, and improving decision-making processes¹²³. It is important to streamline data collection, analysis, and reporting, to produce accurate and timely health data that will allow policymakers to identify priority areas for intervention in their specific setting, track progress, and allocate resources effectively. A standardized data collection system helps describe and report the relevant disease burden and identify high-yield options for better coordination, safety and quality of delivery of ECO care services¹¹⁹.

e) Investing in health infrastructure development and equipment availability

An improved health infrastructure increases accessibility to healthcare¹²⁴, especially in rural and underserved areas. Furthermore, the availability of essential medical equipment, such as diagnostic tools and surgical instruments, has been identified as a crucial condition for providing quality care. Prioritizing the availability of adequate health infrastructure, as well as basic diagnostic and therapeutical capabilities, essential medicines, and vaccines in healthcare facilities can have a significant impact on overall health care outcomes¹²⁴.

f) Upskilling the health workforce

The shortage of skilled healthcare professionals is one of the main challenges facing LMICs¹²⁵. a multi-pronged approach is best suited to address lack of capacity. It advisable to build strategies to expand ECO health workforce and scale up capacity at all levels¹¹⁹. Expanding medical and nursing education programmes, particularly in underserved areas, can increase the number of healthcare workers. Additionally, initiatives to attract and retain healthcare professionals in these regions need to be put in place¹²⁶. Various types of collaborative initiatives and partnerships can facilitate knowledge transfer, training, and capacity building initiatives. While working towards upskilling the health workforce, the lack OHEC capacity can potentially be palliated by various locally adapted systems, including community-based first aid responder programs.

g) Community engagement

Engaging communities in healthcare interventions is vital for sustainable healthcare improvements¹²⁷. WHO recommends the promotion of innovative ways for community engagement in the design and delivery of ECO care services¹¹⁹. These activities can extend from raising awareness on health needs, community education on care seeking behaviours, early recognition of some warning symptoms, and first aid. This involvement of communities should not be during the implementation phase only, rather start at the inception by incorporating community perspectives in strategic planning and continue later during the monitoring and evaluation phase¹¹⁹.

Promoting health literacy and empowering individuals to take charge of their health can lead to positive behavioural changes. Community health workers (CHW) play a pivotal role in creating awareness, delivering health education, facilitating preventive measures, and promoting healthy lifestyles¹²⁸. As they bridge the healthcare system and the communities they are part of, they also enhance the collaboration and trust with local leaders and other community-based organisations and ultimately bolster the cultural acceptance of healthcare services¹²⁹.

LMICs can make significant strides towards achieving equitable and quality ECO care for their populations by firmly setting the few above action priorities relevant to their context.

2.5. COMMUNITY-BASED HEALTH INTERVENTIONS

2.5.1. Introduction

Also known as Community Engagement Interventions, CBHIs plays a crucial role in enhancing access to healthcare services and improving health outcomes in LMICs. In fact, the community-based approach is seen by many experts as the "gold standard" for health promotion and disease prevention¹³⁰; they have the potential to overcome several health system challenges and help foster sustainable improvements. A systematic review by Nickel et al (2020)¹³⁰ which investigated the effectiveness of CBHIs documented evidence showing their effectiveness and benefits, with improvements noted in health behaviours, health literacy, health service access and a range of health outcomes¹³⁰.

A “community” can be defined as constituted by those with a shared social identity; that is of members of the same set of social representations (symbols, meanings and aspirations) through which people make sense of their world¹³¹. And community-based often refers to the setting for interventions, an entity primarily defined geographically as the location in which health activities are conducted¹³². The focus of these interventions is primarily on changing individuals’ behaviours to improve the overall population’s health status¹³¹.

CBHI benefits

In LMICs where health disparities and limited access to healthcare services persist, CBHIs have emerged as a powerful strategy to address these challenges. These interventions prioritise the active involvement of local communities in identifying health needs, designing appropriate solutions, and implementing sustainable programmes^{130 133}. Community engagement empowers the public and holds tremendous potential for improving health outcomes, reducing health inequalities, and achieving long-term sustainable development. Questa et al (2020)¹³³ documented amongst others a significantly reduced neonatal mortality, a substantial reduction in HIV and other STIs, a marked decrease in malaria incidence or prevalence and reductions in infant diarrhoea, all as positive results from community-centred interventions¹³⁰.

CBHIs are characterised by their participatory nature, focusing on collaboration between community members, healthcare providers, and other stakeholders. Beyond buy-in, this

ensures community ownership, fostering a sense of empowerment and accountability among community members^{130 132}. As CBHIs also address social determinants of health, such as poverty, education, and sanitation, they impact the root causes of health disparities. By empowering communities with knowledge and skills, these interventions empower individuals to take charge of their health and make informed decisions^{130 131 133}. Regarding access to Primary Health Care for example, a systematic review by Gizaw et al (2022)¹³⁴ found that CBHIs have the singular advantage of bringing essential health services closer to the community, ensuring that individuals can access care conveniently. This can be achieved through mobile clinics, community health workers, and outreach programs that provide preventive, promotive, and curative services¹³². Furthermore, these interventions recognise and respect local cultures, beliefs, and practices. By involving community members in decision-making processes, interventions can be tailored to suit cultural norms and preferences, making healthcare more acceptable and effective^{130 135}. This culturally informed community engagement approach nurtures trust between healthcare providers and community members, leading to better health-seeking behaviours and outcomes over time¹³⁵.

Finally, CBHIs aim to build capacity within communities to sustain health improvements in the long term. By training and supporting CHW, they create a cadre of locally based healthcare providers who can address ongoing health needs. This approach strengthens health systems at the community level, ensuring continuity of care and reducing dependence on external resources.

CBHIs challenges

Implementation of sustainable CBHIs is not without challenges. The general issues pertaining to the adequate functioning of a health system (see Point 2.2.) also apply to community health. Several obstacles more specific to CBHIs were well illustrated in the findings of the implementation of Family Health Teams program in Ethiopia¹³⁶. Using the Consolidated Framework for Implementation Research during focus groups discussions, authors weighed both organisational and system-level factors that affected adoption of Family Health Teams in two Ethiopian cities; they found that resource constraints restricted capacity to implement¹³⁶; rolling out CBHIs should factor in the availability of resources within the health system

(budget, personnel, equipment and medicines), socio-cultural characteristics as well as strategies to incentivize the intervention (financial, professional, political)¹³⁶.

CBHIs require sufficient resources to support training, supervision, and program implementation. As they are meant to address health needs of a specific community, their acceptability and effectiveness can greatly be influenced by cultural beliefs and practices. Careful consideration should be given to cultural norms and values to design interventions that are culturally sensitive and acceptable to the community¹³⁶. Moreover, the sustainability of CBHIs require that key players are kept motivated, including by the means of small financial incentives. Beyond the intrinsic motivation of community members to participate in activities that will benefit their community at large, without some form of personal incentives or stipend, their good will might wane over time and compromise the longevity of a programme.

Finally, any new CBHI must fit in the main framework of the current health service delivery; this integration with existing health services greatly contributes to building local capacity and promoting community ownership for a long-term sustainability¹³⁶.

2.5.2. Adaptation of CBHI to different contexts.

Adaptation of a health intervention can simply be understood as intentional modifications of an intervention previously implemented in a different context to achieve better fit in a new setting¹³⁷. When a CBHI needs to be implemented to respond to a health need identified in a community, it is not judicious nor cost-effective to reinvent the wheel by developing and rolling it out from scratch. In a scoping review assessing practices in CBHIs, Movsisyan et al (2021)¹³⁸ analysed in-depth 28 studies covering interventions in health behaviour, mental health, sexual health, parenting and family-centred interventions; one of their key findings was that interventions already proven effective can be tailored to a new context specificity and save financial and human resources compared with the development of new interventions¹³⁸. Adaptations are often justified by the need to accommodate different socio-economic, cultural and infrastructural features¹³⁹. After developing a system for classifying modifications made to interventions across a variety of fields and settings, Stirman et al (2013)¹³⁹ coded 258 modifications identified across 32 published articles and grouped them in 12 types further re-categorised as follows:

Main types of adaptations

- Content adaptation: changes made to the intervention procedures, materials or delivery (removal, addition or expansion). Examples include adding or removing elements, refining or tweaking, condensing or extending, reordering or substituting elements, loosening the structure, incorporating a different approach¹³⁹ ...
- Contextual adaptation: changes made to delivery of the same program content, but with modifications to the format or channel, the setting or location, the personnel who deliver the intervention or the target population¹³⁹.
- Cultural adaptation: modification to match the cultural profile of the target community and ensure cultural relevance and compatibility, considering cultural beliefs, values, languages and traditions¹³⁹.
- Adaptation of the training and evaluation processes which typically occur 'behind the scenes' without impacting intervention content or the context of delivery¹³⁹.

A study by Betts et al (2018)¹⁴⁰ which involved an advisory board to guide the process of adapting the Diabetes Prevention Program Group Lifestyle Balance intervention suggested a differentiation between planned and responsive adaptations (modifications decided pre-intervention versus those concurrent with implementation, in response to emergent issues).

Frameworks for the adaptation of health interventions

Not all adaptations are warranted. The need to adapt an intervention to ensure its fit with a new context may seem obvious, but outcomes are mixed. While there are many indications in favour of adapting interventions, some studies showed no added benefits associated with extensively adapted interventions^{141 142 143}. For example, an adapted version of the Strengthening Families Program from the USA into the Swedish context demonstrated no effect¹⁴⁴. This begs the question to know why and when to adapt (or not), and how to decide on the need for and the extent of an adaptation. Hence the need to use frameworks to guide implementation science and the adaptation processes. Moreover, it is crucial for an implementation framework to differentiate between the changes of core elements of the intervention and those made to secondary or peripheral components¹⁴⁵.

The ADAPT study⁷⁶ was set up in the United Kingdom from 2017 to develop comprehensive and consensus-based guidance on adaptation of complex health interventions in new contexts. It is an initiative from the UK Medical Research Council National Institute for Health Research Methodology Research Programme aimed at advising and streamlining the adaptation of evidence-informed population health interventions through inter-related work packages (work packages 1 to 4) implemented in a phased manner⁷⁶. This guidance was developed using a mixed method including a systematic review, qualitative interviews, extensive consultation, and formal consensus methods⁷⁶. It provides a framework and step-by-step guidance for working with stakeholders, selecting suitable interventions, undertaking adaptations, making decisions on evaluation and implementation, and reporting adapted intervention⁷⁶. The four key steps suggested in the ADAPT framework include⁷⁶ (1) an assessment of the rationale for intervention and if the intervention-context fit, (2) a plan for undertaking the adaptations, (3) a plan for piloting and evaluating, and (4) an implementation and plan to maintain the adapted intervention at scale⁷⁶.

Similarly, Stirman et al (2013)¹³⁹ worked over the years on several iterations of a similar guidance, the Framework for Reporting Adaptations and Modifications of Evidence-based Interventions (FRAME)^{139 146}. It includes eight aspects, namely : (1) when and how in the implementation process the modification was made, (2) whether the modification was planned/proactive or unplanned/reactive, (3) who determined that the modification should be made, (4) what is modified, (5) at what level of delivery the modification is made, (6) type or nature of context or content-level modifications, (7) the extent to which the modification is fidelity-consistent, and (8) the reasons for the modification¹³⁹. FRAME also outlines different forms of modifications to interventions and guide in the differentiation between fidelity-consistent versus fidelity-inconsistent modifications^{146 147}. The first group include tailoring of content, changing the length or adding intervention-consistent modules while the latter involves deeply altering modifications such as the integration of conceptually inconsistent strategies, removing elements, loosening structure, or drifting from the protocol¹³⁷.

These two frameworks are illustrations of methodologies for effective adaptation of a CBHI to a new setting. There is need to master the process, understand the nature and outcomes of modifications made to a given intervention in a vastly complex settings such as the EC in LMICs. Adapting a community first responder programme in a different LMIC must abide with these general principles for good outcomes.

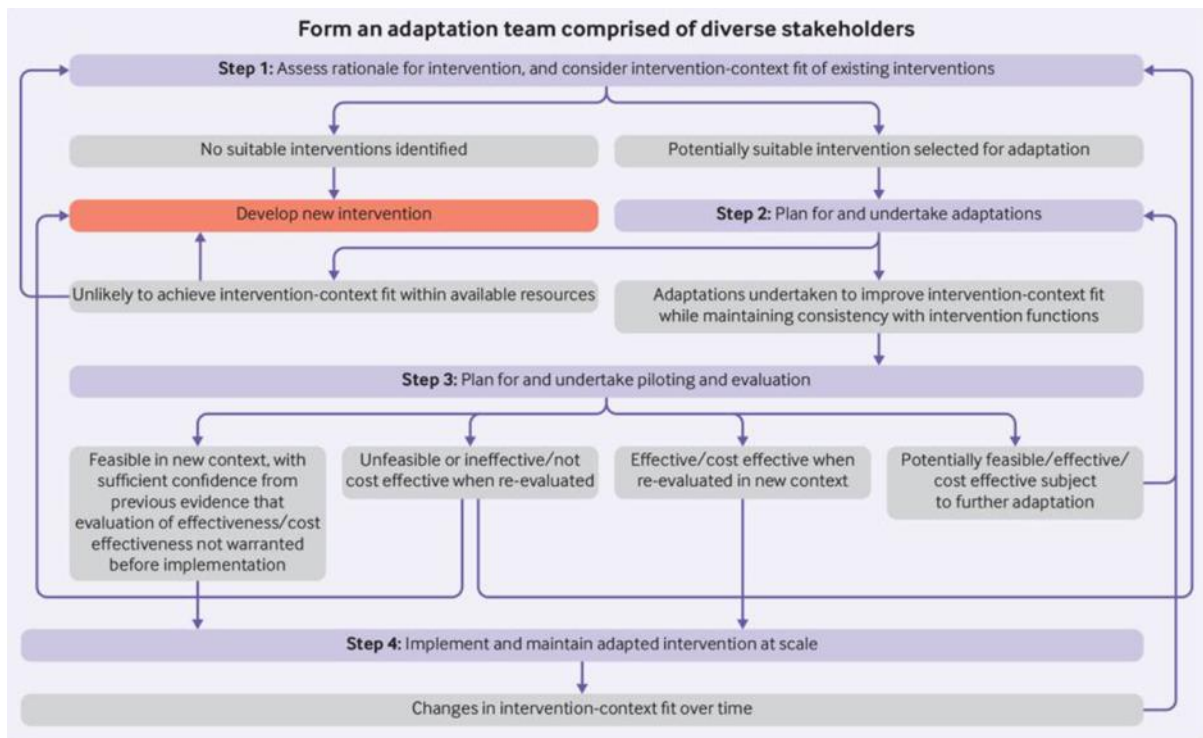


Figure 5. The ADAPT framework key steps

2.5.3. Community Health Workers in CBHIs

CHWs are laypersons providing a limited level of care to members of the community they live in; they receive lower levels of formal education and training than professional health care workers such as nurses and doctors¹⁴⁸. Called Community Health Volunteers (CHV) in some regions, they serve a critical function in the context of limited access to care in LMICs.

a) Benefits of CHW programmes

There is clear evidence confirming the health benefits of comprehensively rolled out CHWs programmes, especially in remote regions and marginalised communities^{149 150}. This partly stems from their unique position, representing a solid bridge between communities and the health sector, a conduit of trust and enhancer of acceptability and sustainability¹⁴⁹. A comparative analysis by Kok et al (2017)¹⁵⁰ on the CHWs privileged position between communities and the health systems in Ethiopia, Kenya, Malawi and Mozambique yielded informative data. Using a conceptual framework on factors influencing performance of CHWs, the study highlighted the multidimensional interplay of influences on CHWs' relationships

with their communities and actors in the health system, and the opportunities to capitalise on their unique intermediary position¹⁵⁰.

CHWs bolster both preventive and curative health services in communities and greatly contribute to fostering collective community action and local accountability¹⁵⁰. Several governments and international bodies have long recognised their strategic value and the great opportunity for healthcare systems improvement; they are increasingly investing in CHWs programmes development and expansion, particularly in LMICs¹⁵¹. Brazil, Ethiopia, Iran and Nepal are often cited as examples as they significantly improved the health of their populations in the last decades by investing steadily in well-planned and adequately supported large-scale CHWs programmes^{152 153}. In South Africa, a country with a long history of CHWs supporting healthcare improvements in marginalised communities, this group of laypersons act as the cornerstone of the country's Ward-Based Primary Healthcare Outreach Teams, with noticeable impact¹⁵⁴.

b) CHWs tasks

A large WHO-commissioned systematic review clustered into six overlapping roles the variety of tasks accomplished by CHWs: (1) clinical care, including diagnostic and treatment (2) encouraging uptake of health services, (3) providing health education and behaviour change motivation, (4) data collection and record-keeping, (5) improving relationships between health system officials and the community and (6) providing psychosocial support as needed¹⁸⁴.

In some settings, to respond to specific health needs, and provided they have been trained for the task, CHWs can get involved in more advanced activities such as rapid malaria diagnosis tests and treatment initiation, administering some immunisations or providing some forms of contraception within their communities. It is expected that CHWs in LMICs will be called to do more to cover the gap represented by the chronic shortage in health professionals in these settings.

c) CHWs training

Imparting technical knowledge and basic skills to community members selected to become CHWs is a key element in the acceptability and sustainability of their roles. However, the

baseline level or formal education level prior to becoming CHW is advised to match the average of the community they are meant to work in¹⁴⁸. Teaching CHWs soft skills such as interpersonal communication and counselling has also been recommended¹⁴⁸. Additionally, technical competence needs to be complemented by strategies to help CHWs gain confidence in their self-efficacy, in order to boost their self-esteem and willingness to assist as needed. Regardless, a back-up support system and regular performance assessments are recommended.

d) CHWs programmes community embeddedness and integration to health systems

Available evidence indicates that the community embeddedness is an important enabler of CHWs programme success as it is associated with CHWs retention, motivation, performance, accountability, and ultimately acceptability and uptake of CHWs' role. Baatiema et al (2016)¹⁵⁵ systematic review in Ghana documented systematic and comprehensive evidence of CHWs' contributions despite minimal integration of CHWs programmes both within the country's health system and several communities. The analysis contributed to clarifying the scope of practice of CHWs and, having re-emphasised the key role of CHWs, it recommended the formulation of a national policy on CHWs, the creation of a professional and regulatory body to regulate the standards and practice of CHWs and a long-term strategy for the gradual replacement or absorption of CHWs into the formal health service in Ghana¹³⁸.

Community embeddedness can be fostered through many initiatives as guided by the specific programme implementation context, including (1) the involvement of the community in CHWs selection and selecting a local trusted local person in the leadership structure, (2) community ownership of the CHWs programme, (3) community monitoring of CHWs, (4) openness and clear communication with the community to set reasonable expectations for their CHWs¹⁵⁶.

Regarding integration to the health system, a clear recognition of the valuable role of CHWs alongside trained health professional has been cited as a great enhancer, together with other initiatives such as the establishment of a system of back-up of CHWs with supervision¹⁵⁶.

e) CHWs programmes incentivisation

The level of satisfaction (or dissatisfaction) with incentives (monetary or non-monetary) impacts on CHWs motivation and performance. Pallas et al (2013)¹⁵⁷ identified incentives such

as stipends, salaries and transportation allowances as important motivators of CHWs. The monetary remunerations vary widely from one setting to the other, or from one programme to another in the same setting. In some cases, CHWs receive no payment at all¹⁴⁸. Should CHWs be paid for a service they volunteered to render for the benefit of their own community, including their own family? Will this additional cost not be a burden on an already resource constrained health system? Who should bear the cost, the governments or community-based NGOs? The answers to these questions must be context-specific. A Ghana review reported a lack of consensus on whether Ghanaian CHWs should be paid and how much they should receive¹⁴⁸. In India, some programmes are incentivised with financial remunerations while others are not, with mixed outcomes in term of CHWs motivation and performance¹⁵⁸.

However, a systemic review by Kok et al (2015)¹⁵⁹ which investigated the intervention design factors influencing performance of CHWs in LMICs determined that most of them prefer financial over non-financial incentives; this draws a better performance than unpaid work receiving only gifts in kind. Finally, employing CHWs without monetary incentive poses a human rights issue. In India, for example, it was recently recommended that all CHWs be integrated to the government payroll as their voluntary status represented a violation of their rights¹⁶⁰.

There are other thematic areas related to CHWs not covered in this review, which may be informative and help with in-depth understanding of CHWs work in LMICs, such as CHW programme governance and financing; partnerships; supervision and interactions with the formal healthcare system; CHWs performance assessment and continued education.

2.5.4. Lay First Responder programmes

a) Introduction

Most emergencies begin far from health facilities and trained healthcare professionals. They occur at home, schools, places of prayer, sports fields, roadsides, etc. Community members are often witnesses and earliest responders; they can play a key role in influencing the severity, subsequent steps, and the overall impact of health emergencies. As such, they may represent a key building block in the sustainable development of the overall ECS as recommended by

WHO⁶. Establishing community-based EC capability not only ensures effective first response to medical emergencies but also creates a link between community-based providers and higher-trained prehospital and facility-based providers, with all the benefits listed in the above section on CHW programmes. LFR programmes have been effective in translating EC skills to members of the public, including teachers, taxi drivers, students⁵. The evidence from the implementation of such programs in South Africa, Uganda, Sierra Leone, Guatemala and Zambia will be discussed in detail in the following sections of the chapter.

A LFR system can simply be understood as a coordinated process to deal with emergencies in a community¹⁶¹. CFAR is a more accurate term than LFR as it indicates the specific type of response the layperson is meant to bring. In some settings, police officers and fire fighters are also considered as “first responders”, an umbrella term that identifies all those who respond to emergency situations in order to provide safety and protection to citizens, property, and communities¹⁶². This thesis will therefore mostly use the term CFAR rather than LFR, except when quoted from the literature.

By training large numbers of members of the public, CFARs are spread throughout the community and can be called upon by their peers during an emergency or may already be present at the scene of an emergency^{5 163 164}. They can also be dispatched via SMS or push notification from a communication centre. Additionally, all laypersons’ activities in a community are ideally mediated by the community leadership to ensure local appropriateness and adaptation of the system to a specific context^{7 162}. As a community-based function, a CFAR system relies on the involvement and buy-in of members of the public, on the basis that training many of them within a community will increase the likelihood that a trained individual is present or near to any emergency that can occur^{5 164}. Each CFAR system should ideally have a governing body, management, and training structures, as well as a form of quality assurance^{5 163}; the South African program and Sierra Leone model use such a leadership structure and training framework and will be detailed in the next section.

Regarding education and training, CFARs are trained in basic life-preserving skills and ECS awareness¹⁶⁵. They don’t require an above-average baseline education level as anyone can be taught and master first aid. In some contexts, CFARs can be imparted more advanced knowledge to respond for example to a specific need such as stopping severe external haemorrhage in a conflict setting¹⁶⁶. Additionally, it is useful for CFARs to learn soft skills

such as interpersonal communication, basic safety and counselling, skills that can be useful in some interactions with community members.

b) Setting up a CFAR system

In settings where there is no pre-existing EMS, CFAR systems can serve as the foundation for a future comprehensive OHEC system^{5 162}. They can be implemented in a stepwise manner based on an area's available resources. Further components are added on as more resources become available to the region so that each region can develop an affordable, functioning emergency medical system that works with existing resources and the ultimate intention of the system progressing to a comprehensive EMS⁷.

The first steps involve setting up a governing authority and associating local community leadership (including influential individuals) for each target community and teaming up with them to do a needs assessment, gauge acceptability, plan for the required resources, develop the training curriculum and adapt the model in each area. The South African program was first initiated in the township of Manenberg, in the Cape Flats in Cape Town, following this approach⁷. For each community, a Governing Body was created and was supported by Community Advisers to collaboratively plan all aspects of the program rollout, therefore ensuring contextualisation^{7 162}.

The next step is training and operationalisation of the CFARs, with specialisation of trainers and senior or head CFARs when resources are available^{5 162}. In some areas, the CFAR course can simply be an additional module added to existing CHWs to specifically capacitate them in managing emergencies.

With the CFARs in place, communications and transporters or ambulances can be implemented concurrently or at a later stage when resources allow, to help coordinate the CFARs' response and to help expedite patients to the hospital. The EFAR in SA only set up a formal communications platform several years after its launch in Manenberg in 2012 and continuously improved it year after year⁷. Over time, the CFAR system can formalise with responders and transporters upgrading to ambulances and still supporting the ambulances until they can completely and adequately cover an entire area¹⁶². In a Bangladeshi study based on data

collected as part of the large-scale study “Saving Of children’s LIves from Drowning” (SOLID) project, Hoque et al (2017)¹⁶⁷ showed that there was a reduction of the severity of non-fatal injuries and the recovery time following first aid administered by both CFARs and professional EC providers.

Like any health intervention, CFAR programmes require a monitoring and evaluation process as part of quality improvement⁷.

c) The WHO CFAR course

The WHO CFAR course is a 4-day in-person training that emphasizes empowers community members to initiate the management of their own health-related emergencies in the interim before ambulance arrival¹⁶⁸. In-depth details of the course specific objectives, content, teaching strategies, target audience, teaching materials and skills stations are provided in Appendix 8 (WHO CFAR concept note and syllabus)¹⁶⁹.

The WHO CFAR course is intended to train selected lay providers or CHWs to recognize emergency conditions, safely provide basic life-saving interventions, and stabilize an individual until further care can be sought, especially in communities where there is limited access to formal EC. The course target audience is not every layperson like for any general First Aid (FA) course, but selected individuals linked to the formal ECS^{168 169}. It only focuses on practical and systematic FA approach to four common groups of emergency conditions (trauma, difficulty in breathing, shock and altered mental status); it is not meant to be a general FA course¹⁶⁹. The curriculum was developed by a team of WHO experts of the Emergency Care unit from the South Africa EFAR course and an initial version of the CFAR conducted in Zambia. The course tapped into available the evidence from various LFR courses to help refine its content, the teaching strategy and determine clear learning objectives. Initial versions underwent subsequent iterative reviews and were enriched with lessons learned from pilot courses in LMIC such as Iraq¹⁷⁰ and Syria.

The course was intentionally developed to be adaptable to different LMICs contexts. It particularly emphasises on the linkage or integration to the formal healthcare system. Lay EC responders are persons formally trained and systematically organized to address medical

emergencies, instead of or in conjunction with professional EMS providers. Examples could include police officers, fire fighters, taxi drivers, community CHWs and other community leaders who have received clinical training and have been integrated into the ECS¹⁶⁹.

2.6. ACCESS TO OUT-OF-HOSPITAL EMERGENCY CARE IN LOW-RESOURCE SETTINGS

2.6.1. OHEC Tier-1 and Tier-2

The term OHEC was agreed by consensus and defined by the African Federation For Emergency Medicine (AFEM) Workgroup as a suitable umbrella term for use in Africa to refer to the full spectrum of EC that occurs outside healthcare facilities. This broadly includes care delivered by both laypersons and professional responders^{171 172}.

Tier-one System refers to the foundation of the OHEC provided by first responders at a community level. Examples of tier-one OHEC systems include taxi-driver or police officer trauma programs in several African settings and the EFAR system developed in South Africa¹⁷¹.

Tier-two System refers to the next level of the OHEC system which provides more specialized prehospital care. Examples of tier-two OHEC systems include national ambulance systems and maternal obstetric motorbike units¹⁷¹.

OHEC and prehospital care are often used interchangeably; there is however a subtle nuance¹⁰⁷. Care can sometime be provided at a scene outside traditional health facilities (“out-of-hospital”) and not necessarily involve transportation for definitive care in a health facility^{107 108}. In some cases, it may be appropriate for patients to be treated and released at the scene, particularly if only minor conditions are identified by adequately trained and authorized personnel¹⁷¹. As only a portion of paramedic practice can now be referred to as prehospital care, out-of-hospital care appears more and more as an accurate and more inclusive term^{107 171}.

OHEC should be seen as the initial component of the EC continuum, starting with first responder care upon recognizing a perceived or actual medical emergency, and ideally continuing with care during transport and advanced treatment at a facility as necessary. It is

highly recommended that LRS decision-makers develop comprehensive strategic plans that includes realistic short-, medium-, and long-term objectives to strengthen the ECS¹⁷¹.

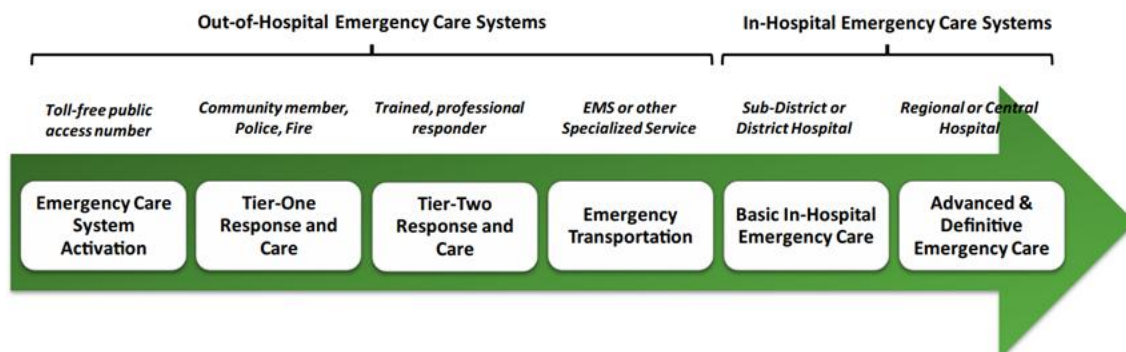


Figure 6. Emergency care system continuum

Source : <http://dx.doi.org/10.1016/j.afjem.2014.02.001/>

In 2013, the AFEM OHEC group advocated for several key attributes at both levels: accessibility, timeliness, safety, effectiveness, scalability, sustainability, cost-effectiveness, and measurable outcomes^{171 172}. As illustrated in the WHO ECS framework, EC exists on a continuum¹⁰⁶. OHEC systems across the continent have progressed slowly due to various challenges, including concerns about financing, and a lack of standardisation on the optimal system structure and function.

2.6.2. Dimensions of access to OHEC in Africa

OHEC should be accessible to all who require it. However available data suggests that there are several barriers to such access in Africa. The AFEM OHEC Group structured a report around six dimensions of access to care, “the 6 A’s of access”¹⁷¹. After a consensus in 2013 on a two-tier system of African OHEC, this AFEM interest group reconvened in 2015 to work on a common understanding of the subject of access to OHEC on the continent. The group added a sixth dimension to the dimensions of the Penchansky and Thomas’ access model¹⁷³. For each of these dimensions, there are specific challenges which largely align with the broad obstacles to healthcare in Africa identified in a study conducted in 2019 in Maputo as part of the African Epidemiological Association Meeting, with the involvement of participants from 11 African countries¹⁷⁴.

Thus “the 6 A’s of access” include:

- 1) **Availability:** It refers to the extent to which the volume and type of services or resources correspond to the needs and demands of the target population. Lack of ambulances services in many African countries highlighted by Mould-Millman et al (2017)⁴ falls within this limitation.
- 2) **Accessibility:** It examines the spatial or geographic relationship between the location of service provision and the location of the clients who require them. In a study that aimed to characterize distribution and accessibility of healthcare facilities in 48 countries in SSA by degree of urbanisation, Florio et al (2023)¹⁷⁵ found that, despite great variability across countries and regions, access was inadequate as poor infrastructure made facilities unreachable, especially in rural areas. This equally applies to access to facility-based EC.
- 3) **Accommodation:** It relates to the manner in which services are organized to address client needs, as well as clients' perceptions of the appropriateness and effectiveness of this organizational structure. The lack of unique and free access number to activate EMS in many African countries as highlighted by Mould-Millman et al (2017)⁴ illustrates this aspect of access limitation.
- 4) **Affordability:** It pertains to the relationship between the financial cost of services, their perceived value, and the clients' capacity to pay. This key aspect of access challenge is represented by the widespread practice of out-of-pocket payment by mostly poor community members in many LMICs^{22 23}.
- 5) **Acceptability:** It concerns the alignment between clients' attitudes and perceptions of the services provided and the characteristics of those services, alongside the attitudes and perceptions of providers toward specific client groups. For example, rejection of utilisation of blood products in the management of haemorrhagic shock in trauma patients by some social groups could restrict access to optimal trauma care, as documented in a critical review by Scharman et al (2017)¹⁷⁶. The construct of acceptability will be further discussed in following sections of the thesis.
- 6) **Awareness:** It is about when and how members of the public access EC. Due to many reasons, patients in LMIC are often not aware of when they should seek immediate care⁶⁷. The AFEM OHEC group established that community education was the key driver for public awareness of EC access and suggested the efficient use of conventional methods of public education to achieve better public awareness¹⁷¹.

2.6.3. Barriers to OHEC in Africa

Several barriers impede the above listed six dimensions of access to care. A systematic review by Kironji et al (2023)⁶⁷ that aimed to identify barriers to OHEC in LMICs found that lack of transportation/ambulances was a common challenge, forcing many patients to rely on alternative means of transportation. Lack of skilled personnel and uniform access to a phone number for EMS activation were other prominent challenges highlighted⁶⁷. Poor infrastructure and coordination/communication, as well as limited availability of equipment were additional factors elicited⁶⁷. Lack of finances largely explained the lack of resources.

Lack of awareness and the resulting absence or delay in seeking care when facing a medical emergency is a widespread issue in Africa ECSs which call for sustainable public communication strategies.

The non-exhaustive list of challenges includes inadequate documentation of the burden of acute diseases, a lack of integrated approaches to acute care, absence of standards, a shortage of evidence-based recommendations, limited technical expertise, and a lack of practical guidelines, resource documents, and toolkits⁶⁷.

In Tier-1 systems, the role of community involvement and support is crucial, along with the importance of a CFAR system acceptable to the community in which it is embedded in order to optimise access.

In Tier-2 systems, the primacy of a single toll-free emergency number and cost-free services do impact accessibility^{67 171}. While generally cost-effective in addressing acute health challenges, Tier-2 systems face financial and technical difficulties in SSA⁴. Despite the presence of small-scale successful models, there is a lack of large-scale OHEC systems with proven efficacy.

Despite challenges, reports from a few African nations indicate early success in establishing both tiers of OHEC systems. In Sierra Leone, Madagascar, Uganda, and South Africa, Tier-one systems were tested using taxi drivers, police officers, local council members, and community volunteers as community-based first aid responders^{161 163 177 178}. These initiatives demonstrated strengths in local relevance, practicality, sustainability, and cost-effectiveness. In 2011, the Belgian Red Cross-Flanders, with support from the WHO and the World Bank,

developed the African First Aid Materials Guidelines to promote locally appropriate first responder (Tier-one) training in regions of Africa that lack formal prehospital care systems¹⁷⁹. Experts called for widespread educational outreach utilizing these materials, targeting all audiences across the continent. In some LMICs, innovations such as SMS text messaging, motorcycle ambulances, and traditional ambulance services staffed by trained prehospital personnel have been introduced to enhance the delivery of prehospital care.

In this context of multiple and complex challenges, CFAR systems could represent an easier yet impactful supporting step in building and scaling up ECS in LMICs.

2.7. COMMUNITY FIRST RESPONDER IMPLEMENTATION MODELS IN LOW-RESOURCE SETTINGS

2.7.1. The South African Emergency First Aid Responder (EFAR) system

The EFAR system is a Tier-1 OHEC model implemented in the Western Cape province in South Africa. Designed by the Western Cape EMS and the Division of Emergency Medicine of the University of Cape Town, the EFAR system is the first community-based programme rolled out in SA to specifically address the challenges of providing timely EC in a LRS^{7 161 180}. This initiative in collaboration with local communities aimed to bridge the gap in emergency response by leveraging trained laypersons and community resources. EFAR was first initiated in the township of Manenberg, in the Cape Flats, an underserved settlement with high rates of crime, accidents and violence, and other forms of emergencies, where the unmet EC needs of residents required a response beyond the Metro EMS offer and capacity^{161 181}. Violence and emergencies in this part of the greater Cape Town had a deep, negative impact on the psychology of the community members, and community members first aid training appeared as an intervention that could provide stress relief to the community while improving laypersons responders' initiative and confidence¹⁸⁰.

Success reaped in Manenberg prompted a progressive expansion of the model across similar areas in the Western Cape province¹⁸⁰.

a) Overview of the EFAR System

As described by Sun et al ¹⁶¹, the EFAR system functions as a coordinated yet flexible framework to respond to emergencies in resource-constrained communities of the Western Cape province. Its primary strategy involves training large numbers of members of the public to act as first responders during emergencies; these trained individuals, called EFARs, are strategically located within the community, allowing rapid response by proximity^{7 161 180}. EFARs may either be present at the scene of emergency, called upon by their neighbours, or dispatched through mobile communication systems by a head EFAR or an EMS centre. EFARs operate alongside professional EMS staff to ensure seamless care delivery^{7 161 180}.

A pivotal role in this model is played by Community Advisers who mediate EFAR activities and adapt the system to the sociocultural and infrastructural nuances of each area. The inclusion of these advisers ensures the system's sustainability and effectiveness⁷. Each community is supported by at least one head EFAR who oversees dispatch and operations. Head EFARs are equipped with additional training, resources, and communication tools to manage emergencies effectively and coordinate responses in real-time¹⁶¹. This structure facilitates comprehensive oversight of emergencies within a community and enhances the efficiency of responses through synchronized efforts between EFARs and professional EMS personnel^{7 161}.

b) Management and Organizational Structure

The EFAR system incorporates a dual-level management framework:

- 1) The professional oversight ensures quality, credibility, and cross-regional consistency. Additionally, it manages training standards, research, and system-wide communication, often administered by EMS organisations, health departments or hospitals^{7 161}.
- 2) The community level management focuses on local adaptability and ownership through collaboration with Community Advisers. These advisers, often community leaders or influent members of the public, adapt and guide the system based on the area's unique characteristics. They may also serve as or appoint head EFARs to lead operational activities^{7 161}.

The Governing Body, which oversees the entire system, works in partnership with Community Advisers to develop context-specific training curricula that align with the community's actual

emergency needs, fostering a sense of ownership and relevance among participants^{161 180}. This participatory approach ensures that EFARs are well-equipped to address the emergencies prevalent in their regions.

c) Training framework

Sun et al (2012)¹⁸² trained 628 community members from Cape Town townships in 2010 and compiled data on the training process, knowledge and skills acquisition, and retention. The EFAR training curriculum is tailored to reflect the resources, infrastructure, language and emergency patterns of a particular community^{7 161}. This adaptation begins with assessing local needs through consultations with Community Advisers and analysing data on the burden of emergencies that in local health facilities^{7 182}. Based on these insights, new training curricula are developed or adapted from existing ones.

Four major categories of needs were identified by Sun et al (2012)¹⁸² on the onset and became the basis of the four modules of the course: (1) emergency scene management, (2) unconscious patients, (3) violent injuries and (4) medical emergencies^{7 161 181}. The standard EFAR course now lasts about 6-10 hours over one to two days and is conducted in the trainees' primary language, in a venue in their community, using readily available tools and consumables¹⁸¹. The training equips EFARs with skills to utilise available community resources effectively during emergencies, with appropriate knowledge gain and retention¹⁸¹. The framework also includes opportunities for career progression, allowing motivated EFARs to receive advanced training and potentially transition into professional EMS roles^{7 161}.

Sun et al (2012)^{161 182} studies showed that this community-based system not only enhances community EC capacity but also provides avenues for individual growth and professional development.

d) Implementation framework

The EFAR system adopts a stepwise approach for its implementation, making it adaptable to varying resource levels^{7 161 182}. The steps used in the South EFAR system include (1) Obtaining community engagement: recruitment of Community Advisers and needs assessment; (2)

Training and deployment: contextualisation of the model; (3) Training EFARs and initiating basic emergency response services; (5) integration of transport systems: introducing ambulances or alternative transport solutions as resources permit; (6) system formalisation: gradual conversion of EFARs into formalised EMS while maintaining community integration^{161 181 182}. This phased approach ensures the system remains functional even at its initial stages, with potential to scale up as more resources become available. In regions with existing EMS services, EFARs provide supplementary support by offering immediate on-scene care, alleviating the burden on ambulances and reducing delays in critical care^{7 182}.

e) Lessons from EFAR implementation

The series of studies conducted on the EFAR system in the Cape Town townships and a review after a decade of EFAR implementation provide informative insights^{161 180}. A 10-year review aimed at evaluating the EFAR implementation outcomes, changes that occurred, and valuable lessons learned. Over a decade, about 10,000 laypersons across over 100 communities received first aid training and more than 2/3 certified as EFARs¹⁸⁰. Despite challenges such as violence and the consequent psychological trauma, community members showed a strong desire to assist during emergencies. This community willingness underscores the potential for community-based care systems¹⁸⁰. Another highlight was that limited formal education did not hinder participants' ability to learn and retain EC skills. Tailored EFAR trainings are accessible to all members of the public regardless of their baseline level of education. The trainings also boosted participants' confidence and willingness to act during emergencies, fostering a culture of proactive care^{161 180}. Finally, these trainings addressed concerns by ensuring appropriate care practices, mitigating the risk that community involvement could lead to behaviours such as inappropriate vigilante responses. Of note, the EFAR system's relative success is largely explained by the emphasis placed on having as much self-sustainability as possible¹⁸⁰. The integration of the EFAR system with the provincial EMS ensured a constant support and subsidy which play a key role in the financial sustainability of EFAR¹⁸⁰. This aspect will be further developed in the section on sustainability of LFRs programmes.

These findings demonstrate the viability of an EFAR system in a LMIC and its potential for scalability to other regions. By capitalizing on community motivation and providing appropriate training, the model enables effective OHEC in contexts where formal EMS

infrastructure is limited. However, several challenges continue to threaten the consolidation of EFAR in some regions of the Western Cape province and limit further expansion in other regions in need, including issues pertaining to financing, resources availability, local coordination and communication, evaluation of EFAR impact on patients' outcomes, and ensuring a continued support structure¹⁸⁰.

The EFAR system illustrates a sustainable and adaptable approach to improving basic EC in underserved communities. By leveraging local resources, fostering community ownership, and integrating with professional EMS services, the model addresses critical OHEC capacity deficiencies. The success of its implementation in South Africa served as a blueprint for similar initiatives in LMICs such as Zambia¹⁶⁴, emphasizing the importance of context-specific solutions, community engagement, and phased development^{7 180}. With continued investment and collaboration, it is likely this model could significantly enhance EC access and outcomes in LRSs worldwide. However, the EFAR system hasn't been rolled out beyond the Western Cape province of South Africa, begging the question to understand why¹⁸⁰. Cost-effectiveness is likely a factor to consider in the self-sustainability of EFAR in South Africa as it has been shown for other LFR systems in other settings.

2.7.2. Trauma-focused first responder models in LMICs

a) Introduction

The WHO CFAR course is typically conducted over a three or four-day period. While this duration allows learners ample time to cover all topics and acquire additional skills, it requires a significant time commitment from both participants and instructors; this can represent a challenge in some settings. For more specific needs such as empowering community members in regions with high prevalence of trauma, a shorter, injury-specific course may be more suitable for supporting a tier-one system^{5 177 178}. Several layperson trauma care courses in LMICs have demonstrated a substantial increase in EC knowledge among specific audiences^{5 177 178}. This suggests that shorter courses for LFRs could be effective for laypersons in similar contexts, be scalable, and potentially reducing the training duration to few hours^{5 8 177}. The implementation of LFR courses in Uganda^{8 178} and Sierra Leone¹⁷⁷ focusing on community-based trauma care highlighted the potential role of such systems in the context of low OHEC capacity in LMICs contrasting and high burden of disease addressable by EC.

b) Training of lay first responders in trauma care

In the Sierra Leone trauma course, a scalable model of a five-hour hands-on training program was adapted to the local context¹⁶⁶. A five-hour curriculum previously developed for Guatemala, and implemented and studied in Chad and Uganda, was adapted to fit the country's context¹⁷⁷. The LFR curriculum was based on guidelines from the WHO, the Red Cross, St. John Ambulance first aid initiatives, and the American College of Surgeons' Prehospital Trauma Life Support course and "Stop the Bleed" initiative¹⁷⁷. The final curriculum was reviewed and approved by two senior instructors from the Sierra Leone Red Cross Society.

It was structured around six distinct learning objectives: (1) Principles and definitions of first aid; (2) Scene management; (3) Airway and breathing management; (4) Haemorrhage control; (5) Fracture splinting; and (6) Victim transport¹⁷⁷. The five-hour course was delivered in both English and a local vernacular, using a lecture format interspersed with hands-on breakout sessions that incorporated graphics to reinforce learning objectives. This is aligned with the delivery strategy of EFAR in SA^{7 161}. The scalable model incorporated a "Training of Trainers" (TOT) component. Initial trainees became instructors, cascading training across communities, ultimately reaching over 4,500 participants in Bombali District¹⁷⁷. A subset of highly active LFRs underwent refresher training using the same curriculum, focusing on enhanced first aid skills aligned with emergency dispatch coordination.

Beside Sierra Leone, the Uganda training program targeted motorcycle taxi drivers ("boda-bodas"), equipping them with FA skills to manage mostly trauma cases, including BLS and common emergencies¹⁷⁸. The course emphasized on community integration and sustainability.

Both the Uganda and Sierra Leone programs reported significant knowledge improvement post-training, with variable retention rates over time. This correlates with findings on EFAR training outcomes in South Africa^{161 180 181}. The emphasis on practical skills and locally relevant scenarios ensured immediate applicability in real-world emergencies.

c) Implementation strategies

Delaney et al (2018)¹⁷⁸ described innovative strategies for deploying the trauma-focused LFR

programs in Uganda. A particular emphasis was put on community integration; LFRs gained community respect and saw an increase in income, linking social recognition with program sustainability¹⁷⁸. Scalability was an implementation feature factored in the Sierra Leone model, highlighting the potential of TOT approaches, enabling rapid expansion of trained responders while ensuring quality¹⁷⁸.

Integration of technology in a pilot in Sierra Leone leveraged mobile dispatch tools to optimize responder deployment¹⁷⁸. It demonstrated the feasibility of using simple technology for emergency coordination in dispersed geographic settings. Key metrics, such as response times, skills application, and cost were documented to fine-tune subsequent implementation phases and establish cost-effectiveness¹⁷⁸.

d) Key programmes highlights

There are key similarities between the outcomes of the EFAR in South Africa and the trauma-based LFRs systems in Uganda and Sierra Leone^{161 177 178 180}, including:

- Sustainability through social and financial incentives: Programs in both countries highlighted the role of community recognition and perceived financial benefits in motivating LFRs.
- Scalability via local ownership: The TOT model proved effective in extending program reach without overburdening resources, emphasizing the importance of empowering local trainers.
- Retention challenges: Knowledge and skill decay were identified as challenges, underlining the need for periodic refresher courses and support.
- Technology integration: Mobile dispatch systems, as piloted in Sierra Leone, demonstrated potential for enhancing coordination and efficiency, albeit with the need for robust infrastructure and training.

Overall, these community-based trauma care courses underscore the transformative potential of LFR programs in addressing the EMS gap in LMICs, highlighting the need for sustained investment, local engagement, and innovative approaches⁵. However, it is crucial for every implementation model to take into account the specific needs to support the necessary costs in a sustainable manner to mitigate the likelihood of the failure of the intervention.

2.8. COST-EFFECTIVENESS OF COMMUNITY FIRST AID RESPONDER SYSTEMS

2.8.1. Cost-Effectiveness Analysis

Cost issues pose a significant barrier to healthcare strengthening, with financial constraints often cited among the greatest challenges to the development of OHEC⁶⁷. As it is the case with all health interventions, effective financial planning and cost-effectiveness are essential for the successful and sustainable implementation of CFAR programmes. While numerous studies have examined clinical outcomes, curriculum development, knowledge retention, and skill decay among CFARs, only a few have investigated their cost-effectiveness to support future healthcare investments.

Cost-effectiveness analysis (CEA) is a critical tool in resource allocation, particularly in LMICs health systems where financial constraints and high disease burdens necessitate efficient interventions¹⁸³. CEA compares the relative costs and outcomes of different interventions, often measured in terms of cost per disability-adjusted life year (DALY) averted or quality-adjusted life year (QALY) gained¹⁸³. The WHO “Choosing Interventions that are Cost-Effective” (WHO-CHOICE) project provides a framework to evaluate cost-effectiveness of interventions¹⁸⁴. WHO-CHOICE suggests that interventions with a cost per DALY averted less than a country’s GDP per capita are “very cost-effective,” while those below three times the GDP per capita are “cost-effective”¹⁸⁴. This benchmark is particularly relevant for LMICs, where maximizing health benefits for every dollar spent is crucial. CEA often include direct and indirect costs; direct costs involve program implementation, including training, supplies, and personnel salaries, while indirect costs encompass broader economic impacts, such as productivity losses averted¹⁸⁵. The effectiveness component considers health outcomes like mortality reductions, improved quality of life, and reduced disease burden^{184 185}. Comprehensive assessments incorporate sensitivity analyses to address uncertainties in costs, outcomes, and model parameters¹⁷⁴.

2.8.2. Cost-Effectiveness of health interventions in LMICs

A systematic review by Watson et al (2018)¹⁸³ which reviewed 37 studies highlighted the importance of cost-effectiveness in the implementation of health interventions in LMICs. Evidence collected suggests that interventions with local ownership and involvement of the

beneficiaries were likely to be cost-effective. Amongst those, interventions that entailed task-shifting from trained professional health workers to laypersons trained to become CHWs were singled out¹⁸³. Training CHWs to deliver an array of basic health services has proven cost-effective in multiple settings¹⁸³. For example, programs integrating CHWs to manage maternal and child health demonstrated Incremental Cost-Effectiveness Ratios (ICERs) significantly below the GDP per capita of many LMICs, a good indication of cost-effectiveness^{186 187}. These programs leverage low-cost personnel and community integration to efficiently deliver essential services.

EC interventions in LMICs are another field increasingly recognised for their cost-effectiveness. Despite gaps in cost-effectiveness evidence for comprehensive ECS in SSA, a systematic review by Werner et al (2020)¹⁸⁸ demonstrated that EC averts significant DALYs at costs well below the GDP per capita of most LMICs. The 35 studies analysed covered prehospital services, provider trainings, treatment interventions, emergency diagnostic tools and packages of care; interventions in all these aspects of EC were found to be cost-effective. A subsequent study in 2022 analysed cost-effectiveness of a multipronged WHO intervention that introduced a toolkit comprising trauma checklist and registry, the Basic Emergency Care (BEC) training, resuscitation area guidelines and a triage tool in two public hospitals in Uganda¹⁸⁹. The pre- and post-intervention multivariate analysis from a societal perspective showed that the introduction of the WHO Toolkit averted 1,498 DALYs when compared to standard care over a one-year time horizon¹⁸⁹. The initial investment of \$5,873 saved 637 life years and avoided \$1,670,689 in downstream societal costs. It was projected that a nation-wide rollout of the toolkit over a five-year period would cost less than 0.1% of the country's total health budget increase but generate a substantial 655% return on investment¹⁸⁹.

The implementation of community-based LFR systems to increase OHEC capacity is another affordable intervention aimed at improving EC services outcomes in LMICs.

2.8.3. Cost-effectiveness of CFAR/LFR systems

CFAR systems represent a scalable and cost-effective approach to addressing EC gaps in LMICs, particularly RTCs, the leading cause of death among young individuals in these settings.

Delaney et al (2022)¹⁹⁰ conducted an analysis of the cost-effectiveness of trauma-specific LFR programs across 5 countries in SSA. They collected cost data from five CFAR programs launched between 2008 and 2019 in SSA and compared calculated cost-effectiveness ratios against African GDP to determine the cost-effectiveness. The results showed an average annual cost per LFR trained of \$16.32, including training and supplies. For adequate emergency coverage, training 750 LFRs per 100,000 population was shown to cost around 12\$, yielding an estimated 227.7 DALYs averted annually per 100,000 population. This results in a cost per DALY averted of \$53.75, well below SSA's average GDP per capita of \$1,585.40, qualifying as "very cost-effective" under WHO-CHOICE guidelines¹⁸⁴.

It has been established that, compared to formal EMS systems, LFR programmes offer a cost-effective alternative with lower initial investments. For instance, a study by Accorsi et al (2017)¹⁹¹ that evaluated the cost of establishing EMS for emergency obstetric care in Ethiopia found an average amount of \$27 per life year saved, a higher cost compared to LFR-based models¹⁹¹. Moreover, LFR systems can complement existing infrastructure, bridging gaps in care during EMS development.

Additionally, comprehensive evaluations of long-term cost-effectiveness, incorporating societal perspectives and broader economic benefits, are essential. With proven affordability, scalability and effectiveness, CFAR/LFR systems can significantly reduce the burden of preventable deaths and disabilities, and contribute to efforts for equitable and universal EC. To yield the maximum benefits, these programs must be implemented more widely in the most sustainable manner.

2.9. SUSTAINABILITY OF COMMUNITY FIRST AID RESPONDER SYSTEMS IN LRS

The construct of sustainability is not well defined; it can refer to continuation, durability, continuance, institutionalisation and adherence among others¹⁹². Schell et al (2013)¹⁹³ focused on the time aspect and defined sustainability as the ability to maintain programming and its benefits over time, while Proctor et al (2011)¹⁹⁴ valued integration more and defined sustainability as the extent to which a newly implemented intervention is maintained or institutionalised within the ongoing operations of a service setting. Regardless of terminology, sustainability is a key goal that must be pursued to determine the success of a health intervention¹⁹⁵.

General strategies to enhance health interventions sustainability are applicable to EC interventions and more specifically CFAR programmes. Several such programmes have been successfully implemented in areas lacking formal OHEC; however, they often struggle to maintain sustainability after the initial pilot phase.

When designing and planning the roll out of a CFAR system as an adaptable and cost-effective intervention, it is crucial to ensure its long-term sustainability¹⁹². Besides establishing the need and acceptability of such a program in a specific context, it is essential that plans are put in place right at the onset to ensure that the programme implementation is sustained over an extended period to achieve the desired outcomes. The implementation of CFARs system in South Africa and Uganda over several years provided valuable insights into the key aspects of sustainable implementation.

Key lessons learned from the EFAR system in South Africa are presented in Point 2.7.1; they give some insights into sustainability. It is worth noting that the original EFAR model was gradually adapted and scaled up across the province as needed. As the EFAR expanded, the model evolved to incorporate regional EMS stations in managing their local EFAR systems^{7 180}. This new management structure progressively transitioned the entire system while further integrating the EMS sectors at the regional level. In many impoverished areas, it was found that EFARs were often the residents' first point of contact with the ECS. After a decade rich in experience, changes continued to be made depending on local regions needs but, in collaboration with EMS. As of 2024, the EFAR system counted several thousands of trainees in over 100 communities, becoming an example of success in the development and implementation of community-based CFARs systems in LRS^{7 180}. Making EFAR self-sustainable in those regions has been one of the most crucial goals of health authorities in the Western Cape provincial leadership. An analysis of keys contributors to the sustainability of the EFAR revealed that collaboration between the official EMS and local EFAR coordination structures as core pillars^{7 180}. Additionally, the continued funding of EFAR through EMS and the use of this system as a conduit for both community and EMS development contributed to the self-sustainability¹⁸⁰.

This has been variably corroborated by Delaney et al (2021)¹⁹⁶ who explored the factors motivating continued LFR participation in Uganda. The aim of the study was to understand the social and financial effects of the programme on participants and the long-term motivation for

the continued participation of volunteers for 3 years post-training¹⁰⁶. Though 3 years may not be seen as long enough from the implementation science perspective, insights from this review highlighted key challenges threatening optimal implementation of trauma-focused LFRs system in Uganda, including¹⁹⁶:

- A sustainable funding strategy
- First aid kits supply limitations: A dedicated first aid office/resupply depot for first responders affiliated with local governments could be a solution.
- Communication challenges, including dispatch systems: Future mobile EMS dispatch technologies designed for use with mobile phones could also improve LFR coordination and communication.
- Education of the public on the purpose of LFRs, while simultaneously equipping first responders with personalized identification cards as a credentialing tool
- Lack of legislative means like Good Samaritan laws to protect responders.
- Lack of coordination with law enforcement such as the police

It is therefore crucial for planners who are considering rolling out LFR programmes to factor in facilitators and barriers to sustainable implementation right on the onset, during the conception phase, the implementation phase and the subsequent evaluations for further adaptations.

2.10. RESEARCH JUSTIFICATION BASED ON THE LITERATURE REVIEW

The in-depth review of the available evidence highlights the critical need for strengthening ECS in LMICs, particularly in under resourced settings like Kinshasa, DRC, a setting characterized by rapid urbanization, high population density, inadequate infrastructure, health workforce shortages, and several barriers to access to care. The city's population unmet EC needs contrast with a lack of formal EMS. These multiple challenges significantly contribute to poor outcomes from acute conditions. The adaptation of a CFAR programme could represent a rational and innovative intervention to address these systemic gaps and increase OHEC.

This research integrates at variable extents three theoretical frameworks (the WHO Health Systems Framework, Community-Based Participatory Research, and Implementation Science) to ensure the programme's relevance and optimize its feasibility and sustainability. The frameworks provide a multi-dimensional approach to addressing the structural, socio-cultural, and operational barriers to OHEC in Kinshasa, DRC. By leveraging the WHO Health Systems Framework, the research systematically identifies critical deficiencies in governance, service delivery, and workforce capacity. The CBPR approach ensures that the intervention is community-centred to foster trust, ownership, and cultural alignment. Implementation Science guides the crucial contextual adaptation and ongoing evaluation of the CFAR programme, ensuring that it is tailored to local needs and scalable within Kinshasa's health system.

This research fills a critical evidence gap by demonstrating the potential, the plausible suitability and small-scale feasibility of an adapted CBHI aimed to enhance OHEC capacity in LMICs. The evidence presented on LFRs cost-effective implementation in LMICs supports the worth of a CFAR programme that capitalises on CHW privileged role in underserved communities; it can serve as a foundational step toward developing a comprehensive and sustainable DRC-specific ECS, with the potential to improve health outcomes in similar contexts globally.

CHAPTER III. MAPPING OF THE DEMOCRATIC REPUBLIC OF THE CONGO EMERGENCY CARE SYSTEM USING THE WHO EMERGENCY CARE SYSTEM ASSESSMENT TOOL.

1. CHAPTER INTRODUCTION

The first and essential step towards developing locally adapted EMS is a comprehensive analysis of the existing ECS to better understand its capacity, its weaknesses and identify priority areas for development or improvement.

This baseline study used a consensus methodology to describe the state of the main component of the ECS of the DRC as gauged by the WHO Emergency Care System Assessment (ECSA) tool. This system-level evaluation - conducted in more than 50 other LMICs - identified core issues the ECS in DRC faces, formulated major recommendations for policy and programs aimed at strengthening ECS in the country. This set the context in which a CFAR programme can be an intervention increasing the out-of-hospital emergency care capacity.

This evaluation findings and action priorities were published in the form of a co-report from the DRC Ministry of Health, with a roadmap on priorities for the strengthening of the ECS in the DRC.

Although this study and its technical report are integral to the dissertation and were planned from the beginning, they serve primarily as an initial background-setting step. The student was central in every step of the implementation of this evaluation, in collaboration with WHO's headquarters team and the DRC MoH.

Though informative, this assessment at system level needed to be supplemented and its key findings corroborated from the perspective of health service consumers: the community members.

Declaration by Author

Although this study and its technical report are integral to the PhD and were planned from the beginning (Ethics approval HREC 085/2021 received beforehand – Appendix 1), they served primarily as an initial background-setting step. Unlike the three subsequent published studies which were driven by student KD in a central authorship role, this study was conducted in collaboration with key personnel from WHO and the DRC Ministry of Health. Explicit permissions were received from the DDB and the Ministry of Health of the DRC to include this technical report the student planned and contributed to as part of his thesis (Appendix 7).

KD played a central coordination role in all the ECSA steps, in collaboration with technical officers from WHO headquarters and DRC MoH Directorate for Emergencies, Disasters and Humanitarian Action (Programme National d'Urgence, de Catastrophes et Action Humanitaire – PNUAH). The steps include the conception of the study; the acquisition, analysis, or interpretation of data; and drafting the work or revising it critically for important intellectual content.

The DRC MoH and WHO approved the final version of the report and agreed to be accountable for all aspects of the work.

Location of stored data: All survey data and consensus meeting notes are stored by WHO.



Ken Ngoy Diango

Date:

13 February 2025

Inclusion of Technical Report

Emergency Care System Assessment and consensus-based action priorities: Democratic Republic of Congo. Technical report 2021. Ministry of Health, DRC. (*Unpublished and not peer-reviewed Technical Report*).

Permissions were received from the DDB and the Ministry of Health of the DRC to include this technical report as part of the thesis.

Statement

The DRC MoH gave permission for that the DRC ECSA report to be included in the thesis “Adapting a community first aid responder programme to increase out-of-hospital capacity in Kinshasa, Democratic Republic of Congo” (See authorisation letter in Appendix 7).

None of the other contributors is a student of UCT or any another institution and will not be using any of this report to contribute to a thesis.

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In accordance with the UCT Doctoral Degrees Board guideline titled, “GUIDELINES FOR THE INCLUSION OF PUBLICATIONS IN A DOCTORAL THESIS”, authors signed approval



Ken Diango



Lee Wallis
(On behalf of all co-authors)

2. COPY OF TECHNICAL REPORT:

EMERGENCY CARE SYSTEM ASSESSMENT AND CONSENSUS-BASED ACTION PRIORITIES: DEMOCRATIC REPUBLIC OF CONGO

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EXECUTIVE SUMMARY

Emergency care systems address a wide range of common medical, surgical, and obstetric conditions, including injury, complications of pregnancy, exacerbations of non-communicable diseases (e.g. asthma, heart attacks, strokes), and acute infections (e.g. sepsis, malaria). With sound planning and organization, emergency care systems have the potential to address half of deaths and more than a third of disability in low- and middle-income countries.

Given the potential to reduce death and disability in DRC through improvements in emergency care, the DRC Ministry of Health, in collaboration with the World Health Organization (WHO) undertook a system-level assessment using the WHO Emergency Care System Assessment (ECSA) tool and organized a working group comprised predominantly of local emergency care experts. Key stakeholders were asked to complete the WHO ECSA, an instrument designed to help policymakers and planners assess a national emergency care system and identify country specific action priorities for high-impact improvements of the emergency care system. A working group was convened on 27-28 April 2021 to review results. During the meeting, each question and the amalgamated answer was discussed among the stakeholders and a consensus answer was obtained. Based on discussions, action priorities were recorded. At the end of the meeting, all action priorities were arranged in a priority list based on group consensus.

Representatives from the following major groups dealing with emergency care in DRC were represented at the consensus meeting:

- Ministry of Health (2 directorates and 3 programs)
- WHO country office representative
- Association de Médecine d’Urgence de la RDC
- Army medical department
- Fire brigade
- Congolese emergency care providers now practicing abroad
- Community activists
- Academics from 2 major Universities (University of Kinshasa and University of Kisangani)

There are a range of opportunities for improvement in emergency care in DRC including: improving prehospital emergency care, strengthening facility-based emergency care, standardizing emergency unit processes and implementing systematic data collection to support quality improvement efforts. The government will need continued commitment to strengthening the delivery of emergency care in DRC in order to bring about meaningful change. The specific action priorities for each component of the emergency care system proposed by the working group are listed below, and details of the discussion on each topic are described in the main document.

ACTION PRIORITIES

Governance and Financing:

- Include an explicit reference to emergency care in the next revision of the PNDS (Plan National de Développement Sanitaire, PNDS)
- Strengthen the national lead office (National Programs on Emergencies and Humanitarian Action), revise its vision and mission, and support its function with appropriate legislation and resources
- Introduce legislation defining emergency care, ensuring access to it regardless of ability to pay, and offering appropriate financial protection
- Once emergency care is defined, establish a dedicated emergency care fund to facilitate free access (within the terms of the legislation)
- Develop a national status report on emergency care

Data and Quality Improvement

- Introduce standardised clinical charts for emergency units
- Empower the lead agency to collect data on emergency conditions and use that information for system planning (by adding data points to SNIS)

Scene care, transport, transfer, and referral

- Establish formal EMS (SAMU) systems in each province

- Introduce community first aid response (CFAR) systems into existing networks of community health agents in each province
- Introduce nationally regulated certification courses for EMTs and expand access to training
- Introduce regulation for ambulance services, including a universal access number
- Introduce a policy for interhospital transfers, including communication requirements
- Launch community awareness campaigns regarding the use of ambulance services
- Develop a national trauma centre designation system
- Expand first aid training nationally – initially into schools, and regulate it through Ministry of Health

Facility-based care

- Develop a free-to-use poison control centre
- Ensure every first level hospital has a fully functional EU (open 24 hours, has clinical staff continuously onsite and uses an acuity-based triage protocol)
- Introduce the Interagency Triage Tool as a standardised national EU triage tool
- Introduce Emergency Medicine as a medical specialty program
- Introduce post graduate training in emergency care for nurses
- Introduce standardised protocols to guide clinical management in EUs
- Introduce standardised protocols to guide patient flow, admission, discharge and transfer
- Roll out WHO BEC training nationally in undergraduate doctor and nurse training and for in-service training

Emergency Preparedness

- Strengthen the national multi-sectoral disaster coordination centre transform it into a permanent multi-risk unit
- Roll out training of emergency care personnel in disaster planning and response
- Enforce the requirement that all hospitals have a multi-hazard response plan in place
- Review the overarching national disaster preparedness and response plan, and regularly test its capacity and operations

- Introduce security systems (protocols, staff and training) for all emergency units and ambulance services

Through the ranking process, the working group agreed that 19 should be prioritised into a Roadmap for Action, as the next stage of this process:

1. Revise the National Health Development Plan (Plan National de Développement Sanitaire, PNDS) to explicitly include emergency care.
2. Strengthen the national lead office (the National Programs on Emergencies and Humanitarian Action), revise its vision and mission, and support its function with appropriate legislation and resources
3. Once emergency care is defined, establish a dedicated emergency care fund to facilitate free access (within the terms of the legislation)
4. Introduce standardised clinical charts for EUs
5. Empower the lead agency to collect data on emergency conditions and use that information for system planning (by adding data points to SNIS)
6. Establish formal EMS (SAMU) systems in each province
7. Introduce community first aid response (CFAR) systems into existing networks of community health agents in each province
8. Expand first aid training nationally – initially into schools, and regulate it through Ministry of Health
9. Develop a free-to-use poison control centre
10. Ensure every first level hospital has a fully functional EU (open 24 hours, has clinical staff continuously onsite and uses an acuity-based triage protocol)
11. Introduce the Interagency Triage Tool as a standardised national EU triage tool
12. Introduce Emergency Medicine as a medical specialty program
13. Introduce post graduate training in emergency care for nurses
14. Introduce standardised protocols to guide clinical management in EUs
15. Introduce standardised protocols to guide patient flow, admission, discharge and transfer
16. Roll out WHO BEC training nationally in undergraduate doctor and nurse training and for in-service training
17. Strengthen the national multi-sectoral disaster coordination centre transform it into a permanent multi-risk unit

18. Enforce the requirement that all hospitals have a multi-hazard response plan in place
19. Review the overarching national disaster preparedness and response plan, and regularly test its capacity and operations

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ABBREVIATIONS

AMURDC	Association de Médecine d’Urgence de la République Démocratique du Congo
DRC	Democratic Republic of Congo
ECS	Emergency care systems
ECSA	WHO Emergency Care System Assessment
EU	Emergency Unit
MOH	Ministry of Health
PNDS	Plan National de Développement Sanitaire
QI	Quality Improvement
SAMU	Service d’Aide Médicale Urgente
SOPs	Standard operating procedures
WHO	World Health Organization

1. INTRODUCTION TO ECS AND WHO ECSA

Emergency care systems (ECS) address a wide range of medical, surgical, and obstetric conditions, including injury, complications of pregnancy, exacerbations of non-communicable diseases (e.g. asthma, heart attacks, strokes), and acute infections (e.g. sepsis, malaria)¹. The emergency care system is often the first point of contact with the health system, particularly in areas where there are barriers to access². With sound planning and organization, emergency care systems have the potential to address half of deaths and more than a third of disability annually in low- and middle-income countries (LMICs)^{3 4}.

Despite the potential benefit of an organized emergency care system, it remains underdeveloped in many countries⁵. As a result, emergency care delivery is often compromised due to a lack of supportive legislation, governance and regulation, gaps in funding, and insufficient human and physical resources⁶.

The WHO Emergency Care Systems Assessment (ECSA) is a WHO tool designed for internal systematic assessment of essential components of a country's emergency care system. The ECSA process is led by the Ministry of Health and facilitated by WHO. The main goal of the ECSA process is to identify country specific action priorities for high impact improvements of emergency care system processes and outcomes. Participants generally include government/ministry representatives, prehospital providers, clinicians, and EMS and hospital administrators, among others, as identified by the Ministry of Health in collaboration with implementing partners. The following components of a national emergency care system are assessed via the ECSA: system governance and financing; data and quality improvement; scene care; transport transfer, and referral; facility-based care; and emergency preparedness.

Answers to the online survey are amalgamated and presented to a working group consisting of at least a core set of respondents at a two-day in country consensus meeting. Each ECSA question is discussed and a final answer determined based on consensus at the meeting. At the end of an ECSA meeting, policymakers and planners discuss and gain consensus on action priorities for emergency care system strengthening. While country participants may choose to create a strategy for implementation of identified action priorities together at the end of the ECSA process, WHO may be invited back for a separate meeting to assist with creation of an implementation roadmap for action priorities identified from the ECSA process.

2. HEALTHCARE IN THE DEMOCRATIC REPUBLIC OF CONGO

The Democratic Republic of Congo is a vast country located in central Africa (second-largest country in Africa), with a population of over 85 million⁷. The country is endowed with vast natural resources and encompasses 26 provinces, including the capital city Kinshasa, a megacity home to 12 million people. With an estimated annual population growth of 2.9% (corresponding to an annual increase of more than 2 million people), the country expects to reach 120 million inhabitants by 2030 and double its population in 25 years. This poses serious problems regarding provision of healthcare, especially considering that 74% of the population lives below the threshold of poverty⁸.

The DRC has made considerable progress over the last five years in terms of economic growth and macroeconomic stability. With an average of 7% per year, the country has experienced a period of strong and sustainable economic growth these past years. Despite this performance, GDP per capita remains among the lowest in sub-Saharan Africa (US \$ 514 in 2017)^{8 9}.

However, the political and security uncertainties of past decades have had serious consequences on the health sector: life expectancy at birth is 60 years, and one out of four people are likely to die prematurely due to injury, acute illness or exacerbation of a chronic illness¹⁰. There are very few public healthcare facilities, most of which are understaffed and under-resourced. The country uses the fee-for-service model: patients are usually required to supply payment and necessary medications and supplies prior to receiving any medical care, leading to delays in care and high out-of-pocket expenditure for the vast majority of citizens¹¹.

The overarching health policies framework is centred on primary health care (PHC) and reaffirms the health zone as a unit of their operationalization¹².

Healthcare is organised at three levels in the DRC:

- 1) The central level (National Ministry of Health) is responsible for legislation, policies, regulation, and standardization and health strategies. It also defines the financial framework and ensures mobilization of internal and external resources necessary for implementation of government health programmes.

- 2) The provincial level comprising Provincial Ministries of Health, Provincial Health Departments and Provincial Referral Hospitals). This level ensures the role of technical supervision, monitoring and translation of directives, strategies and policies to facilitate the implementation of actions at the level of Health Zones.
- 3) The local level: This is the operational level which includes 516 Health Zones with 393 General Referral Hospitals and 8,504 health areas (AS) of which 8,266 have a Health centre. This level is primarily dedicated to the implementation of the health care strategy.

The organisation of the supply of health care is ensured by both public and private health facilities. The public sector is organized around health Centres, General referral Hospitals, Provincial Hospitals, as well as armed forces, police and other departments providing care for their workers. The private sector comprises two categories, private for-profit and non-profit (services non-governmental organizations and faith-based organizations) as well as traditional medicine¹².

According to the latest data presented in the revised PNDS, the overall state of health care in the country remains concerning. Most indicators remain worrying, despite recent improvements, including a life expectancy of 61-year-old, a neonatal mortality ratio of 28 per 1000 live births¹⁰, an under five mortality ratio of 91 per 1000 live births and a maternal mortality rate of 846/100000 live births⁸.

3. EMERGENCY CARE IN THE DEMOCRATIC REPUBLIC OF CONGO

There are several challenges regarding optimal supply of health care in general in the DRC. This is even more pronounced regarding emergency care. There is no doubt about the need to develop and strengthen efficient emergency care in a country where one out of four people are likely to die prematurely due to injury, acute illness or exacerbation of a chronic illness¹⁰.

There are a very few public healthcare facilities, most of which are understaffed and under-resourced. The country uses the fee-for-service model: patients are usually required to provide payment and necessary medications and supplies prior to receiving any medical care, leading to delays in care and high out-of-pocket expenditure for the vast majority of citizens¹¹.

There is a shortage of skilled EC providers, with currently only two emergency physicians practicing in the country. Emergency units struggle to provide the full breadth of essential services, and resources and infrastructure are lacking. Emergency care is not included in curricula for medical and nursing students. The DRC has no formal EMS system to provide out-of-hospital emergency care, and the few existing ambulances are poorly equipped and staffed with untrained personnel. There is no universal access number for patients to call and connect with EC. Moreover, there are no proper referral pathways for emergency care in the country^{11 14}.

Despite a recently expressed political will regarding universal health coverage, there is simply no access to good standard prehospital and facility-based emergency care services. As with any emergency care system, there are still many opportunities for development and improvement. With development and continued strengthening of the emergency care system, timely care for conditions responsible for the greatest mortality can improve the prognosis of those affected.

4. EMERGENCY CARE SYSTEM ASSESSMENT WORKING GROUP

Given the potential to reduce death and disability in DRC through improvements in emergency care, the RDC Ministry of Health, in collaboration with the WHO, undertook a system-level assessment using the WHO ECSA tool and organized a working group composed of local emergency care experts and other key stakeholders identified by MOH and WHO. This included representatives from:

- Ministry of Health (2 directorates and 3 programs)
- WHO country office
- Front line emergency care providers (doctors and nurses from primary, district and tertiary hospitals)
- Academics from 2 major Universities (University of Kinshasa and University of Kisangani)
- Leaders of the Association de Médecine d'Urgence de la RDC
- Army Medical department
- Fire brigade of Kinshasa
- Congolese emergency care providers now practicing abroad
- Community activists

Stakeholders were asked to complete the ECSA questionnaire with the goal of using the findings to inform the development of action priorities for strengthening the DRC emergency care system. A total of 43 stakeholders completed a French version of the ECSA survey. The survey answers were amalgamated, and the results analysed. On 27-28 April 2021, MoH and WHO hosted a working group meeting to review the WHO ECSA results and establish consensus on all responses, identify gaps in the emergency care system and develop consensus-based action priorities for system development.

The following sections summarize the ECSA results and the discussions and conclusions of the ECSA working group. Action priorities are listed together in the executive summary above and are listed by section with discussion highlights below.

5. RESULTS FROM THE WHO ECSA AND DISCUSSION

a. SYSTEM ORGANISATION, GOVERNANCE AND FINANCE

The meeting participants discussed a 2017 assessment of emergency care capacity at some hospitals in Kinshasa (“Rapport de Mission d’Evaluation des Services d’Urgence des Hôpitaux Cibles de Kinshasa”). It was noted that this was the first attempt at a national assessment of emergency care. Unfortunately, it never extended beyond the capital city of Kinshasa. The availability of emergency care was noted to be extremely limited across the country, and worse in rural areas compared to the larger cities. Some participants noted that many people had been trying to improve the situation, but it still had a very long way to go to provide a quality service for the population.

In the national Ministry of Health, within the Directorate of Disease Control (“Direction Générale de la Lutte contre La Maladie”, DGLM), is the National Program on Emergencies and Humanitarian Action (“Programme National des Urgences et Action Humanitaire” PNUAH). The Director of the program is supported by staff dedicated mostly to response related activities, but facility-based and prehospital day-to-day emergency care also fall under the program’s responsibility. While there is a general law specifying the right to healthcare, the office has no legislative mandate related to emergency care, and inevitably much of its resource base is directed towards outbreak response. Participants were very keen that the office be better resourced and supported by an enabling legislative and regulatory framework.

The legal framework for emergency care is minimal: there are no laws explicitly guaranteeing access to care for any part of the population, including migrants and refugees, and there is no bystander protection law. The national health development plan (Plan National de Développement Sanitaire, PNDS) has no explicit mention of any aspects of emergency care, and all participants felt that it should. Work will start on the 2022 update in 2020.

There has been no comprehensive national status report on injury or emergency care. All participants felt that the development of a national status report on emergency care, coordinated by MOH, should be a key priority.

There is no government funded national health insurance scheme, although there are strong political moves towards establishing universal health coverage in the country; participants desired a finding scheme but realised it was beyond the scope of this meeting. Emergency care services do not have dedicated budgets; all funding provided comes from the general fiscus and is supported by user fees. The population can access emergency care prior to payment but are required to pay for all care provided as soon as possible, the latest by the time of the discharge. Participants were keen to define who is entitled to free care, and to offer some form of financial protection to those seeking emergency care.

ACTION PRIORITIES: SYSTEM ORGANISATION, GOVERNANCE AND FINANCE

- Include an explicit reference to emergency care in the next revision of the PNDS (Plan National de Développement Sanitaire, PNDS)
- Strengthen the national lead office (National Programs on Emergencies and Humanitarian Action), revise its vision and mission, and support its function with appropriate legislation and resources
- Introduce legislation defining emergency care, ensuring access to it regardless of ability to pay, and offering appropriate financial protection
- Once emergency care is defined, establish a dedicated emergency care fund to facilitate free access (within the terms of the legislation)
- Develop a national status report on emergency care

b. EMERGENCY CARE DATA AND QUALITY IMPROVEMENT

While there are good local examples of effective data gathering systems, such as for maternal mortality and for Ebola, emergency care data, including data on emergency conditions, management, and outcomes, are not systematically gathered for use by policy makers for system planning. There are no prehospital data. Emergency Units have registers, but nobody extracts data from them. No other data sources are used to look at the emergency care system. There is a national health information system (Système National d'Information Sanitaire, SNIS) which could easily have emergency care data points added to it, and participants were keen to do this.

Prehospital systems do not use standardised clinical record sheets – in fact, where ambulances exist, there is typically no clinical record keeping.

There are no electronic medical record systems. Clinical data are not routinely used for quality improvement (QI) purposes system wide. Some hospitals run morbidity and mortality meetings, but this is infrequent. There are no other examples of quality improvement initiatives in emergency care. All participants agreed that it is important to develop simple QI programs throughout the emergency care system.

ACTION PRIORITIES: DATA AND QUALITY IMPROVEMENT

- Introduce standardised clinical charts for EUs
- Empower the lead agency to collect data on emergency conditions and use that information for system planning (by adding data points to SNIS)

c. SCENE CARE, TRANSPORT, TRANSFER AND REFERRAL

Prehospital care services effectively do not exist in DRC. There are some public and private ambulance services, but they are almost all hospital-based and serve as interfacility transfer services. The government had had some donations of ambulances in the past but has not been able to maintain them or integrate them into a centralised service.

Participants reported that 119 has been allocated as the emergency ambulance number, but this is not legislated, there is no mandate to make calls free, it is not advertised, and there is no service to respond if someone called the number. Private ambulance services have their own numbers, but they tend to be the owner's mobile phone number.

The meeting noted that the proportion of the population covered by formal ambulance services was effectively zero. There is no dispatch system, no protocols, and no regulation in place to enable creation of a centralised service. Each province reported that it had a small number of marked vehicles that purported to be ambulances, but that they had a single driver and no equipment, so were effectively taxis. Participants felt that development of formal prehospital systems in each province was one of the highest priorities.

The Red Cross offers first aid training, as do a number of other NGOs, but there is no central coordination or regulation. Participants were keen to see these types of trainings roll out widely, especially in schools. There is a nation-wide network of community health agents already catering for immunizations programmes, Ebola awareness campaigns, TB and HIV programmes. Participants were very supportive of the idea of incorporating a community first-aid response (CFAR) system in the country and felt that this existing group of community health workers represented the ideal target population for training.

There are no centrally coordinated or centrally certified prehospital provider training courses. Anyone can offer a training program with their own curriculum and certification, which is enough to be employed by a private ambulance company. Participants noted that under the MOH's desired SAMU model, providers would primarily be from a nursing background. There was agreement that expansion of training opportunities for prehospital providers – regardless of background – was desirable.

Interfacility transfers usually occur in an uncoordinated and unstructured manner and were noted to lead to bad outcomes. The meeting agreed that the introduction of referral and transfer protocols was important. In addition, while there are no centre designation systems currently in place, creation of such a system for trauma centres was held to be a high priority.

ACTION PRIORITIES: SCENE CARE, TRANSPORT AND TRANSFER

- Establish formal EMS systems (Service d'Aide Médicale urgente, SAMU) in each province
- Introduce community first aid response (CFAR) systems into existing networks of community health agents in each province
- Introduce nationally regulated certification courses for EMTs and expand access to training
- Introduce regulation for ambulance services, including a universal access number
- Introduce a policy for interhospital transfers, including communication requirements
- Launch community awareness campaigns regarding the use of ambulance services
- Develop a national trauma centre designation system

- Expand first aid training nationally – initially into schools, and regulate it through Ministry of Health

d. FACILITY-BASED CARE

The University of Kinshasa has a toxicology department that is able to provide advice to clinicians regarding poisonings and envenomation, but it does so on an ad hoc basis and is not structured to provide this service in a meaningful way. There is no public facing poison centre. Participants reported that development of such a centre – initially, for clinicians to gain advice on a 24-hour basis – was a high priority.

With regard to first level hospitals, emergency care was noted to be in a very basic state. Very few meet the definition of a functional EU and typically lack dedicated non-rotating staff, act only as a reception to direct patients to inpatient services or consist of several speciality-specific units. The vast majority do not use a formal triage system. Most lacked adequate clinical equipment including for basic ABC management or monitoring, and most had poor access to diagnostic support from radiology or labs (with the exception of rapid malaria testing). Most offer caesarean sections 24/7, less offer emergency laparotomies and very few offer management of open fractures, usually due to equipment shortages. Blood for transfusion tends not to be available in emergency care.

The situation is somewhat better at the referral hospital level, and particularly in the 5 tertiary hospitals (3 in Kinshasa, 1 in Lubumbashi and 1 Kisangani), although most tend to be structured as separate specialty units not a dedicated EU. Nurses are typically non-rotating, but doctors spend their on-call days in the unit. There are no EM specialists (other than 1 in Goma) and, based on the Francophone model, Anaesthesia run most emergency care in hospitals (although it seems likely that this is mostly resuscitation: inpatient teams are called to address specific presentations such as chest pain or trauma). There is no triage system. Equipment for ABC management and monitoring is available in around half of these hospitals, and most have decent radiology and lab support, albeit from central labs and typically without a process to identify emergent or urgent test requests. There are no CT scanners. All are able to offer caesarean sections 24/7, and most offer emergency laparotomies, but few offer managements of open fractures, usually due to equipment shortages. Blood transfusion is

typically available. The MOH has produced clinical protocols for the management of many diagnoses, but these are not widely used.

Participants identified several areas for priority action, including the establishment of functional EUs at all first level hospitals, wider uptake of protocols for clinical management, and roll out of a national triage system.

One hospital has introduced a 2-year post-graduate clinical programme for emergency and critical care nurses, but while participants noted the urgent need for such opportunities, it is the only one in the country. Surgical training is general, followed by sub-specialisation in trauma, orthopaedics, or paediatric surgery. Anaesthesia runs most emergency care in hospitals, and Emergency Medicine does not yet exist as a separate speciality. Participants voiced strong support for its introduction.

There are no requirements for injury or emergency care training to work at any facility. Participants suggested that the WHO BEC should be introduced as both undergraduate (medical and nursing school) and in-service training.

There is a national HIV screening program, but it is poorly implemented. No other screening occurs. Surveillance and reporting systems are robustly in place for Ebola, but the screening component seems not to work well for other highly infectious conditions.

There are no protocols relating to patient flow, admission, or discharge. Participants supported the introduction of such protocols.

ACTION PRIORITIES: FACILITY-BASED CARE

- Develop a free-to-use poison control centre
- Ensure every first level hospital has a fully functional EU (open 24 hours, has clinical staff continuously onsite and uses an acuity-based triage protocol)
- Introduce the Interagency Triage Tool as a standardised national EU triage tool
- Introduce Emergency Medicine as a medical speciality program
- Introduce post graduate training in emergency care for nurses

- Introduce standardised protocols to guide clinical management in EUs
- Introduce standardised protocols to guide patient flow, admission, discharge and transfer
- Roll out WHO BEC training nationally in undergraduate doctor and nurse training and for in-service training

e. EMERGENCY PREPAREDNESS AND RESPONSE

In 2018, a Joint External Evaluation occurred, and the findings are being consolidated into an improvement and action plan within the National Programs on Emergencies and Humanitarian Action¹³. There has been some mapping of resources, but planning around effective use of these is limited. There is a multi-sectoral, multi-hazard national response plan that contains all relevant sections, but it has not yet been tested in any simulations or tabletop exercises. In 2018, two provinces tested their own plans against industrial and man-made disasters. Facilities are required to have disaster plans in place, but this is poorly enforced. Participants felt that compliance with this requirement should be a priority.

Coordination of preparation and response is reported as being good for Ebola. At the time of the meetings, DRC had an ongoing measles outbreak and an acute problem with flooding in a province. No coordinated plan has been put in place for these, leading participants to identify that systems out in place for Ebola are not working effectively in other large-scale emergencies. This includes the Emergency Operations Centre, housed within the national Ministry of Home Affairs.

Security for disaster response, ambulance personnel, and hospital emergency care workers was noted to be poor and there was felt to be a constant threat to staff safety. Having adequate plans in place was noted as a priority.

ACTION PRIORITIES: EMERGENCY PREPAREDNESS AND RESPONSE

- Strengthen the national multi-sectoral disaster coordination centre transform it into a permanent multi-risk unit
- Roll out training of emergency care personnel in disaster planning and response

- Enforce the requirement that all hospitals have a multi-hazard response plan in place
- Review the overarching national disaster preparedness and response plan, and regularly test its capacity and operations
- Introduce security systems (protocols, staff and training) for all emergency units and ambulance services

6. NEXT STEPS

At the conclusion of the ECSA meeting, all participants expressed enthusiasm and commitment for taking part in next steps. A consensus on action priorities was obtained as outlined in this report.

It was agreed that following the writing of this report with input from all stakeholders, it will be presented to MOH. Further discussions will continue with MOH and WHO to guide next steps in the implementation of action priorities. There was unanimous support for a Roadmap meeting within the next 3-4 months.

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End of the verbatim report

LIMITATIONS

This study is the first to methodically assess the ECS of the country using a validated WHO tool. However, for such a vast country like the DRC, with 537 health zones spread in 26 provinces, data collected from the responses of 60 selected stakeholders (4 times the WHO minimum limit of 15 respondents) may not necessarily be truly representative of its diverse context.

Nevertheless, the information collected from the heterogenous sample of stakeholders from various positions, expertise and provinces is most likely indicative of the reality across the country. Moreover, the threshold of 70% for consensus ensured that a majority opinion is formed for finding to be considered as approved. Budget and logistical constraints dictated that the numbers of participants to the consensus meeting was kept to just 40.

Finally, the dynamics of the working group discussions may have at times been biased, with influential well-known or high-ranking officials speaking up more than other participants. The facilitators strived to encourage participants to speak equitably and promoted a non-judgmental atmosphere where all opinions were welcome.

CHAPTER SUMMARY

This baseline study systematically assessed the core components of the DRC ECS and identified major gaps, including a deficient OHEC capacity. It was published in the form of a co-report from the DRC Ministry of Health and WHO and was provided to the country health authorities, policy makers, health administrators and researchers, as well as external observers, with a roadmap on priorities for the strengthening of the ECS in the DRC. The student was central in every step of the implementation of this methodical system-level evaluation in collaboration with WHO Emergency Care unit and the DRC MoH. UCT HREC approval was obtained prior the study, and permission obtained from UCT DDB and DRC MoH to include the report in this dissertation.

Though informative, this assessment at system level needed to be checked and its key findings corroborated from the perspective of health service consumers: the community members. The

research team therefore conducted a community-based survey to ascertain the availability and utilisation of EC services in Kinshasa, DRC.

CHAPTER IV. EVALUATION OF NEEDS AND SUPPLY OF EMERGENCY CARE IN KINSHASA, DEMOCRATIC REPUBLIC OF CONGO

1. CHAPTER INTRODUCTION

Emergency care can address over half of deaths occurring each year in low-income countries. A baseline evaluation of the specific needs and gaps in the supply of emergency care at community level could help tailor suitable interventions in such settings. This study evaluates access to, utilisation of, and barriers to EC in the city of Kinshasa, DRC.

We conducted a cross-sectional, community-based household survey in twelve health zones in Kinshasa, DRC. Three-stage randomised cluster sampling was used to identify approximately 100 households in each of the 12 clusters, for a total of 1217 households. The head of each household or an adult representative responded on behalf of the household. Additional 303 respondents randomly selected in the households were interviewed regarding their personal reasons for not accessing emergency care. The primary outcome was the availability and utilisation of EC services.

In August 2021, 1217 households encompassing 6560 individuals were surveyed (response rate of 96.2%). Most households were economically disadvantaged (70.0% lived with <US\$100 per person per month) and had no health insurance (98.4%) in a country using a fee-for-service healthcare payment system. An emergency visit in the last 12 months was reported in 52.6% of households. Ambulance utilisation was almost non-existent (0.2%) and access to health facilities for emergencies was mostly by walking (60.6% and 56.7% by day and night respectively). Death in the last 12 months was reported in 12.8% of households, of which 20.6% occurred out-of-hospital with no care received within 24 hours prior to death. Self-medication (71.3%) and the expected high cost of care (19.5%) were the main reason for unmet emergency care needs.

This study showed a substantial gap in the supply of emergency care in Kinshasa, with several unmet needs and reasons for poor access identified.

Declaration by Author

I was the primary author of this paper with co-authors John Yangongo, Vera Sistenich, Peter Hodgkinson, Eric Mafuta and Lee Wallis. The idea and design of the study was constructed collectively by all authors with KD, EM and LW drafting the content of the work. I had completed the manuscript for publication under the supervision and revision of the co-authors.

Authors contribution include the conception or design of the work; the acquisition, analysis, or interpretation of data for the work; and drafting the work or revising it critically for important intellectual content.

In this chapter 4, the nature of contribution is as follows:

KD contributed 60%; JY contributed 5%, VS contributed 5%, PH contributed 10%, EM contributed 10% and LW contributed 10%.

All authors approved the version to be published and agreed to be accountable for all aspects of the work.

Location of stored data:

All survey data and raw data downloaded is stored on the primary author (KD) password protected cloud account.



Ken Ngoy Diango

Date:

13 February 2025

Inclusion of publication

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Contribution	KD	JY	VS	PH	EM	LW
Conception	✓		✓			✓
Development of Methodology	✓		✓		✓	✓
Data acquisition	✓	✓			✓	
Statistical Analysis	✓	✓				
Initial Drafting	✓			✓		
Manuscript Revision	✓	✓		✓	✓	✓
Manuscript Approval	✓	✓	✓	✓	✓	✓
Overall Contribution	60	5	5	10	10	10

Statement

The Authors listed below agree that:

- Their paper to be included in the thesis “Adapting a community first aid responder programme to increase out-of-hospital capacity in Kinshasa, Democratic Republic of Congo”
- Remaining authors John Yangongo, Vera Sistenich, Peter Hodkinson, Eric Mafuta and Lee Wallis are not students of UCT or any another institution and will not be using any of this paper to contribute to a thesis.

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In accordance with the UCT Doctoral Degrees Board guideline titled, “GUIDELINES FOR THE INCLUSION OF PUBLICATIONS IN A DOCTORAL THESIS”, authors signed approval.



Ken Diango



Peter Hodkinson

(On behalf of all co-authors as authorised by the DDB)

2. COPY OF PUBLISHED ARTICLE: EVALUATION OF NEEDS AND SUPPLY OF EMERGENCY CARE IN KINSHASA, DEMOCRATIC REPUBLIC OF CONGO

INTRODUCTION

The 2019 Global Burden of Disease Report showed increases in injury and non-communicable diseases, with the greatest proportion in low- and middle-income countries (LMICs)¹. Available data indicate significant mortality in these countries, particularly in sub-Saharan Africa where a substantial proportion of deaths occur in the acute phase of illness or injury². Injuries and other time-sensitive illnesses are significant contributors to premature mortality and disability, and are the result of inadequate prehospital care³. Of the 45 million deaths every year in LMICs, 54% are due to conditions that emergency care can address⁴.

Despite evidence showing the positive impact of emergency care on patients outcomes⁵, most LMICs lack organised emergency care systems (ECS), therefore suffer substantial preventable death and disability⁶⁻⁸. A robust ECS is the common safety net that provides lifesaving interventions regardless of the cause of an acute condition⁹. This is why the 72nd World Health Assembly urged member states to prioritise Emergency Care Systems for Universal Health Coverage¹⁰. Despite concerning health indicators¹¹⁻¹⁴, the Democratic Republic of Congo (DRC) has no formal Emergency Medical Services (EMS). While there is a current drive for its development, little is known about the specifics of the demand and supply of EMS at community level in LMICs. Appropriate and sustainable interventions require a better understanding of shortcomings, best obtained by using a consumer-based method of health needs assessment that includes the primary beneficiary, the community.

The aim of this study is to gain an understanding of the nature and level of the demand and use of emergency care as perceived by community members in Kinshasa, particularly its utilisation, and barriers to access.

METHODS

Study design

A community-based cross-sectional household survey.

Study setting

The study was conducted in 2021 in Kinshasa, the capital city of DRC, home to almost 15 million people¹⁵. Its administrative boundaries cover a vast area and a large section of the city's land is rural in nature¹⁶. The demographic structure of residents of urban suburbs and peri-urban areas is representative of the DRC as a whole. Kinshasa's has a multi-ethnic population mostly young and faced with the same socioeconomic challenges as the rest of the nation¹⁶.

The DRC is a vast country located in Central Africa, with an estimated population of 90 million. Its GDP per capita (US\$580.7) is among the lowest in sub-Saharan Africa; an estimated 72% of the population lives below the poverty line¹¹. The overall state of healthcare in the country remains concerning; most indicators are worrying^{12 15 17}. The country's life expectancy at birth is 59 years (male) / 62 years (female) and the under-five mortality rate is 98 per 1,000 live births¹². The probability of dying between 15- and 60-years is at 281/232 m/f per 1000 population. The malaria mortality is one of the highest in the world¹³. Though declining, the country's maternal mortality ratio is still high at 693 per 100,000 live births, a key indicator of the inability to adequately manage obstetric emergencies. Road traffic collisions are an important cause of injury-related disability and deaths in the country¹⁴. The DRC total expenditure on health per capita is low at US\$32, 4.3 % of GDP¹². There are very few public healthcare facilities, most of which are understaffed and under-resourced. The country uses the fee-for-service model, leading to delays in care and high out-of-pocket expenditure for most citizens. The challenges regarding optimal supply of healthcare are more pronounced regarding emergency care. There is no formal EMS system to provide out-of-hospital care and the few existing ambulances are poorly equipped and staffed with untrained personnel. There is no universal access number for patients to call and connect with EMS. There is a shortage of skilled emergency care providers and emergency units struggle to provide the full breadth of essential services; resources and infrastructure are lacking¹⁸. The alternative is the private healthcare sector, unaffordable for the majority.

Study population and sampling methods

Cluster sampling was used to calculate the requisite sample size. Twelve of the city's 35 health zones (HZ) were selected for inclusion based on data of previous large surveys¹⁹. A sample of 1060 households was generated with 5% absolute precision and 95% confidence. A 10% non-response rate was considered as conservative based on similar household surveys on emergency care in LMIC. Multiple socioeconomic features differentiate residents of urban areas (UA) from those in peri urban areas (PUA), and the data was stratified accordingly. A three-stage randomised cluster sampling was used to identify the households, starting with the health areas (HA) within the HZ, followed by streets within HA, and lastly, households. In each household, the head of household or his/her representative was subjected to a comprehensive questionnaire on emergency care. To obtain more accurate data on unmet needs, a second randomly selected adult present in the household was interviewed specifically regarding his/her own reasons for lack of access to emergency care, not those of other householders.

Survey protocol

The questionnaire used was adapted to the DRC context from similar surveys^{20 21}. It encompassed five sections: demographic information, socioeconomic background, healthcare utilisation in the past 12 months, death of a member of the household in the past 12 months and reasons for not accessing emergency care.

A survey team of 12 experienced researchers fluent in the two majority languages of the area underwent a 2-day survey orientation for training, evaluation of competency in administering the protocol, and piloting of the survey for refinement. Over 10 days, surveyors worked in demarcated HA blocks during working hours each weekday plus one Saturday, starting at a convenient household, and then interviewing every 10th adjacent household until a sample of approximately 100 households was reached. In cases where householders declined to participate or were all absent, surveyors moved to the next household immediately adjacent until they were able to conduct an interview, later resuming the original selection of the systematic allocation. A consenting household head (or an adult representative) was asked a variety of questions about the needs and supply of emergency care in households while a second respondent was interviewed specifically about his/her reasons for not accessing emergency care. No survey responses were excluded.

Data collection and analysis

The survey questionnaire was hosted on the SurveyCTO platform²². Responses were captured on password-protected tablets and uploaded daily on the secure server. Ten percent of saved surveys responses were randomly checked daily by a researcher for adequacy and ongoing quality assurance. The raw data was securely downloaded and stored on a password-protected computer. Chi-square test and Fischer's exact testing were used to determine statistically significant differences across groups (two-sided significance level of $p < 0.01$).

Research Ethics

Ethics approvals were obtained from two universities; the first from the university where the corresponding author is affiliated to, and the second from a university in the country where the study was conducted.

RESULTS

Demographics (Table 8)

In August 2021, 1217 households were surveyed in Kinshasa: 1016 in urban areas (UA) and 201 in peri-urban areas (PUA), encompassing 6560 individuals, with a response rate of 96.2%. Respondents were predominantly female (68.1%), mean age 39.9 years, with a rate of tertiary education significantly greater in UA than PUA (41.9% vs 14.9%, $p < 0.01$). Unemployment was predominant at 49.5%, higher in PUA than UA (65.2% vs 46.4%, $p < 0.01$). This correlated with a greater proportion of households living on $< \text{US\$}100$ in PUA compared to UA (39.0% vs 16.1%, $p < 0.01$). The average size of households was of 5.39 members and only 1.6% had formal health insurance.

Healthcare utilisation (Tables 9 and 10)

Routine visits to health facilities were relatively low (23.1%) compared to emergency visits (52.6%), with infectious diseases being the reason in 60.0%. No meaningful data could be obtained on utilisation cost, waiting time or quality of care in ambulances due to the low rate of utilisation (0.2%). Moreover, 99.8% of respondents did not know which emergency number to call if a householder needed an ambulance. Private healthcare facilities were the most attended in UA (69.3% for day and 72.6% for night visits respectively) while they were less visited in PUA (25.9% and 35.8% by day and night respectively). The majority accessed care

by walking (60.6% and 56.7% by day and night respectively). Infectious diseases were the reason of visits in 55.4% of cases.

Death in households (Table 11)

A total 155 deaths were reported for the 12 months prior to the study (12.8% of households), with UA and PUA equally affected. The deceased were much younger in PUA than UA (mean of 37.5years vs 47.5years, $p<0.01$). The deceased were not known to have any underlying chronic disease in 60.6% of cases; their deaths were thought to be due to an acute illness (including injury) in 56.4%. One out of five deceased did not receive any healthcare within 24 hours prior to death which occurred on the way to the health facility (43.8%) or at home (43.8%). There were no significant differences between UA and PUA in the reasons given for out-of-hospital deaths: distance to the health facility (38.7%); sudden death (19.3%) and self-medication (12.9%).

Reasons for not accessing emergency care (Table 12)

There were 303 second respondents interviewed to establish their personal access experiences. Their demographics were generally similar to first respondents, except for a younger age (mean of 35.6 years versus 39.9 years for first respondents). There was no significant difference between UA and PUA regarding unmet emergency care needs, with 44% and 43% respectively reporting having had a complaint requiring urgent treatment for which they did not seek care. Moreover, 60.9% said they behaved that way on more than one occasion. Self-medication was the main reason in both settings, but to a greater extent in UA than PUA (75.6% vs 44.4%, $p<0.01$), while the expected high cost of care was more predominant in PUA than UA (33.3% vs 17.4%, $p<0.01$).

Table 8. Respondent demographics and household socioeconomic background

	Urban areas		Peri urban areas		Total	
	n	%	n	%	n	%
	1016	83.48	201	16.52	1217	100
Gender						
Male	328	32.3	60	29.9	388	31.9
Female	688	67.7	141	70.1	829	68.1
Age (years)						
18-20	48	4.7	7	3.5	55	4.5
21-30	267	26.2	54	26.8	321	26.4
31-40	276	27.1	60	29.8	336	27.6
41-50	197	9.5	43	21.4	240	19.7
51-60	110	10.8	20	9.9	130	10.7
61-70	79	7.7	16	7.9	95	7.8
71+	39	3.8	1	0.5	40	3.3
Mean	40.1	--	39.0	--	39.9	--
Level of education						
None	15	4.8	4	2.00	19	1.6
Primary	86	8.4	26	12.9	112	10.0
Secondary	489	48.1	141	70.1	630	51.8
Tertiary	426	41.9	30	14.9	456	37.6
Employment						
Unemployed	471	46.4	131	65.2	602	49.5
Public servants	177	17.4	18	8.9	195	16.0
Private sector	120	11.8	14	6.9	134	11.0
Self-employed	152	14.9	21	10.4	173	14.2
Others	96	9.4	17	8.4	113	9.3
Household size						
1-2	105	10.3	9	4.5	114	9.4
3-4	280	27.6	80	39.8	360	29.5
5-6	327	32.2	78	38.8	405	33.3
7-8	170	16.7	23	11.4	193	15.9
9+	134	13.2	11	5.5	145	11.9
Median	5.49		4.98		5.37	
Total household income						
< US\$ 100	129	16.1	57	39.0	186	15.3
US\$ 100-249	357	35.1	53	26.3	410	33.7
US\$ 250-499	217	21.3	25	12.4	242	19.9
US\$ 500-999	80	7.8	11	5.5	91	7.5
US\$ 1000+	18	2.3	00	0.0	18	1.5
Couldn't say	215		55		270	
Householders with regular income						
No breadwinner	16	1.5	1	0.5	17	1.4
Single breadwinner	531	52.3	99	49.3	630	51.8
2 or more	469	46.2	101	50.2	570	46.8
Household primary language						
Lingala	716	70.5	137	68.1	853	70.1
Kikongo	4	0.4	0	0.0	4	0.3
Swahili	14	1.3	1	0.5	15	1.2
Tshiluba	2	0.2	6	3.0	8	0.7
French	280	27.5	57	28.3	337	27.7
Dwelling ownership						
Owned	420	41.3	146	72.6	566	46.5
Rented	596	58.7	55	27.3	651	53.5
Dwelling standard						
With running water	558	54.9	19	9.5	577	47.4
With electricity	887	87.3	92	45.8	979	80.4
Health insurance						
Standard scheme	11	1.1	9	4.4	20	1.6
Informal/mutual plan	35	3.4	8	4.0	43	3.5
Employer hospit plan	236	23.2	12	6.0	248	20.5

Table 9. Emergency care utilisation

	Urban areas		Peri urban areas		Total	
	n	%	n	%	n	%
	1016	83.48	201	16.52	1217	100
Routine visit of householders to a health facility in the last 12 months						
Total	247	24.3	34	16.9	281	23.1
Emergency visit of householders to a health facility in the last 12 months						
Total	513	50.5	127	63.2	640	52.6
Emergency visit by householder: Reason						
Pregnancy related	48	8.7	7	5.6	55	8.1
Infectious disease	300	54.1	76	60.8	376	55.4
Cardiovascular	56	10.1	9	7.2	65	9.6
Gastro-intestinal	50	9.0	4	3.2	54	4.4
Respiratory disease	27	4.9	4	3.2	31	4.6
Neurologic disease	15	2.7	0	0.0	15	2.2
Injury	20	3.6	1	0.8	21	3.1
Other/Doesn't know	38	6.8	24	19.2	62	9.1
Emergency visit by householder: Satisfaction with care						
Not satisfied	29	5.2	5	4.0	34	5.0
Average	64	11.6	13	10.4	77	11.3
Satisfied	461	83.2	107	85.6	568	83.7
Ambulance calls for emergencies						
	3	0.2	0	0.0	3	0.2
Hospital admission of householder						
	279	27.4	85	42.3	364	30.1

Table 10. Healthcare facility visit for emergency care

	Urban areas		Peri urban areas		Total	
	n	%	n	%	n	%
	1016	83.48	201	16.52	1217	100
	DAY	NIGHT	DAY	NIGHT	% Day	% Night
In case of emergency in household: Type of health facility						
Public clinic	236	219	134	102	30.4	26.4
Public referral hospital	72	53	10	27	6.7	6.6
Private facility	704	738	57	72	62.6	66.5
Other	4	6	0	0	0.3	0.5
In case of emergency in household: Mean of transportation						
Walk	588	609	149	79	60.5	56.5
Motorbike	195	233	32	82	18.6	25.9
Public transport	151	64	7	13	13	6.3
Personal vehicle	89	90	0	16	7.3	8.7
Neighbour's vehicle	4	22	0	1	0.3	1.9
Other	2	8	0	0	0.1	0.6
In case of emergency in household: Cost of transportation						
US\$ 0.1-2	906	824	188	120	90	77
US\$ 2.1-5	51	108	6	52	4.7	13
US\$ 5.1-10	25	25	46	19	5.8	3.6
US\$ 10.1-20	6	13	1	9	0.5	1.8
> US\$ 20	2	6	1	14	0.2	1.6
Doesn't know	26	40	0	0	2.1	3.3

Table 11. Death in the household.

	n		n		n	%
	1016	83.48%	201	16.52%	1217	100%
Death in the households past 12 months						
Total	130	12.8	25	12.4	155	12.7
Age at death (years)						
0-5	14	10.7	6	24.0	20	12.9
6-10	2	1.5	1	4.0	3	0.2
11-20	16	12.3	0	0.0	16	1.3
21-30	6	4.6	5	20.0	11	0.9
31-40	14	10.7	3	12.0	17	1.4
41-50	8	6.1	2	8.0	10	0.8
51-60	20	15.4	1	4.0	21	1.7
61-70	22	16.9	3	12.0	25	2.0
71-80	21	16.1	3	12.0	24	1.9
81+	7	5.4	1	4.0	8	0.7
Mean	47.5		37.5		45.5	
Was known with chronic illness						
Yes	56	43.1	5	20.0	61	39.4
Type of illness which caused death						
Underlying chronic illness	48	36.9	10	40.0	58	37.4
Acute illness	28	21.5	5	20.0	33	21.3
Injury	16	12.3	4	16.0	20	12.9
Pregnancy related	4	3.0	1	4.0	5	3.2
Unknown cause	23	17.7	5	20.0	28	18.0
Other	11	8.4	0	0.0	11	7.1
Received care 24hours prior to death?						
Yes	102	78.4	21	84.0	123	79.4
Where? Health centre	36	35.3	10	47.6	46	37.4
Public hospital	36	35.3	5	23.8	41	33.3
Private facility	27	26.5	6	28.6	33	26.8
Home	3	2.9	0	0.0	3	2.4
No	28	21.5	4	16	32	20.6
Reason? Distance to health facil.	10	35.7	2	50.0	12	37.5
Lack of transportation	1	3.6	0	0.0	1	3.1
Anticipated high cost	3	10.7	0	0.0	3	9.3
Self-medication	3	10.7	1	25.0	4	12.5
Chron. illness/ pal. care	2	7.1	1	25.0	3	9.3
Sudden death	6	21.4	0	0.0	6	19.0
Others	3	10.7	0	0.0	3	9.3
Out-of-hospital death?						
Yes	28		4		32	20.6
Where? Home	12	42.9	2	50.0	14	43.8
On the way to hospital	12	42.9	2	50.0	14	43.8
Other	4	14.2	0	0.0	4	12.4

Table 12. Second respondents' reasons for not accessing emergency care

	Urban areas		Peri urban areas			
	n		n		n	%
	261	86.1%	42	13.9%	303	100%
Had a complaint requiring urgent treatment but DID NOT seek care at a health facility						
Yes	115	44.0	18	42.9	133	44.0
Pregnancy related	8	6.9	2	11.1	10	7.5
Infectious disease	62	53.9	11	61.1	73	54.8
Cardiovascular disease	11	9.5	2	11.1	13	9.8
Gastro-intestinal disease	5	4.3	1	5.5	6	4.5
Respiratory disease	4	3.5	2	11.1	6	4.5
Neurologic disease	3	2.6	0	0.0	3	2.2
Injury / trauma	4	3.5	0	0.0	4	3.0
Other / Couldn't tell	18	15.6	0	0.0	18	13.5
Reason for not seeking care						
Anticipated high cost	20	17.4	6	33.3	26	19.5
Family disapproval	4	3.5	0	0.0	4	3.0
Chronic illness / palliation	1	0.9	0	0.0	1	0.7
Self-medication	87	75.6	8	44.4	95	71.3
Negligence	3	2.6	1	5.5	4	3.0
Distance to health facil.	0	0.0	2	11.1	2	1.5
Lack of transportation	0	0.0	2	11.1	2	1.5

DISCUSSION

This study evaluated the needs and supply of emergency care in the low socioeconomic setting of Kinshasa, DRC. The systematic clustering approach and the large sample size (1217 households; 1016 in urban areas and 201 in peri urban areas) makes the results to be likely broadly representative of the city's heterogenic population. Two similar studies on emergency care needs in Cameroon²⁰ (LIC) and in South Africa²¹ (middle-income country) provided valuable comparison.

Our respondents were mostly female (68.1%), as it is often the case in African household surveys^{20 23}. Respondents were mostly heads of the households or their spouses (44% and 34.5% respectively), which likely increases reliability of the information provided. Household size varied widely both in UA and PUA, with an average of 5.39 (Cameroon-6.7 and South Africa-5)^{20 21}. Studies on impact of household size on standard of living and health have yielded mixed results²⁴⁻²⁶. Larger family size has been found, to a certain extent, to negatively affect health outcomes due to resource dilution, but there are arguments that the assumption of a fixed and narrow flow of resources from parents underpinning the theory may not always hold²⁵. Unemployment rate was high at 49.5% (South Africa-60%)²¹. Of note, employment in the DRC context does not necessarily equate good income because wages are fairly low, particularly among public servants. Our data suggest that the differences in level of education between UA and PUA may have indirectly affected these groups' utilisation of healthcare. There is evidence that education is a determinant of health, correlating with healthy lifestyles, health seeking behaviours, preventative service use²⁷. Income interacts in many ways with education and appears to have an equal effect on health; they both impact the standard of living, the dwelling type, access to amenities such as running water and electricity (restricted in PUA vs UA), health behaviours and practices^{28 29}. The level of poverty we recorded is worse than the sub-Saharan average of 40% of the population living below the US\$1.90/day poverty line³⁰. The higher poverty level in PUA is multifactorial, with lower employment rate likely playing a role. In the context of a fee-for-service health system, the lack of financial resources undoubtedly had an impact on utilisation of healthcare services. Our data show that access to healthcare is largely unaffordable for the majority in Kinshasa. Acute sickness and injury represent a serious threat to the already precarious financial situation of most households^{31 32}.

Routine primary healthcare visits for ante- and post-natal care, childhood checks, chronic illness follow-ups, and routine screening among others were relatively low (23.1%), similar to findings in South Africa (24.1%)²¹. This could be due to the scarcity of clinics and hospitals to cater for a dense population with a fairly high burden of disease, the inadequate supply of various routine health services and the financial drain of cash payment for services on the limited household budgets. The attendance rate was significantly lower in PUA compared to UA, in keeping with the established evidence of reduced access to care in rural compared to urban populations³³⁻³⁵. The rate of unscheduled visits for acute illnesses or injuries (52.6%) was significantly higher than routine visits, and higher than in the Cameroon and South African studies (34.8% and 17% respectively)^{20 21}. This may suggest that health services are mostly sought when acuity and severity drive behaviour, and the lack of access to primary healthcare delays presentations until they become emergencies. Residents of UA attended mostly private facilities and those in PUA generally visited public ones, likely due to cost or scarcity of private facilities in rural regions. Though expensive, private healthcare is often preferred and perceived as offering better services. However, a large Cochrane review found private healthcare services in LMIC to be no better and sometimes inferior³⁶. Utilisation of ambulance services for emergency care was almost non-existent (0.2%), well below other African countries like South Africa (67%)²¹, Ethiopia (20.3%)³⁷ and Ghana³⁸ (4.5%). Though our study did not investigate average distances between households and their nearest health facilities, there is little doubt that the lack of ambulance services is a major barrier to emergency care in Kinshasa as is the case in many LMICs³⁹. In the context of economically disadvantaged households, the relatively low cost of transportation to health facilities reported (<US\$2 for 77% of respondents) still represents a non-negligible deterrent to seeking emergency care.

Our study mortality data point to patterns and gaps in the healthcare system as contributors to avoidable deaths. There was a higher mortality rate than official national statistics (155 deaths in a total population of 6535, 23.7 per 1000 people), although it is unclear if this could be due to inaccurate official statistics or the study period (Covid-19 pandemic). The deceased were relatively young (mean of 45.5years), well below the country's and Sub-Saharan region life expectancy (60.6 and 61.6years respectively)^{12 40}. Low socioeconomic status has consistently been associated with increased risk of premature death⁴¹, and avoidable mortality linked to the inefficiency of healthcare⁴², particularly lack of adequate emergency care⁵. These premature deaths (younger age in PUA than UA) may have been prevented by early access to suitable emergency care. One out of five deaths did not receive any care in the 24hrs prior to death.

Unmet emergency care needs were high and similar in UA and PUA (44.0% vs 43.0%). Unlike in Cameroon where neurologic conditions formed the main group for unmet needs²⁰, infectious diseases represented the majority of conditions in our study, in keeping with the country's burden of disease. Self-medication and the anticipated high cost of healthcare were by far the two most cited reasons; in contrast, economic issues and use of complementary medicine were the two main motives in Cameroon²⁰. Acceptability, accessibility and cost have been shown to be important factors elsewhere⁴³. In fact, the two top reasons in our study come down to unaffordability of care. Self-medication in place of seeking professional medical care is a widespread practice in LICs⁴⁴ and has a multifactorial basis. Poor socioeconomic status, lower level of education, inaccessible and unaffordable health care have all been cited^{45 46}.

LIMITATIONS

This research is based on self-reported data and the accuracy of responses provided by a respondent about other individuals could not be independently verified. Furthermore, some participants may have had recall bias or provided socially-desirable answers. Additionally, terms like “emergency”, “needs” or “income” used in the questionnaire have broad definitions and, despite surveyors attempts to clearly explain meanings, they could have been understood differently. Our study couldn't evaluate specific facets of ambulance utilisation because it was negligible. Unmet needs were not comprehensively detailed to establish associated factors, which deserve further study on its own. Finally, the generalisability of Kinshasa's findings to the DRC as a country may be limited in some respects.

CONCLUSION

This population-based evaluation provides an understanding of the nature and level of the demand and supply of emergency care in Kinshasa. The results point to critical barriers to access mainly due to poverty in the context of under-resourced fee-for-service healthcare system. The reasons for unmet emergency care needs and the factors related to the high rate of avoidable premature deaths underpin the necessity to develop emergency care in Kinshasa, DRC. Substantial contextually relevant interventions aimed at improving access, increasing

availability of services, building capacity and reducing cost of emergency care are needed to address the identified gaps.

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End of the verbatim report

3. CHAPTER SUMMARY

This population-based survey evaluated access to, utilisation of, and barriers to EC in the city of Kinshasa, DRC. Three-stage randomised cluster sampling was used to identify a total of 1217 households, and with availability and utilisation of EC services as the primary outcome. The study demonstrates a substantial gap in the supply of EC in Kinshasa, with several unmet needs and reasons for poor access identified.

In this context, an intervention aimed at increasing OHEC capacity as an initial response to the unmet EC needs of community members could be a solution towards improving EC provision.

However, it is essential that the unique situational EC needs of the DRC be documented, and acceptability established prior to implementation of a tailored programme to ensure success in this setting. This was the aim of the next study.

CHAPTER V. NEEDS ASSESSMENT AND ACCEPTABILITY OF A COMMUNITY FIRST AID RESPONDER PROGRAMME TO INCREASE OUT-OF-HOSPITAL CAPACITY IN KINSHASA, DEMOCRATIC REPUBLIC OF CONGO

1. CHAPTER INTRODUCTION

Despite efforts in recent years to expand the availability of prehospital care in LIMC, its availability remains limited in many regions. WHO advocates the development of LFR programmes as a supportive step in building functioning prehospital systems. This study aimed to identify the need for, and acceptability of, a community first responder programme to increase out-of-hospital EC capacity in Kinshasa, DRC.

We conducted five focus group discussions using purposive sampling. We included health system planners, emergency care providers, community health volunteers, and community members in both urban and peri-urban areas. Interviews were recorded and transcribed verbatim, validated, and subjected to inductive content analysis to identify themes and sub-themes.

Several areas of the country ECS were identified for improvement, starting with the initial response to emergencies in the community. Barriers included planning and governance issues; inadequate resources such as trained staff; cost; transportation issues; and reliance on alternative forms of care. There was a dominant view that sustainably addressing these barriers and building on identified facilitators requires a multi-pronged approach involving government, healthcare, and community members. Perspectives about the acceptability and sustainability of a community first responder programme were largely positive, and numerous actionable recommendations were provided.

A community first responder programme was deemed a useful and acceptable intervention to help increase OHEC capacity in Kinshasa. Key potential facilitators and barriers to its implementation and sustainability were identified.

Declaration by Author

I was the primary author of this paper with co-authors Pigoga, Eric Mafuta, John Yangongo, Lee Wallis, Charmaine Cunningham and Peter Hodgkinson. The idea and design of the study was constructed collectively by all authors with KD, LW and PH drafting the content of the work. I had completed the manuscript for publication under the supervision and revision of the co-authors.

Authors contribution include the conception or design of the work; the acquisition, analysis, or interpretation of data for the work; and drafting the work or revising it critically for important intellectual content.

In this chapter 4, the nature of contribution is as follows:

KD contributed 50%; JP contributed 10%; EM contributed 10%, JY contributed 5%; LW contributed 5%; CC contributed 10% and PH contributed 10% .

All authors approved the version to be published and agreed to be accountable for all aspects of the work.

Location of stored data:

All survey data and raw data downloaded is stored on the primary authors (KD) password protected cloud account.



Ken Ngoy Diango

Date:

13 February 2025

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Contribution	KD	JP	EM	JY	LW	CC	PH
Conception	✓				✓		✓
Development of Methodology	✓		✓		✓		
Data acquisition	✓		✓	✓			
Statistical Analysis		✓					
Initial Drafting	✓					✓	✓
Manuscript Revision	✓	✓	✓	✓	✓	✓	✓
Manuscript Approval	✓	✓	✓	✓	✓	✓	✓
Overall Contribution	50	5	10	5	10	10	10

Statement

The Authors listed below agree that:

- Their paper to be included in the thesis “Adapting a community first aid responder programme to increase out-of-hospital capacity in Kinshasa, Democratic Republic of Congo”
- Remaining authors Jennifer Pigoga, Eric Mafuta, John Yangongo, Lee Wallis, Charmaine Cunningham and Peter Hodkinson are not students of UCT or any another institution and will not be using any of this report to contribute to a thesis.

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In accordance with the UCT Doctoral Degrees Board guideline titled, “GUIDELINES FOR THE INCLUSION OF PUBLICATIONS IN A DOCTORAL THESIS”, authors signed approval.



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(On behalf of all co-authors as permitted by the DDB)

2. COPY OF PUBLISHED ARTICLE: NEEDS ASSESSMENT AND ACCEPTABILITY OF A COMMUNITY FIRST AID RESPONDER PROGRAMME TO INCREASE OUT-OF-HOSPITAL CAPACITY IN KINSHASA, DEMOCRATIC REPUBLIC OF CONGO

INTRODUCTION

Improving provision of emergency care (EC) in health systems can have a significant impact on morbidity, mortality, and well-being of populations¹⁻³. Efficient EC systems that include prehospital and facility-based care are essential for good patients outcomes². Despite the evidence, EC has historically not been prioritised in Africa; only one third of countries have prehospital Emergency Medical Services (EMS) systems in place⁴ and facility-based EC is often underdeveloped⁵⁻⁷. Most health emergencies occur in community spaces and homes, away from health facilities and trained healthcare providers, and community members are often the first on scene. Out-of-Hospital EC (OHEC) capacity broadly relates to the ability of a healthcare system to provide care outside traditional hospital settings⁸. In order to address delays in care at the scenes of emergencies, particularly in low-and-middle income countries (LMICs) with less developed EC systems, immediate bystander intervention could be vital⁹. Substantial evidence has demonstrated the positive impact of laypersons trained in basic EC¹⁰, with improvements across a range of illnesses and injuries, including out-of-hospital cardiac arrest¹¹, trauma¹², burns¹³, and drowning¹⁴.

The World Health Organization (WHO) identified the development of layperson first responder programmes as a fundamental first step in expanding the functionality of prehospital systems¹⁵ and developed the Community First Aid Responder (CFAR) programme to this effect. CFARs are members of the public who receive first aid training and are actively linked into the prehospital system, to help their community by responding to medical emergencies before formal care can be accessed¹⁶. They can improve access through the integration of EC with community-based health care systems, particularly in poorly-resourced and rural settings^{17 18}. Several community-based first responder programmes have been implemented in Africa to varying extents^{16 19 20}, with increased OHEC capacity and improved access to care as prominent benefits. The Democratic Republic of Congo (DRC) EC system is underdeveloped²¹⁻²³ and could benefit from a CFAR programme. As with all health interventions, though, local adaptation to the specific country's context is required.

To ensure successful implementation, it is essential that the country's EC needs be documented, and acceptability established. A needs assessment can be understood as the systematic process of identifying unmet health-related needs of a population to facilitate adequate solutions²⁴. It is a crucial step in successful implementation of health interventions as it informs an overall plan, helps identify targeted strategies and prioritise resources²⁵⁻²⁶. Acceptability is a multi-faceted construct that speaks to the appropriateness of a healthcare intervention and must be considered when designing, implementing, and evaluating healthcare interventions^{28 29}.

This study aimed to assess the needs for, and acceptability of, the CFAR programme in the DRC.

METHODS

Study design

Semi-structured interviews involving focus group discussions.

Study setting

The study was conducted in Kinshasa, the capital city of the DRC, home to approximately 12 million people³⁰. The DRC is located in Central Africa and has an estimated population around 100 million³¹. Its healthcare system is under resourced and many of its health indicators are concerning³². There is no formal national EMS system^{20 22} and nor inadequate knowledge of first aid in households³³.

Study population and sampling strategy

Through purposive sampling aiming to build representative groups of individuals capable of engaging in rich discussions to generate high-quality data, five focus groups were conducted (Table 1), each with eight participants. (average of 3 women for 5 men, aged between 30 to 60 year old). Gender and age representativity were ensured.

Table 13. Overview of focus groups participants and selection process

Focus groups	Participants selection
<u>Group 1</u> (G1) Healthcare system cadres*	Participants were selected by the Head of the Planning Division of the National Directorate for Emergencies and Humanitarian Action (National Ministry of Health) among participants of the two-day WHO DRC Emergency Care System Assessment consensus meeting held in Kinshasa in 2021. Suggested participants lists were independently checked, amended, and approved by two research team members.
<u>Groupe 2</u> (G2) Frontline emergency care providers**	Participants were selected doctors and nurses who attended the above meeting, with the addition of the rare prehospital care providers from the fire brigade. The final list followed the same approval process as above.
<u>Groupe 3</u> (G3) Community health volunteers*** (CHVs)	Participants were selected by two research team members (4 for each) from a list of most active and available CHVs designated by the Chief Medical Officer of the health zone of Lemba in Kinshasa
<u>Groupe 4</u> (G4) Community members (Urban area)	Participants were lay members of the community of the urban health district of Mont-Ngafula selected by two research team members (4 for each) among respondents of a previous community-based survey on needs and supply of EC in Kinshasa
<u>Groupe 5</u> (G5) Community members (Peri urban area)	Similar to the G4, but members were from the rural health district of Maluku 2 in Kinshasa
<i>*Healthcare workers (ambulance providers, nurses, or doctors) representing the first point of contact for patients needing emergency care.</i> <i>**In the DRC healthcare system, group of laypersons with no medical background registered with the health zone, not on a payroll, and already involved in various health promotion programs such as family planning, malnutrition, childhood immunisation, malaria prevention, etc. They play a crucial role, bridging the health system and the community.</i> <i>***Healthcare system cadres: 2 senior members of the National Directorate for emergencies, 2 members of the Kinshasa provincial coordination for emergencies, 1 Chief Medical Officer of a health zone, 1 supervisor of CHVs at health zone level, 2 doctors from a General Referral Hospital</i>	

Data collection

Based on the study objectives and the groups profiles, four separate semi-structured facilitation guides were developed by the research team following iterative reviews and consensus (Appendix 1). The guides included open ended questions relating to participants views on the current state of the country's EC system, CFAR suitability as an intervention, and the facilitators and barriers to its implementation and its sustainability. Two experienced facilitators led focus group discussions (FGD) at neutral locations within a two-week period. Participants were briefly introduced to the concept of EC systems and given an overview of the CFAR programme. Discussions lasted approximately fifty minutes each and were conducted in French in G1 and G2, and in Lingala (vernacular) in the three other groups to enhance optimal participation. Interviews were audio recorded and transcribed. Another research team member fluent in both Lingala and French first went through the interviews

transcripts to gain familiarity with the content before translation into English. Transcripts were verified by a different research team member. Anonymised transcripts were stored on a university-based cloud service (© OneDrive, Microsoft Corporation; Redmond, Washington, U.S.), with access restricted to the research team.

Data analysis

Data analysis was led by a research team member who was not involved in any aspect of the data collection. De-identified transcripts were imported to NVivo version 14 (© QSR International, Melbourne, Australia)³⁴ and analysed using inductive-dominant content analysis in a five-step approach³⁵: 1) immersion in the data, 2) extraction of meaning units, 3) condensing or summarising larger meaning units, 4) allocating codes to meaning units, 5) organising codes into categories. Open coding was used to systematically examine the data to identify initial labels that captured meaningful segments of information. The coding process was flexible and iterative, allowing for the refinement and development of codes as new insights emerged, and each transcript was reviewed at least twice. All the codes were checked by two research team members during the analysis process, with further discussion around any discrepancies, until consensus was reached. Following review of open coding, axial coding was used to establish relationships between the initial codes. This involved categorising codes into broader themes and subthemes, facilitating the identification of patterns within the data. Coding tree extracts were generated to visually depict the coding process; they were then compared with original transcripts to determine coherence, and another research team member verified the process.

Trustworthiness

In keeping with Guba's constructs³⁶, qualitative rigour was ensured. Credibility was ensured by using well-established methods to collect data from consenting participants, debriefing sessions after FGD and the checking of translations and transcriptions³⁶. Dependability was ensured through the detailed description of the methods that were employed for data collection and analysis, and through the reflective commentary related to prior assumptions and regular debriefings³⁶. Confirmability was bolstered by regular debriefings and reflective commentary. The use of the COREQ reporting checklist ensured transparency and further supported dependability³⁶. Though transferability of the results cannot be guaranteed, the detailed description of the setting and the sampled population will assist readers in gauging the generalisability of the findings. A pre-test of the data instrument was not performed beforehand to assess if it fits the purpose of the study.

Ethics

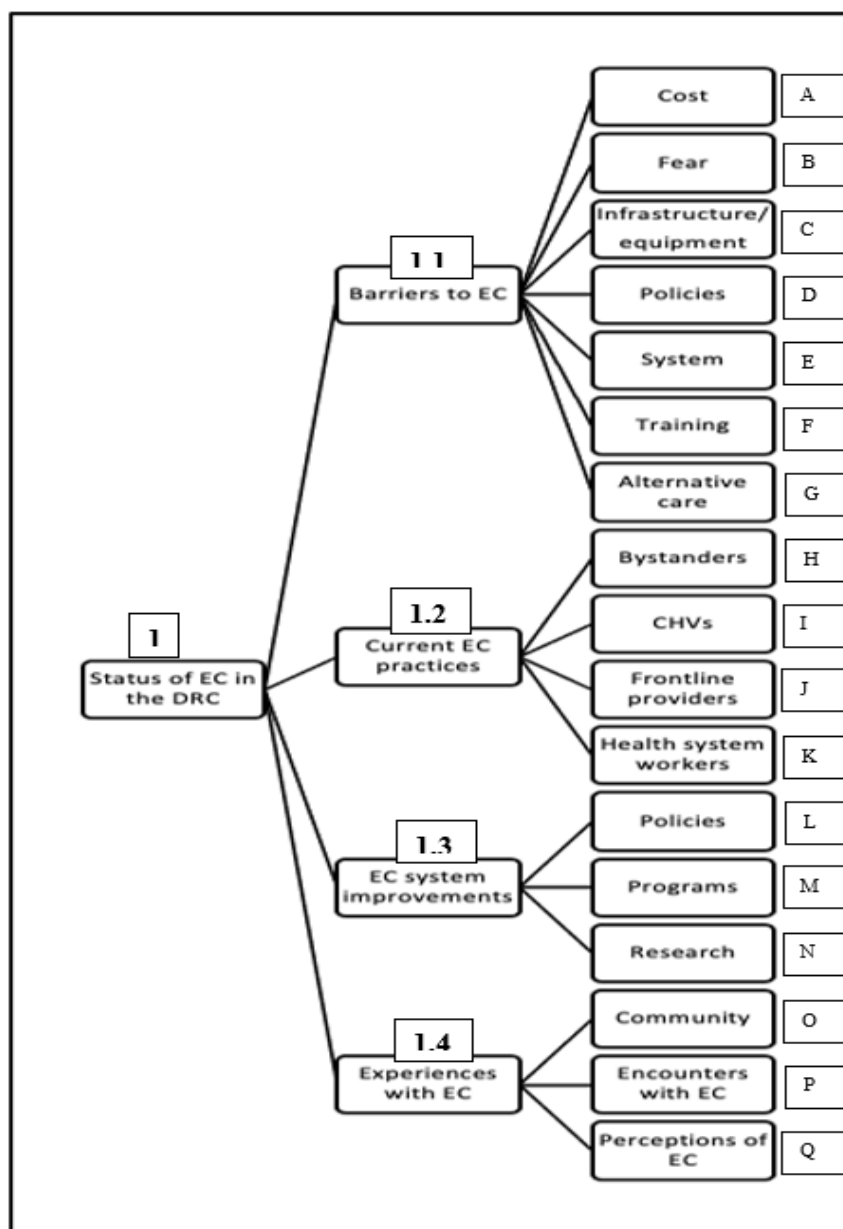
Approvals were obtained from the University of Cape Town (HREC REF 088/2021) and the University of Kinshasa (REF ESP/CE/077/2021). Informed consent was obtained from all participants. Prior to commencing discussions, participants were informed of the purpose of the study, associated risks and benefits, and how confidentiality will be maintained. They were also told they could withdraw at any stage without any consequence.

RESULTS

Five FGD were conducted, with a total of 40 participants included. Discussions were structured around two main sections: the state of the EC in the DRC and the need for, and implementation of, a CFAR programme.

1) Status of emergency care in the DRC

Four key categories were identified (Figure 7). They broadly describe the DRC's EC context and enable a better understanding of the potential role of a layperson first responder system.



DRC: Democratic Republic of Congo / EC: Emergency Care / CHV: Community Health Volunteer / Alternative care: often called traditional medicine, including herbal treatments, naturopathy, homeopathy)

Figure 7. Coding Tree Extract – Status of Emergency Care in the DRC

2.1. Barriers to EC

Substantial issues of planning, governance, and resources allocation were highlighted as obstacles that prevented a resilient and accessible EC system. Clinicians voiced a lack of trust in decision-makers as they felt that they were not investing enough and strategically in the strengthening of the country's healthcare system. (Reference: Fig 7, 1.1. D & E)

“Politicians do not act as they should, everyone comes with their idea and sees their interests, so there are no favourable factors.” (G2)

The lack of investment in EC was reported to hinder the availability of trained personnel and ambulances to transport patients to health care facilities. Many anecdotes of poor outcomes due to lack of prehospital care were provided. Even when patients made it to health facilities, care was often inadequate due to poor infrastructure and scarce equipment. (Reference: Fig 7, 1.1. C)

“The situation is deteriorating; there are no adequate conditions for patients when they arrive, no equipment, loads of missing items, etc.” (G5)

Cost was also a key driver of limited access, with community members and CHVs describing situations wherein care was delayed or not sought due to finances (Reference: Fig 7, 1.1. A)

“They refused to attend to the patient at first because we had no money, and even when the money arrived, the care was still mediocre.” (G4)

Participants also spoke of the despair and resignation of the mostly poor communities they lived in. They were faced with a lack of functioning government facilities, which often led them to resort to mostly unaffordable private medical services. A combination of traditional beliefs, fear, and costs drove many to use over-the-counter medications, homemade solutions, and, very often, prayer. (Reference: Fig 7, 1.1. A, B & G)

“Since we are jobless, we support ourselves with traditional medicines...” (G4)

“I called on my neighbours to help me to take her to the health centre after a nearby pastor prayed for her.” (G5)

2.2. Current EC practices

Due to their proximity, CHVs were found to be already playing an inadvertent role in improving access to care. CHVs confirmed their interest in aiding in emergencies, especially with further first aid training (Reference: Fig 7, 1.2. H), with one stating:

“During a routine community visit for polio vaccination for example, nothing would prevent me from assisting an injured person I come across; I cannot not intervene.”

2.3. *EC system improvements*

Community members and CHVs described general discouragement about previous community-based programs, particularly lack of follow-up, additional training or equipment provision. The sustainability of small stipends that incentivise CHVs participation in various programmes was poor, which reduces participation in much-needed community interventions (Reference: Fig 7, 1.3. L).

“...we were trained (as “community-based contraception sensitisers”) and were told that we will be receiving a certain amount of money monthly. But since our training to date, it's been almost 2 years, we haven't received anything. Now, when there is activity and we are needed, sometimes only 6 out of 11 health areas respond, the others don't come because promises made to them were not fulfilled.” (G3)

An illustrative reference was made to a previous government attempt to develop a prehospital emergency care service in Kinshasa. (Reference: Fig 7, 1.3. M). Despite early success, the programme ultimately failed, due in large part to a lack of political support.

“Between 2013-2016, we launched a pilot project of prehospital care service in Kinshasa (...) it barely lasted 6 months and stopped... the barrier for this project sustainability was the politicians...(they) did not follow, many vehicles broke down, staff training stopped halfway when we already had positive outcomes. The population accepted and supported, and many activities were carried out...” (G1)

A participant also discussed the great potential of new leadership in the country to improve access to EC through the implementation of Universal Health Coverage (Reference: Fig 7, 1.3. L), noting:

“This opportunity is the rise of the new leadership into power, with the vision of implementing universal health coverage... A lot of lives will be saved...” (G2)

2.4. *Experiences with EC*

Some participants described deeply personal encounters with the EC system, with some witnessing an emergency of someone they did not know and choose to intervene. (Reference: Fig 7, 1.4. P). Accessing and paying for EC were described as difficult, with one community member being forced to leverage their own home for payment:

“I found my son (...) in severe pain; but we had no more money to go to the hospital. He previously had surgery but was still experiencing pain. The hospital managers had kept our property documents (as guarantee of payment), I didn't know what else to do, I had no money.” (G4)

Perceptions of facility-based EC were mixed in and across participant groups. Some community members were satisfied with the care provided at hospitals, while others were discouraged, sharing stories of inadequate and delayed care. (Reference: Fig 7, 1.4. Q).

“(...) there were no adequate conditions for patients when they arrive, no equipment, loads of missing items, etc.” (G5)

2)The CFAR programme

Five categories pertaining to the need for, and sustainable implementation of, a CFAR programme were identified (Figure 8).

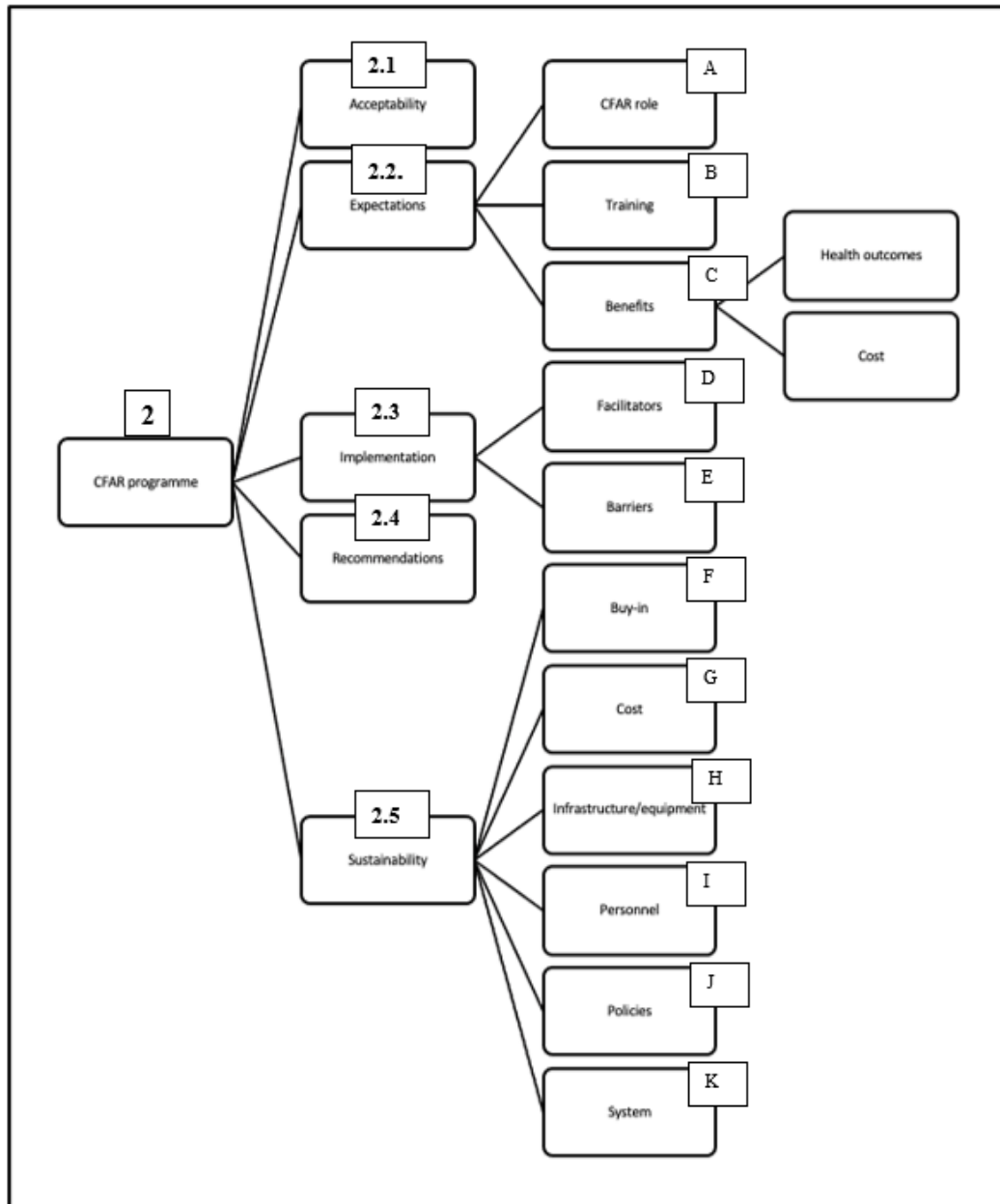


Figure 8. Coding Tree Extract – CFAR Programme

Table 14. CFAR programme meaning units

Meaning unit	Condensed meaning unit	Code	Subcategory	Category
<i>"It (CFAR programme) will be accepted because members of the community trust us as CHVs. Once we raise awareness about the programme, they will adhere, as it will be for their greatest benefit."</i> <i>"...There is such a great need in the population, the need to be assisted on time, to be transported in the right conditions. Such a program will be accepted by the population because, since this is about saving lives, I do not see why someone would refuse."</i>	<i>"...The CFAR programme will be accepted...there is such a great need in the population...it will be accepted because this is about saving lives"</i>	Community buy-in	Programme adoption	(8.1.) CFAR acceptability
<i>"...this program will be an activity linked to the other activities we already do; it will integrate well with the others."</i>	<i>"...activity linked to other (CHVs) activities..."</i>	Integration of CFARs in existing CHVs package	Facilitators	(8.2.) CFAR implementation
<i>It requires drugs and tools, because even with the training, if you don't have the necessary equipment, you won't do anything".</i>	<i>"...without the necessary equipment, you won't (act)"</i>	Lack of necessary tools	Barriers	
<i>"...health facilities will like this program because patients will start receiving first aid in the community already before arriving to them"</i>	<i>"...patients will start receiving first aid..."</i>	Initial scene care	CFARs role	(8.3.) CFAR expectations
<i>"...the community health volunteers themselves; they must learn a certain ethic or code of conduct in the training they will receive so that they do not disappoint the community." (G4)</i> <i>"...the people who will work in the field must be willing, well trained and available whenever they are called upon..." (G3)</i>	<i>"...they must learn in the training they will receive... and be well trained"</i>	CFARs first aid skills	Training	

<i>"[The programme] will allow us to deal with the issue of avoidable deaths. A benign first aid skill can save a life."</i> <i>"It is a good idea to help the population, and that will not be at a high cost."</i>	<i>"...(CFAR) will deal with avoidable deaths...care will not be at a high cost"</i>	Life-saving skills at lower cost	Benefits	(8.3.) CFAR expectations
<i>"...[develop] tools adapted to community health workers level, like simple algorithms they will follow".</i> <i>"...this program will be an activity linked to the other activities we already do; it will integrate well with the others."</i>	<i>"...programme adapted to CHVs and well-integrated with other activities"</i>	Adaptation and integration	Success factors	(8.4.) Recommendations
<i>"...it's a need that comes from the community, it's not something we're going to impose on the community. As soon as we (...) show its merits and implement it, the community will buy in because it is already experiencing the effects of lack of emergency care services."</i> <i>"The key link is the community; without the involvement of the community, this will not succeed. We must help the community become resilient; this programme will empower the community in dealing with its emergencies."</i>	<i>"...the community will buy-in...the need comes from the community already experiencing lack of emergency care services...it will empower the community."</i>	Community ownership of the CFAR programme	(H) Community buy-in	(8.5.) CFAR Sustainability
<i>"Although we are volunteers, there should be an incentive or stipend for those who go into the field. Without it, people can work the first month, but in the 2nd month, they will get demotivated if there is no incentive or stipend."</i>	<i>"...There should be an incentive or stipend..."</i>	Compensation	(I) Cost	

<i>It requires drugs and tools, because even with the training, if you don't have the necessary equipment, you won't do anything".</i>	<i>"...it requires drugs and tools...without the necessary equipment, you won't do anything"</i>	Availability of consumables	(J) Infrastructure/equipment	(8.5.) CFAR Sustainability
<i>"For this to be sustainable, the people who will work in the field must be willing, well trained and available... this programme will last</i>	<i>"...people who will work in the field must be... available"</i>	CHVs continued motivation and involvement	(K) Personnel	
<i>"...the coordinator must do regular follow-ups in the field for further improvements." (G2)</i>	<i>"...regular follow-ups for improvement"</i>	Monitoring and evaluation	(M) System	
<i>"Efficient communication must be done upstream for greater community awareness and buy-in. (G5)</i> <i>"I will insist on one thing: communication. When there is community engagement, things do work. With engagement, the community accepts, they feel at the centre of it, and they think there is a benefit to be gained, it always work." (G4)</i>	<i>"...Efficient communication for awareness and community engagement"</i>	Communication	(L) Policies	

2.1. Acceptability of a CFAR programme

CHVs were confident that the community would accept a CFAR programme, particularly because it would be implemented within the existing CHV intervention structure, which the community supports (Reference: Fig 8, 2.1.).

“It will be accepted because members of the community trust us as CHVs. Once we raise awareness about the programme, they will adhere, as it will be for their greatest benefit.” (G3)

Most clinicians were supportive and believed that a program that increased access to immediate care and transportation would improve health outcomes, and therefore be accepted in, and utilised by, the community. (Reference: Fig 8, 2.1.)

“I say yes right away. There is such a great need in the population, the need to be assisted on time, to be transported in the right conditions. Such a program will be accepted by the population because, since this is about saving lives, I do not see why someone would refuse.” (G2)

Health systems workers were generally supportive, but one did note that it would be essential to sensitise the community to the concept prior to implementation, or else “we’d be putting the cart before the horse.” A participant did note that, in order for acceptance to be widespread, there could not be costs associated with accessing care. (Reference: Fig 8, 2.1.).

“It’s a good thing, provided that the aim is to assist people in need and not to charge them and earn money.” (G4)

2.2. Expectations for a CFAR programme

It was emphasised that the CFARs needed to be well trained to be competent, safe and of good ethical conduct (Reference: Fig 8, 2.2 B):

“...the community health volunteers themselves; they must learn a certain ethic or code of conduct in the training they will receive so that they do not disappoint the community.” (G4)

“...the people who will work in the field must be willing, well trained and available whenever they are called upon...” (G3)

They also argued that continuity with hospitals was requisite to a successful programme, so CFARs could smoothly handover patients. (Reference: Fig 8, 2.2 C).

“If you make the commitment to train us, please also follow up on this, make all necessary items available in the health centres and hospitals, so that if we encounter cases, we can directly send them there.” (G3)

Cost was a key driver of the enthusiasm about the programme, with the expectation that there would be little cost associated with accessing CFAR care: (Reference: Fig 8, 2.2 C).

“It is a good idea to help the population, and that will not be at a high cost.”

There was optimism that the programme could yield substantial health benefits, with frontline clinicians stressing on the positive impact on prehospital outcomes:

“[The programme] will allow us to deal with the issue of avoidable deaths. A benign first aid skill can save a life.” (G2)

2.3. Implementation of a CFAR programme

Potential barriers were elucidated, including longitudinal investment, with concerns that programme organisers may give up on implementation halfway through. This has occurred before, with previous health programs, and deeply frustrated the community. (Reference: Fig 8, 2.3 E).

“(…) We gathered to give ideas, but until now, they have not returned.” (G3)

Lack of community awareness regarding CFAR and lack of trust, both in the community and the health system, were also noted as barriers to the program’s uptake. (Reference: Fig 8, 2.3 E). A CHV also highlighted the importance of proper identification in establishing trust with the community:

“We who work on the ground, we know each other, in the neighbourhood, but we must first identify ourselves” (G3)

Speaking from experience, a CHV noted that perception of CFARs lack of knowledge could reduce trust (Reference: Fig 8, 2.3 E).

“If there is a need and people resort to you, and you cannot give a solution, then people will not have confidence, they will have doubts, and it will not work.” (G3)

Finally, resources were perceived as a major barrier to the CFAR programme’s success. Concerns about cost of supplies that would be necessary to provide appropriate care and CFARs were raised (Reference: Fig 8, 2.3 E):

“It requires drugs and tools, because even with the training, if you don't have the necessary equipment, you won't do anything”.

Despite several challenges, participants mostly maintained confidence that they could be overcome and highlighted several facilitators such as the integration of the program within the existing CHV structure. Being used to tasks being added to their repertoire of skills as new health needs arise, CHVs felt certain that the programme could be easily incorporated. (Reference: Fig 8, 2.3 D).

“...this program will be an activity linked to the other activities we already do; it will integrate well with the others.” (G3)

Health systems cadres felt that the community first-hand experience of the consequences of the absence of effective EC would lead to greater interest and buy-in for a CFAR programme. Finally, the potential benefits to healthcare facilities, including receiving patients that are better stabilised, would facilitate the programme’s uptake (Reference: Fig 8, 2.3 E).

“...health facilities will like this program because patients will start receiving first aid in the community already before arriving to them.” (G3)

2.10. Recommendations for a CFAR programme

Participants insisted on the importance of having clear protocols for CHVs to follow (Reference: Fig 8, 2.4).

“...[develop] tools adapted to community health workers level, like simple algorithms they will follow”.

Regular evaluation and follow-up were recommended to regulate CFAR interventions and quantify impacts on the community. Community awareness of the CFAR program was advised, with suggestions for public advertisement through posters and community meetings. CHVs requested appropriate means of identification for CFARs to facilitate community recognition (Reference: Fig 8, 2.4):

“(...) that we also have distinctive signs, so that I am identified when I am in a place where no one knows me.”

2.11. Sustainability of a CFAR programme

Participants generally felt confident that the facilitators of the programme implementation would also impact its sustainability (Reference: Fig 8, 2.5):

“I think it will be sustainable because it's a need that comes from the community; it's not something we're going to impose on the community. As soon as we (...) show its merits and implement it, the community will buy in because it is already experiencing the effects of lack of emergency care services.”

Community buy-in and longitudinal engagement with citizens were thought to be of vital importance. Stories of failures of previous programmes due to lack of community acceptance were told (Reference: Fig 2, 2.5 F) :

“The key link is the community; without the involvement of the community, this will not succeed. We must help the community become resilient; this programme will empower the community in dealing with its emergencies.”

However, concerns surrounding the sustainability of CFAR were raised. As CHVs are unpaid, adding an additional task to their workload may lead to burnout or take up too much time that they need to instead use to earn money. Several CHVs suggested compensation for their efforts, to improve motivation and financial sustainability (Reference: Fig 8, 2.5 G):

“Although we are volunteers, there should be an incentive or stipend for those who go into the field. Without it, people can work the first month, but in the 2nd month, they will get demotivated if there is no incentive or stipend.” (G3)

“[A] small stipend for transport; it can vary between 5 and 10 \$ per month over the three years.” (G3)

Communication was also noted by participants as a key driver of long-term sustainability (Reference: Fig 8, 2.5 H):

“Efficient communication must be done upstream for greater community awareness and buy-in.(G5)

“I will insist on one thing: communication. When there is community engagement, things do work. With engagement, the community accepts, they feel at the centre of it, and they think there is a benefit to be gained, it always work.” (G4)

The importance of regulation of both training and programme administration was highlighted by G1 and G2 members, as well as quality assurance and ongoing programme assessment, to ensure that high quality care is being delivered (Reference: Fig 8, 2.5 I):

“The coordinator must do regular follow-ups in the field for further improvements (G2)

Finally, continuity with the formal healthcare system was thought to be critical to the programme’s success (Reference: Fig 8, 2.5 K):. Several participants called for integration of the CFAR with broader goals to improve facility-based care:

“We could train community health workers, but if care in hospitals emergency rooms is not improved, it will be difficult ... Therefore, the training of community health workers must go hand in hand with restructuring of the emergency care system.” (G2)

DISCUSSION

The insights gained through the FGDs shed light on the current status of EC in the DRC and the potential for a CFAR programme to improve its prehospital care OHEC delivery. Participants reported key challenges that align with findings of an evaluation conducted a decade ago²⁶, the gaps identified in a recent WHO-led EC system evaluation²⁴ and results of a household survey on the supply of EC in Kinshasa, DRC²⁵. Barriers encompassed multiple aspects of health services delivery, including governance, financing, resource allocation, transportation, infrastructure, training, and cost.

Many participants conveyed eroded trust in policymakers and a lack of strategic investment in healthcare system strengthening. Lack of good governance and corruption have been found to undermine the delivery of essential healthcare services and result in poor health outcomes in LMICs³⁷. Infrastructure and equipment were frequent barriers to community members successfully receiving EC services. The lack of a functioning ambulance service^{24 26} was noted as a major impediment to access to early EC, as most patients have to walk or use private means to reach health facilities²⁵. Similar to other African nations³⁸, conditions in emergency receiving areas of DRC hospitals were inadequate, with essential equipment and services often unavailable²⁶. Lack of EC-specific training for healthcare providers was reiterated as a major hurdle to overcome^{24 26}. In line with recommendations for the region³⁹, training at all levels would be essential to enhance the national system's capacity. CHVs could fill the gap in the meantime, receive first aid training and bridge the community and the out-of-hospital healthcare system¹⁴. The necessary funding to sustain the program over the long term and cost issues emerged as a significant barrier, with participants highlighting that the inability to pay upfront for EC services resulted in people not accessing care or reverting to self-medication⁴⁰. These challenges underscore the importance of addressing financial barriers to ensure that individuals can access timely and quality EC when needed. WHO recommends universal health coverage (UHC)⁴¹, and the country's political leadership has committed and started implementation.

CFAR as an intervention to strengthen out-of-hospital capacity in the DRC received positive reviews. Similar to other laypersons first responder programs^{19 21 22}, most participants showed support for the concept, with few reservations regarding its sustainability. Anticipated benefits included increased access, cost reduction, improved health outcomes, and prevention of unnecessary morbidity and mortality^{42 43}. CFAR could also be a pillar for the development of resuscitation systems in LMIC settings with a growing burden of cardiovascular diseases and

complications such as out-of-hospital cardiac arrests⁴⁴. Acceptability was high across all groups, with only few participants expressing some hesitation. While community members were receptive to the concept and said they would utilise it, end-user education remains a key component of successful programme implementation⁴⁵. The programme credibility was another ingredient for acceptability and to ensure uptake, the programme needs to be supported by those with subject matter expertise⁴⁶. The healthcare providers endorsement could lend a sense of trust to the programme. Additionally, evidence of increased access to care following programmes involving CHVs^{42 47} could increase credibility.

However, several potential barriers to implementation and sustainability were identified, including long-term investment and financing, as previous programmes were abandoned due to cost and lost interest frustrated the community. Additionally, should CFARs be unpaid as CHVs are, the longevity of the programme will not be guaranteed. Despite the CFAR intrinsic motivation to participate, without financial incentives, their good will might wane over time⁴⁸. As highlighted, infrastructure and equipment may hinder the programme's success; longitudinal funding for expendable items will be vital.

Recommendations for a robust CFAR programme's execution and implementation in DRC were aligned with documented essential factors of successful community-based health interventions⁴⁹, including ensuring strong community buy-in, thoughtful participants selection, clear protocols, linkage to formal care through a basic communication and transportation system, and a framework for interaction with the healthcare system for greater integration. A greater chance of success was envisioned with CFAR programme integration into the existing CHV structure, as community members already trusted this effort and built a great trust over the years. Ongoing evaluation⁵⁰, another essential link in the implementation framework, was also recommended for continuous fine-tuning and improvement.

LIMITATIONS

This study has a few limitations. Some participants may have not expressed their honest opinions but socially acceptable answers or refrained from expressing thoughts opposing the views of the majority, despite efforts made to ensure a conducive atmosphere for discussion. The FGD facilitators invited participants to freely express their views and assured them of anonymity. One of the facilitators is a Congolese healthcare provider who works within the system, and this could have biased his facilitation; this was countered by using a facilitation

guide. Discussions were conducted in Lingala and French, then translated into English and transcribed. Though these translations and transcriptions were checked, a few misrepresentations could have happened as a few words do not necessarily translate. Finally, the inclusion of high-ranking Emergency Care Directorate leaders in one of the groups could have biased discussion as they seemed to dominate proceedings and speak longer, despite facilitators' efforts to circumvent their influence.

CONCLUSION

This study highlights barriers to resilient and accessible EC systems in the DRC, including planning and governance issues, inadequate resources, precarious financing, under-equipped health facilities, cost, and transportation challenges. Among the areas of the country's EC system requiring improvement, the initial response to emergencies in the community is likely one of the most fundamental. An adapted community-based first responder programme was deemed a useful and acceptable intervention to help increase out-of-hospital emergency care capacity in Kinshasa. The identified key potential facilitators and barriers to its implementation and sustainability can usefully guide the country's decisionmakers in their efforts to improve health outcomes from emergency conditions.

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3. CHAPTER SUMMARY

This study aimed to identify the need for, and acceptability of, a community first responder programme to increase out-of-hospital capacity in Kinshasa, Democratic Republic of Congo. Focus group discussions using purposive sampling were conducted and involved groups of health system planners, emergency care providers, community health volunteers, and community members in both urban and peri-urban areas. Several areas of the emergency care system were identified for improvement, starting with the initial response to emergencies in the community. Perspectives about the acceptability and sustainability of a community first responder programme were largely positive, and numerous actionable recommendations were provided. A community first responder programme was deemed a useful and acceptable intervention to help increase out-of-hospital emergency care capacity in Kinshasa. Key potential facilitators and barriers to its implementation and sustainability were identified.

Considering the above, the research team undertook a final study to pilot an adapted CFAR in Kinshasa/DRC as a small-scale feasibility assessment. The aim was to describe and evaluate the process, resources, course content and teaching methodology, as well as capture the perceived knowledge and self-confidence gain from the perspectives of both organisers and participants to inform future rollouts and related research.

CHAPTER VI. IMPLEMENTATION AND EVALUATION OF A PILOT COMMUNITY FIRST AID RESPONDER TRAINING IN KINSHASA, DEMOCRATIC REPUBLIC OF CONGO

1. CHAPTER INTRODUCTION

OHEC in many LMICs is underdeveloped and needs strengthening for improved outcomes. Where formal prehospital care systems are under development, the integration of a LFR programme may help improve access for those in need. WHO recently developed the CFAR learning program in support of this system, providing that it may require adaptation to be contextually suitable and sustainably implemented at country level. This study assesses a pilot WHO CFAR course in Kinshasa, DRC, to inform future rollouts and related research.

We conducted a 3-day in-person pilot CFAR training with 42 purposively selected CHWs. Data collection involved quantitative and qualitative phases. The first consisted of structured pre- and post-training surveys, and a course evaluation by participants. The second consisted of two focus group discussions involving purposively selected community health workers in one group, and a convenience sample of course instructors and organisers in the other. Perceptions regarding course content, perceived knowledge acquisition and self-confidence gain were analysed using descriptive statistics for the quantitative data and content analysis for qualitative data.

Course participants were predominantly male (76.3 %) with a median age of 42 years and most (80.5 %) had no prior first aid training. Most were satisfied that the learning objectives were reached, the logistics were adequate, and that the content and teaching language were appropriately tailored to local context. The majority (94.7 %) found the 3-day duration insufficient. There was a significant self-confidence gain regarding first aid skills (average 17.9 % in pre- to 95.3 % in post-training, $p < 0.001$). Favourable opinions on the course structure, content, logistics and teaching methods were noted.

A CFAR course pilot was successfully conducted in Kinshasa. The course is appropriate for context and well received by participants. It can form a key component of developing prehospital care systems in resource-constrained settings.

Declaration by Author

I was the primary author of this paper with co-authors Eric Mafuta, Lee Wallis, Charmaine Cunningham and Peter Hodgkinson. The idea and design of the study was constructed collectively by all authors with KD and PH drafting the content of the work. I had completed the manuscript for publication under the supervision and revision of the co-authors.

Authors contribution include the conception or design of the work; the acquisition, analysis, or interpretation of data for the work; and drafting the work or revising it critically for important intellectual content.

In this chapter 4, the nature of contribution is as follows:

KD contributed 60%; EM contributed 10%; LW contributed 5%; CC contributed 10%; PH contributed 15%.

All authors approved the version to be published and agreed to be accountable for all aspects of the work.

Location of stored data:

All survey data and raw data downloaded is stored on the primary authors (KD) password protected cloud account.



Ken Ngoy Diango

Date:

13 February 2025

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Contribution	KD	EM	LW	CC	PH
Conception	✓		✓		✓
Development of Methodology	✓	✓	✓		✓
Data acquisition	✓	✓			
Statistical Analysis	✓				
Initial Drafting	✓			✓	✓
Manuscript Revision	✓	✓	✓	✓	✓
Manuscript Approval	✓	✓	✓	✓	✓
Overall Contribution	60	10	5	10	15

Statement

The Authors listed below agree that:

- Their paper(s) to be included in the thesis “Adapting a community first aid responder programme to increase out-of-hospital capacity in Kinshasa, Democratic Republic of Congo”
- Remaining authors Eric Mafuta, Lee Wallis, Charmaine Cunningham and Peter Hodkinson are not students of UCT or any another institution and will not be using any of this report to contribute to a thesis.

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In accordance with the UCT Doctoral Degrees Board guideline titled, “GUIDELINES FOR THE INCLUSION OF PUBLICATIONS IN A DOCTORAL THESIS”, authors signed approval.

A handwritten signature in black ink, appearing to be 'K. Diango', enclosed within a thin black rectangular border.

Ken Diango

A handwritten signature in black ink, appearing to be 'P. Hodkinson', with a long horizontal flourish underneath.

Peter Hodkinson

(On behalf of all co-authors as permitted by the DDB)

2. COPY OF PUBLISHED ARTICLE: IMPLEMENTATION AND EVALUATION OF A PILOT WHO COMMUNITY FIRST AID RESPONDER TRAINING IN KINSHASA, DEMOCRATIC REPUBLIC OF CONGO

INTRODUCTION

Lack of organised emergency care systems (ECS) greatly contributes to substantial preventable death and disability in low- and middle-income countries (LMIC)¹⁻³. As a key component of an ECS, well organised prehospital care systems save lives^{4 5}. Where formal prehospital care systems are under development, integration of a layperson first responder programme may help improve access for those in need⁶. The World Health Organization (WHO) recently developed the Community First Aid Responder (CFAR) learning program in support of this system development. The CFAR course emphasises community participation and empowers people to initiate emergency care in the community; its strategy is to train targeted community members and integrate them into a dispatch and response system, reducing time to arrival of a trained responder at the scene of an emergency^{7 8}. Similar short courses can meaningfully impact emergency care and training layperson responders has proven effective in LMICs⁹⁻¹¹. As is commonly observed in LMICs, the Democratic Republic of Congo (DRC) suffers from a significant burden of ill health across all age groups and disease categories, and health indicators point towards an urgent need for health system strengthening^{12 13}. The country's recent ECS strategic planning identified key system deficiencies¹⁴ and a household survey showed substantial unmet needs in the supply of emergency care to communities in Kinshasa, the capital city¹⁵. One solution to help address this need lies within prehospital care systems, and the CFAR programme is ideally suited to support system development in the DRC. Several studies on layperson first aid yielded well documented educational outcomes. The WHO-endorsed CFAR course builds on these courses mostly through the emphasis on integration to the health system and a context adaptive curriculum (language, burden of disease...). For the course to be contextually appropriate and successfully implemented, an adaptation to the specific local context may be required. This is usually best accomplished through piloting¹⁶ and its evaluation, which involves a systematic collection of descriptive and judgemental information necessary to make decisions related to selection, adoption, and modification of various instructional activities¹⁷.

Given the need in the DRC, we piloted the CFAR course in Kinshasa as a small-scale feasibility assessment aimed to describe and evaluate the process, resources, course content and teaching

methodology. It also captures the perceived knowledge and self-confidence gain from the perspectives of both organisers and participants to inform future rollouts and related research.

METHODS

Study design

Sequential mixed methods.

Setting

This study was conducted in the DRC's capital city Kinshasa, home to approximately 12 million people¹⁸. The DRC is located in central Africa, with an estimated population of 100 million¹⁹. The healthcare system is under-resourced, underdeveloped and most health indicators are concerning¹³. There is no formal prehospital system and a lack of trained emergency care providers²⁰. The training was conducted in the suburb of Mbankana located 130km from central Kinshasa, in the health zone of Maluku 2. This suburb was purposively selected because of its peri-urban nature, its high burden of disease potentially amenable to emergency care (including high trauma prevalence), clearly identified health facilities receiving most emergencies and the presence of a functioning Community Health Workers (CHW) network.

Study population and sampling

Participants were CHWs, a group of laypersons with no medical background registered with the health zone, not on a payroll, and already involved in various health promotion programs such as family planning, malnutrition, childhood immunisation, malaria prevention, etc. Their French designation of “relais communautaires” embodies the crucial role they play, bridging the health system and the community. The 42 participants (background presented in Table 1) were purposively selected among the 375 active CHWs by the health zone leadership to ensure representation of all health areas within the zone and a mix of gender, age, and length of service.

Training structure and content

The 3-day in-person training (24 classroom hours) was conducted both in a mixture of French and Lingala (vernacular) and locally led by the Emergency Medicine Association of the DRC. The course curriculum was developed from the South African Emergency First aid responder (EFAR)²¹ and Zambian CFAR⁹ courses by a team of WHO experts, and initial versions underwent subsequent iterative reviews. The evidence from various layperson first aid courses helped refine the teaching strategy and determine clear learning objectives. The course was

adapted specifically for a greater emphasis on practical skills, amongst other adaptations shown in Table 2. The course instructors (all Congolese) were two certified CFAR trainers assisted by four certified WHO Basic Emergency Care (BEC) instructors from the same professional society (giving a participant: instructor ratio of 7:1). A course coordinator oversaw the organisation assisted by two local health zone staff. The course had three main sections: interactive lectures (7 modules); case studies (after each lecture); and 16 practical skills stations. Anticipating a mismatch between the original course curriculum and the local context, the study team methodically reviewed and consensually adopted initial modifications mainly guided by the refined Zambia curriculum contextualised by mapping and blueprinting⁹, the South African EFAR curriculum and disease burden reports available at the health zone. The list of lecture modules, the practical skills stations, the equipment list, and the course schedule are presented as Supplementary materials 1 (Appendices 1-4).

Data collection and analysis

1. Quantitative phase

- **Data collection:** Data were collected from pre-, and post-test and a course participant evaluation, all derived from the WHO BEC and Zambia CFAR course after iterative reviews and consensus among co-authors. The data provide insight on participants demographics, trends in perceived knowledge and self-confidence gain, as well as perceptions on the course. Responses were captured on mobile devices on to the Kobo Collect application²², downloaded into an Excel spreadsheet and securely stored on a password-protected computer. Survey responses were checked by the research assistant (AM) for adequacy and quality assurance.
- **Data analysis:** Descriptive statistics were used to interpret the data.

2. Qualitative phase

- **Data collection:** Two focus group discussions (FGD) were conducted in-person at the end of the training. The first involved seven purposively selected participants taking into account the gender mix and health areas representation. The second involved a convenience sample of four course instructors and three organisers. Two separate facilitation guides

were developed and used to structure the discussions. The co-authors developed two separate facilitation guides by iterative reviews process and consensus to structure the discussions, expand on aspects not covered in surveys and stimulate additional comments on key others. FGD were facilitated by first author (KD - male) and the research assistant (AM - female) respectively, both with experience in conducting FGD. Facilitators introduced themselves and a relationship was established prior to discussion commencement. Discussions were conducted in French and lasted approximately 50 minutes. They were audio recorded, transcribed, translated into English, and checked by the first author who is fluent in both languages.

- **Data analysis:** Content analysis was conducted in NVivo 14 software (© QSR International, Melbourne, Australia)²³ by co-author EM, who was not involved in any aspect of the data collection. De-identified transcripts were imported to NVivo version and analysed. The coding process was flexible and iterative, allowing for the refinement and development of codes which were checked by the KD and EM during analysis process until consensus was reached. Relationships between the initial codes were established and codes were then grouped into broader themes and subthemes, facilitating the identification of patterns within the data. KD then made comparisons with original transcripts to determine coherence, and EM verified the process.

Trustworthiness

In keeping with Guba's constructs²⁴, we ensured qualitative rigour. Credibility was ensured by using well-established methods to collect data from consenting participants, debriefing sessions after FGD and the checking of translations and transcriptions²⁴. Dependability was ensured through the detailed description of the methods that were employed for data collection and analysis, and through the reflective commentary related to prior assumptions and regular debriefings²⁴. Confirmability was bolstered by regular debriefings and reflective commentary²⁴. The use of the COREQ reporting checklist (COnsolidated criteria for REporting Qualitative research) ensured transparency and further supported the dependability²⁴. Though transferability of our results cannot be guaranteed, the detailed description of the setting and the sampled population will assist readers in making a judgement related to the generalisability of the findings.

Ethics

Approval was obtained from the School of Public Health of the University of Kinshasa (REF ESP/CE/160/2022) and the University of Cape Town (HREC 056/2023). Participants were informed of the study purpose, associated risks, and benefits, and how confidentiality will be maintained. They were also told they were free to withdraw at any stage. Written informed consent was received from all participants.

RESULTS

1. Quantitative phase:

Forty-two participants completed the surveys and the course evaluation, of which two responses were irretrievably lost during uploading and two others excluded for incompleteness (only 20% of questions answered), meaning a total of 38 responses. Participants surveyed were predominantly male (sex ratio 3:1), with a median age of 42-years and mostly of a secondary education level or below (78.9%) (Table 14). Regardless of their length of service, close to a third of those surveyed had never attended a training of any kind and only one out of ten received first aid training. Participants were significantly more proficient in the local language (Lingala: 94.7%) compared to the course language (French: 57.9%) ($p < 0.001$), hence the predominant use of the former during the course.

There was a significant shift between participants' pre- and post-training self-confidence (average 17.9% in pre- to 95.3% in post-training, $p < 0.001$) (Table 16), including the readiness to perform first aid when required (31.6% to 97.4%, $p < 0.001$); the self-reported awareness of scene and personal safety (34.2% to 84.2%, $p < 0.001$) and the ABCDE approach to life support (7.9% to 97.4%, $p < 0.001$). Surveyed participants rated the key aspects of the course organisation highly (Table 17). They were overwhelmingly (99.6%) satisfied with the overall quality of the course components and materials and strongly commended the course logistics. The instructors' effectiveness was reflected in 97.4% stating they would recommend the course to others, despite 94.7% expressing that the course duration was insufficient.

2. Qualitative phase

A summary of the qualitative findings is presented in below tables. Instructors were satisfied that the course learning objectives were relevant, clear, and achieved. CHWs particularly

highlighted the value of community-based emergency care as an additional component in their package, considering the great need identified within communities.

...The objectives have indeed been achieved. Today, they (participants) are able to identify an emergency in the community, assess it according to the ABCDE approach by looking, listening, and feeling, then appropriately apply lifesaving skills before facilitating the transfer for further adequate care... We can say that the objectives were achieved in 90–95% of what was planned (Instructor).

Regarding the course structure and content, participants were satisfied with the main components of the course. The emphasis on practical aspects and the hands-on approach emerged as a key determinant in the course's perceived quality and participants' satisfaction.

...The training was of high quality (CHW)

Challenges requiring adaptations and improvements were mainly related to the course duration, the language, and the lack of participant manual. The 3-day duration was deemed insufficient, more so by participants than instructors, which raises the question if this is real or motivated by external factors such as enthusiasm or per diem for course attendance.

...As this training is crucial, 3 days are insufficient because there are several concepts and skills to cover during the training. If it could be extended to 5 or 6 days (CHW)

Instructors anticipated the need to refrain from only using French during the course, cognisant of the setting and the usual CHWs education profile. The predominant use of Lingala was welcomed, though all written materials in French were still in some way a limiting factor.

...Had the trainers taught in French only, I would have recommended that to be changed (CHW)

Both groups recommended the dissemination of the training with no or minimal modifications as dictated by ongoing evaluations and research to fine-tune it.

...We hope the training (i.e., as we received it) is rolled out. What will need to be added (i.e., further adaptations) will depend on findings of future studies (CHW)

Table 15. Participant background

	n	%
Gender		
Male	29	76.3
Female	9	23.7
Age (years)		
18-27	6	15.8
28-37	10	26.3
38-47	12	31.6
48-57	7	18.4
58-67	3	7.9
> 67	0	0
Level of education		
None	0	0
Primary	4	10.5
Secondary	26	68.4
Tertiary	8	21.1
Time as health volunteer (year)		
< 1	7	18.4
1-5	13	34.2
6-10	9	23.7
>10	9	23.7
Previous trainings attended as community health volunteer		
None	11	28.9
1-2	5	13.2
3-5	5	13.2
>5	17	44.7
Previous First Aid training		
Yes	4	10.5
No	34	89.5
Has an occupation other than health volunteer		
Yes	35	92.1
No	3	7.9
Knowledge of French		
None	1	2.6
Average	15	39.5
Good	18	47.4
Excellent	4	10.5
Knowledge of Lingala		
None	0	0
Average	2	5.3
Good	26	68.4
Excellent	10	26.3
Owns a mobile phone		
Yes	35	92.1
No	3	7.9

Table 16. Summary of DRC pilot adaptations

Course component	WHO standard CFAR course (Zambia CFAR) * (South Africa EFAR) **	DRC CFAR pilot
Target audience	<u>WHO</u> : Laypersons explicitly linked into prehospital response system, e.g., CHWs, community brigades, firefighters, civil defence – No general bystanders <u>Zambia</u> : laypersons <u>SA</u> : General laypersons	CHWs registered/integrated with the health system at district level
Duration	<u>WHO</u> : 3 days <u>Zambia</u> : 3 days <u>SA</u> : 1 day	3 days
Curriculum	<u>WHO</u> : 7 lectures (1hr each) Case discussions (20min) 15 skills stations (No CPR) <u>Zambia</u> : 54 topics and 26 skills. No CPR <u>SA</u> : 4 modules, trauma +++. Video recorded lectures. + CPR	7 lectures (30min each) 6 core cases discussions (30min) 16 skills stations (No CPR) (Added: Snakebite, burns, febrile convulsions)
Language	<u>WHO</u> : English, French <u>Zambia</u> : English <u>SA</u> : English + Afrikaans	Lingala (75%) + French (25%)
Instructors	<u>WHO</u> : Not defined <u>Zambia</u> : Drs (foreigners + local) <u>SA</u> : Drs (foreigners + local) + local EFAR champions	Local doctors (BEC certified)
Costs	Variable	60\$ per trainee per day (per diem, meals and FA kits)
Knowledge and competency assessment	<u>WHO</u> : MCQs in post-test. 75% pass mark <u>Zambia</u> : Post-test. 75% pass mark <u>SA</u> : Post-test. 75% pass mark. Certificate of competency	No objective knowledge and competency assessment. Post-test for confidence and perceived knowledge gain (Likert scale) Certificate of participation
* Zambia CFAR: Pigoga JL, Cunningham C, Kafwamfwa M, et al. Adapting the emergency first aid responder course for Zambia through curriculum mapping and blueprinting. BMJ Open 2017;7(12):e018389. Doi: 10.1136/bmjopen-2017-018389 [published Online First: 2017/12/13] ** South Africa EFAR: Sun J., Wallis L. The emergency first aid responder system model: Using community members to assist life-threatening emergencies in violent, developing areas of need. Emergency medicine journal. 2019. Vol 29, Page 673-78. DOI 10.1136/emmermed-2011-200271/		

Table 17. Pre- and Post-test results (Part 1)

	Pre-test			Post-test		
Agreement with the following statements.						
	Agree n (%)	Neutral	Disagree	Agree n (%)	Neutral	Disagree
I feel comfortable assisting any member of the community requiring first aid	9(23.7)	0	29	37(97.4)	0	1
I feel nervous seeing community members in an emergency	22(57.9)	2	14	4(10.5)	2	32
I feel that many around me have the knowledge and skills necessary to take care of emergency patients	6(15.8)	0	32	6(15.8)	2	28
I feel like I don't have the skills to provide care in most emergencies	28(73.7)	2	8	3(7.9)	3	30
I feel ready to help members of my community in an emergency	12(31.6)	2	24	37(97.4)	0	1
I feel confident in front of very sick community members.	8(21.0)	1	29	37(97.4)	0	1
I feel comfortable using standard first aid protocols in an emergency	10(26.3)	5	23	38(100)	0	0
I believe I understand the ABCDE approach in first aid	3(7.9)	5	30	37(97.4)	1	0
I feel I have a methodical approach that allows me to be prepared to perform first aid in emergencies	6(15.8)	2	30	38(100)	0	0
I doubt my first aid knowledge and skills.	26(68.4)	0	12	4(10.5)	0	34
I feel comfortable ensuring the safety of a scene where there is an accident or a patient in an emergency	13(34.2)	3	22	32(84.2)	1	5
I believe that first aid training for community members is important.	35(92.1)	1	2	33(86.8)	2	3
I am confident in assisting transportation of a sick or injured person to a health facility for definitive care after first aid	10(26.3)	0	28	29(76.3)	4	5
I feel I have a basic understanding of how community-based emergency care is integrated with the overall health system	14(36.8)	2	22	28(73.7)	3	7

Table 18. Pre- and Post-test results (Part 2)

Self-confidence in the following circumstances or skills						
(FA = First Aid)	Confident n (%)	Neutral	Not confident	Confident n (%)	Neutral	Not confid.
FA principles for the adult	9(23.7)	2	27	37(97.4)	0	1
FA principles for a child	6(15.8)	4	28	36(94.7)	0	2
FA for the adult with trauma	8(21.0)	0	30	37(97.4)	0	1
FA for the child with trauma	7(18.4)	2	29	37(97.4)	1	1
FA for the patient in shock	4(10.5)	1	33	37(97.4)	1	1
FA of the unconscious person	5(13.1)	2	31	35(92.1)	2	2
FA for a person choking	3(7.9)	3	32	37(97.4)	1	0
Use of the basic elements of first aid kit	6(15.8)	0	32	36(94.7)	1	1
FA maneuvers to open the airway	5(13.1)	4	29	36(94.7)	2	0
FA skills of case of respiratory distress	5(13.1)	3	30	37(97.4)	1	0
FA skills to stop an external bleeding	9(23.7)	1	28	33(86.8)	4	1
FA skills to immobilise a limb fracture	10(26.3)	1	27	37(97.4)	0	1
FA skills to immobilise an injured person	7(18.4)	1	30	38(100)	0	0
Put a person in recovery position.	4(10.5)	2	32	36(94.7)	1	1
Move/transport a sick/injured person	9(23.7)	4	25	36(94.7)	1	1
Seek further help after providing FA	11(28.9)	2	25	36(94.7)	2	0
Ensure the safety of an accident scene	7(18.4)	2	29	38(100)	0	0
Teach other community members FA skill	8(21.0)	2	28	33(86.8)	3	2
Average confidence	17.9%			95.3%		

Table 19. Course evaluation by participants (n=38)

	Unfavourable opinions			Favourable opinions	
Clarity and language of the below course components/materials					
	Very unclear	Unclear	Neutral	Clear	Very clear
Slides	0	1	0	25	12
Lectures	0	3	0	25	10
Quick cards	0	1	0	27	10
Case scenarios	0	1	0	27	10
Skills stations	0	2	0	16	20
Case report form	0	1	0	16	21
Average	9/228 (3.95%)			219/228 (96.05%)	
Overall quality of the below course components/materials					
	Unacceptable	Poor	Neutral	Good	Excellent
Lectures	0	1	0	12	25
Quick cards	0	0	0	23	15
Case scenarios	0	0	0	21	17
Skills stations	0	0	0	20	18
Revisions/recaps	0	0	0	19	19
Case report form	0	0	0	25	13
Average	1/228 (0.40%)			227/228 (99.6%)	
Level of modules content					
	Very difficult	Difficult	Appropriate	Simple	Very simple
	1	2	20	11	4
Relevance of modules content to the local context					
	Very inappropriate	Inappropriate	Neutral	Appropriate	Very appropriate
	0	0	0	30	8
Preference for receiving a course workbook prior the training?					
		Yes	No		
		35	3		
Duration of 3-days of the course is appropriate?					
		Yes	No		
		2	36		
	If No	Prefers shorter	½ day	1 day	2day
		0	--	--	--
		Prefers longer	4 days	5 days	6 days or more
		36	3	10	23
Agree or disagree on the below points:					
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Course venue	2	0	10	17	9
Catering	0	0	1	13	24
Expectations met	0	0	0	22	16
Instructors' effectiveness	0	0	1	4	33
Productive use of my time	0	0	0	20	18
Course equipped me with FA skills	0	0	0	19	19
Would recommend course to others	0	0	1	19	18
Average	2/266 (0.7%)		13/266(4.9%)	251/266 (94.4%)	

Table 20. Focus Group Discussions summary

Category	Code
Objectives of the course	Objectives were clear and relevant.
	Objectives were achieved.
Resources including logistics	The venue was suitable.
	Catering was adequate
	Training equipment was mostly home-made and adapted.
Course content and structure	Case discussions were useful.
	Skills stations were valued.
Course instructors and participants	Participants were enthusiastic and committed. Instructors were had good teaching skills
Main challenges and suggested improvements	The 3-day duration was insufficient.
	Mixing both French and Lingala during the course was commendable
	Participants coming from far need accommodation during the course.
	Ideal to distribute course manuals to participants
Course dissemination and sustainability	Disseminate the training with no or minimal modification
	Monitoring and further studies

DISCUSSION

This study is a small-scale feasibility assessment which describes and evaluates key aspects of the implementation of a pilot WHO CFAR training to inform future rollouts. The study findings provide key indications on the potential outcomes the course and guide necessary adaptations^{10 25 26}.

Evidence shows that emergency care short courses (including layperson first aid courses)^{10 11 27 28} increase participants' confidence, knowledge, and skills²⁹⁻³². The WHO CFAR course curriculum was developed with clear learning objectives, a context adaptive content, a rational delivery mode and a well-defined target audience: all key factors for effective learning³³. Participants, instructors, and organisers agreed that the DRC pilot satisfied these core criteria. The curriculum adaptations for this type of course all reflect local prevalence of emergencies and health system resources, such as interpersonal trauma and CPR in South Africa, and addition of snakebite, burns and febrile convulsions in DRC.

The choice of CHWs as target audience was judicious as they are trusted lay members of their communities who serve as a bridge to the health system which they understand and are part of. This ensured integration with the health system, a fundamental characteristic differentiating CFAR from most existing first aid trainings and representing a core pillar of a successful first responder system³⁴. Police officers, taxi drivers, teachers, and other laypersons have been the recipients of emergency responder trainings in other settings^{10 11 30-32}. CHWs roles and activities are tailored to meet the specific needs of the communities they serve³⁵, including the mitigation

of deficiencies in prehospital emergency care¹¹. In the context of underdeveloped healthcare system and healthcare worker shortage, it is expected that their role will be further defined as they develop new competencies (such as first aid skills) that relate to CHW–health system integration.

Other key areas of adaptation of our pilot are related to the language proficiency and literacy level of participants. The language proficiency of a class correlates with the quality of learning³⁷; learning difficulties have been demonstrated in low literacy and illiterate adults. Considering the latest data on adult literacy rate in sub-Saharan Africa (67%)³⁹, it is crucial for community-based courses to be kept as basic as possible in this setting, covering a few fundamental concepts and skills well rather than attempting to teach a larger number of topics¹⁰. Lingala (vernacular) was preferred to French during discussions and skills stations. Participants appreciated the emphasis on practical skills rather than lectures, which correlates with the evidence that workshop-based skills teaching, as well as case study-based discussions are more effective than lecture-based classes in medical education^{40 41}. Cost-effectiveness (not analysed in the DRC pilot) is undeniably a crucial factor of an intervention's sustainability, particularly in resource-constrained settings⁴². The low-tech low-cost approach of a lay responder course enhances self-sustainability and rollout in most environments¹⁰. Although many participants wanted a longer course duration, there did seem to be overall satisfaction and a positive perception of skills and knowledge acquisition; this may therefore warrant further scrutiny.

Our data showed a significant self-confidence gain regarding first aid skills among participants, which most likely correlated with self-reported knowledge increase. However, this is not necessarily associated with objective knowledge acquisition. Similar gains have been shown for the WHO BEC course^{29 30} and other short courses^{10 21 27}. Knowledge essentially stems from learning and training and is anchored by practice⁴⁴. Ongoing training and objective assessments are needed to retain knowledge⁴⁵. A deviation from the original course was the omission of formal summative competency assessment in the DRC pilot, rooted in the study team's perception of the inadequacy of multiple-choice questions in French to assess knowledge and competency in this setting. Validated skills-based competency assessments tailored to the layperson literacy would be ideal. Although positive perceptions on a course and immediate educational impact as we demonstrated may not necessarily equate to long-term effectiveness of such a layperson emergency care training, a 10-year review of the South African emergency first aid responder course³⁴ suggests that a comprehensively rolled out adapted CFAR system could potentially increase out-of-hospital capacity and affect outcomes in prehospital care.

LIMITATIONS

This study has several limitations. Our self-reported data infer bias. Non-probability sampling of course participants may have incurred selection bias. The relatively small sample size for the quantitative phase limits statistical inferences from the results. However, the significant trends noted in the participant surveys were supported by qualitative data and would most likely be replicable with a bigger sample. The lead instructor facilitation of one of the two FGD may have biased dynamics; but it is unlikely that this played a major role in a group who informally knew one another by that stage, with a facilitator who endeavoured to remain neutral. Another possible shortcoming relates to generalisability of our findings; participants were from a single health zone, and the context variability of a mega city like Kinshasa (35 health zones) is such that the findings may not necessarily be valid for all its urban or peri-urban suburbs, let alone the DRC as a country. However, we have no reason to believe the results would be different elsewhere.

CONCLUSION

This mixed method analysis of the small-scale implementation and feasibility assessment of the WHO CFAR training in DRC provides informative data on potential contextualisation needs and improvements for a greater educational impact. Participants, instructors, and organisers were mostly satisfied with the key aspects of the adapted course. This satisfaction was correlated with self-confidence gain following training. The predominantly positive feedback is a robust indication that trained community health workers will most likely use the skills learned. Further research is needed to fine-tune some aspects of the training and better understand other facets such as the objective assessment of skill gain, objective knowledge acquisition and retention, cost-effectiveness, in situ behavioural change among trainees and ultimately the likely impact on health emergencies outcomes.

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End of verbatim published paper

3. CHAPTER SUMMARY

This study assessed a pilot WHO CFAR course in Kinshasa, DRC, to inform adaptation needs, future rollouts and related research. We conducted a 3-day in-person pilot CFAR training with 42 purposively selected CHWs. Data collection involved quantitative and qualitative phases. Perceptions regarding course content, perceived knowledge acquisition and self-confidence gain were analysed using descriptive statistics for the quantitative data and content analysis for qualitative data.

Most participants were satisfied that the learning objectives were reached, the logistics were adequate, and that the content and teaching language were appropriately tailored to local context. A significant self-confidence gain regarding first aid skills was noted, as well as favourable opinions on the course structure, content, logistics and teaching methods.

An adapted CFAR course pilot was successfully conducted in Kinshasa, well received by participants and found to be appropriate for context. It can form a key component of developing OHEC systems in resource-constrained settings.

CHAPTER VII. DISCUSSION: IMPLICATIONS OF RESEARCH

1. INTRODUCTION

The overarching aim of this research was to assess how the development of a country-specific CFAR programme could serve as an initial step to increase OHEC capacity in Kinshasa, DRC, a LMIC with an underdeveloped and under resourced healthcare system in which communities' EC needs are largely unmet. In a broader perspective, it explored how a CBHI could be adapted to a specific resource-constrained country's health system and represent a solution for the inadequate offer of a health service, a common challenge across several LMICs.

Considering the key WHA resolution which identified ECO systems as a critical area for health system strengthening for better outcomes of acute medical conditions¹¹, a CFAR system - recommended by WHO as a foundational step to enhance the OHEC and develop functional ECS⁶ - was implemented in DRC. Seeing Kinshasa's specific context^{58 59 60}, particularly the non-resilience of its ECO system, one could understand the potential role a CFAR programme could likely play in bridging critical gaps in the OHEC capacity.

This research findings collectively inform the design and the implementation of a CFAR programme specifically tailored to Kinshasa's unique needs, and in doing so, enrich the body of EC literature on CBHI and CFAR programmes in LMICs. Additionally, it provides health system planners with much needed guidance for successful and sustainable rollouts in similar settings.

2. CONTRIBUTIONS TO EMERGENCY CARE STRENGTHENING

1) Novelty of research

This research makes a transversal contribution to the field of Public Health, Community Health, Project Implementation science and Out-of-Hospital Emergency Care by demonstrating a context-specific approach to adapting a CFAR programme for a resource-constrained healthcare setting. The literature review underscores several key points on the benefits of CBHI in response to health systems gaps in LMICs¹³⁰⁻¹³⁴, and particularly on the value of LFR programme for ECO system strengthening in settings with documented disproportionately high

mortality from time-sensitive conditions. The evidence supports the positive impact of LFR programmes in improving OHEC response in LRS^{161 177 178 180}, though implementation challenges pertaining to context-specific adaptation, financing, incentivisation, integration and sustainability have currently not been studied and documented well enough.

This research fills the gap in the evidence regarding other dimensions of CFAR systems in LMICs which have so far mostly focused on implementation needs and outputs without delving into specific steps upstream, namely the in-depth mapping of the existing ECS and particularities of communities where the proposed intervention is planned to be implemented. Additionally, documenting usefulness and acceptability of LFR programme in the LRS setting from the perspective of beneficiaries within communities, healthcare providers and health system planners, has strengthened the value of this intervention beyond previously documented aspects^{161 177 178}. It may be intuitively expected that a CFAR system would be accepted in LRS with OHEC challenges, without much evidence on the nature, extent, facilitators and barriers to the acceptability; this research firms up this aspect by ascertaining the usefulness and endorsement of a tailored CFAR model from the perspectives of different stakeholders. Finally, the emphasis placed throughout this research on adaptation of this healthcare intervention for optimum impact, and the specific approach followed to achieve the required contextualization in DRC, adds on the available evidence on LFR such as Sun et al^{161 180 182} and Delaney et al^{89 177 178 190} studies.

1) Contextual system- and community-level evaluations

The adaptation framework used to match the intervention with the country's unique features had amongst the prerequisites the requirement for an in-depth knowledge of the setting as described in the introduction chapter. Several systematic reviews on adaptation of CBHI have emphasised the value of a well thought out adaptation to enhance successful implementation^{137 138 139}. Mapping the ECS of the DRC using the WHO ECSA tool (Chapter 3) and conducting a large household survey to evaluate the needs and supply of EC in Kinshasa (Chapter 4) enable the establishment of an accurate matrix on the state of EC in Kinshasa both at system and health consumer levels. Furthermore, insights from the initial part of focus group discussions on CFAR usefulness and acceptability (Chapter 6) also picture the state of EC in the country as perceived by community members, health system planners and frontline EC

providers. This in-depth characterisation of the DRC EC context marks a notable addition to previous LFR studies in South Africa, Madagascar and Sierra Leone^{161 163 177}.

The implementation of CFAR in DRC was motivated and explicitly supported as an action priority of the ECSA process (Action Priority #7: “Introduce Community First Aid Response systems into existing networks of community health agents in each province”). The WHO Health Systems Framework the ECSA process is aligned with was used as a foundational theory to help describe the landscape of the DRC healthcare system^{71 137}, hence firmly establishing the gap in OHEC delivery.

Moreover, the needs for a low-cost CFAR system emerged as a plausible solution in the context of the household survey keys findings, including a high burden of acute conditions contrasting with poor access to care, a restrictive fee-for-service healthcare system and an almost non-existent utilisation of ambulances services. Unlike South Africa¹⁶¹ and Sierra Leone¹⁷⁷ where no wide-ranging system-level evaluation were conducted prior to LFR system implementation, and where needs assessment was mostly limited to community circles, the situational context of CFAR implementation in DRC was comprehensive and robust, combining methodical system- and users-level evaluations.

2) Multi stakeholders support of CFAR usefulness and acceptability

Another key characteristic of the research was the endorsement of the usefulness and acceptability of a CFAR programme in Kinshasa from the perspectives of many stakeholders. The ECSA action priority #7 formally recommending the implementation CFAR in each DRC province and the perceived need of immediately available community-based EC from the 1217 households surveyed in Kinshasa, didn’t suffice to motivate and predict the successful rollout in Kinshasa.

Another significant merit of this research is to establish beyond the mere intuitive reasoning and from the view of different types of cadres, that CFAR is likely a useful and acceptable CBHI to enhance OHEC in LRS. The quasi-unanimous agreement of health policymakers, frontline EC providers and community members (urban and rural areas) is a robust endorsement that underpins the suitability of CFAR system in LMICs as indicated in South Africa, Uganda, Madagascar, Zambia and Sierra Leone^{161 162 163 164 177 178}. Most individuals in

the three groups showed support for the CFAR concept by anticipating benefits such as improved access, cost reduction, prevention of unnecessary morbidity and mortality and overall better outcomes. The high acceptability across all groups is a key indicator of the multidimensional advantages CFAR could bring about in underserved communities.

The objective of obtaining a multifaceted determination of the worth of CFAR by key stakeholders was justified using the CBPR framework which stresses collaboration and partnership between all health systems stakeholders and communities⁷². The involvement of these groups in early stages of CFAR implementation in Kinshasa likely played a positive role in fostering the necessary trust and teamwork for a successful and sustainable health intervention. Additionally, the CBPR principles allowed an early community engagement, empowerment, ownership and buy-in which continued during the pilot phase. This is also the case for the South Africa EFAR and Uganda CFAR implementations^{161 178}.

3) Programme adaptation process and outcomes

A significant aspect of this research lies in the details it provides on the intent, the process, the specifics and outcomes of the contextual adaptation of CFAR in DRC. Previous studies in South Africa¹⁶¹, Sierra Leone¹⁷⁷ or Uganda¹⁷⁸ did not extensively describe this key aspect of implementation and programme success facilitator. The theoretical foundation that accounts for this adaptation is guided by principles including contextualization, stakeholder engagement, and iterative assessment and refinement⁷⁶.

Already proven effective in some LMICs, CFAR was purposely modified in some respects to fit Kinshasa's socio-economic, cultural and infrastructural features, for a greater impact and judicious human and financial resources utilisation^{138 139}. The modifications from the original WHO CFAR course were related to several aspects listed in Table 15 in Study 4, presented below again for easy reference. Of these modifications, two are worth a special mention as they highlight the uniqueness of the DRC pilot: the selection of CHW as target audience and the curriculum modification to match the local burden of disease and needs.

Most CFAR models indistinctly use members of the public as trainees and potential first aid responders (South Africa and Sierra Leone)^{161 177} while some are selective (taxi drivers in Madagascar and motorcyclists in Uganda)¹⁷⁸. However, the DRC model exclusively targeted

CHWs to capitalise on their privileged position, bridging the health system and the community. This strategic choice gets the most out of the several documented benefits of CHW programmes in LMICs¹⁴⁹⁻¹⁵⁴ and ensures a greater integration of the CFAR system with existing health district structure which encompasses hundreds of CHWs (375 for Maluku 2 where the CFAR pilot was conducted). Beyond the integration to the healthcare system, the DRC model promotes community embeddedness and recognises the valuable role of CHWs alongside trained health professionals, both cited as enhancer of CBHI success^{155 156}. However, lack of incentivisation of CHWs role in the DRC negatively impacts this prospect.

Table 16. Summary of CFAR pilot adaptations in the DR Congo (Study 4)

Course component	WHO standard CFAR course (Zambia CFAR)* (South Africa EFAR)**	DRC CFAR pilot
Target audience	WHO: Laypersons explicitly linked into prehospital response system, e.g., CHWs, community brigades, firefighters, civil defence – No general bystanders Zambia: General laypersons SA: General laypersons	CHWs registered/integrated with the health system at district level
Duration	WHO: 3 days Zambia: 3 days SA: 1 day	3 days
Curriculum	WHO: 7 lectures (1hr each) Case discussions (20 min) 15 skills stations (No CPR) Zambia: 54 topics and 26 skills. No CPR SA : 4 modules, trauma +++ Video recorded lectures. + CPR	7 lectures (30 min each) 6 core cases discussions (30 min) 16 skills stations (No CPR) (Added: Snakebite, burns, febrile convulsions)
Language	WHO: English, French Zambia: English SA: English + Afrikaans	Lingala (75 %) + French (25 %)
Instructors	WHO: Not defined Zambia: Drs (foreigners + local) SA: Drs (foreigners + local) + local EFAR champions	Local doctors (BEC certified)
Costs	Variable	60\$ per trainee per day (per diem, meals and FA kits)
Knowledge and competency assessment	WHO: MCQs in post-test. 75 % pass mark Zambia: Post-test. 75 % pass mark SA: Post-test. 75 % pass mark Certificate of competency	No objective knowledge and competency assessment. Post-test for confidence and perceived knowledge gain (Likert scale) Certificate of participation

* Zambia CFAR: Pigoga JL, Cunningham C, Kafwamfwa M, et al. Adapting the emergency first aid responder course for Zambia through curriculum mapping and blueprinting. *BMJ Open* 2017;7(12):e018389. Doi: 10.1136/bmjopen-2017-018389 [published Online First: 2017/12/13].

** South Africa EFAR: Sun J., Wallis L. The emergency first aid responder system model: Using community members to assist life-threatening emergencies in violent, developing areas of need. *Emergency medicine journal*. 2019. Vol 29, Page 673–78. DOI 10.1136/emmermed-2011-200,271/.

The CFAR curriculum adaptation in DRC was similar in many ways to the Zambia approach¹⁶⁴. It essentially involved four steps: (1) review of the original WHO CFAR course content, (2) comparison with data of the local burden of disease, (3) curriculum mapping and (4) curriculum blueprinting. For the DRC context, this resulted, for example in the addition of first aid for snakebite and children's febrile convulsions, while maintaining a significantly lower list of topics and skills compared to Zambia (6 core cases and 16 skills versus 54 and 26 respectively in Zambia)¹⁶⁴ (Table 20).

Regarding the contextualisation process, the use of the ADAPT framework⁷⁶ to methodically identify and apply the needed changes represents another strength that underpins the relevance of CFAR in the DRC. Having already assessed and established the rationale for the intervention and determined that the intervention was useful and acceptable in the setting, the research team drew a plan to undertake adaptations; it entailed initial discussions and review of a series of proposed alterations, followed by a selection guided by iterative reviews and further discussions to reach a consensus⁷⁶.

The next phase of the adaptation process was the pilot and its evaluation from the perspective of both course instructors and trainees (Study 4). This allowed further finetuning for subsequent trainings and adaptation process. No previous LFR system implementation in a LMIC documented the design of a more suitable programme implementation maintainable at scale as in the DRC.

2.1. Conceptual contributions

This research makes several conceptual contributions to the fields of EC research, Implementation Science, and health systems strengthening in LMICs. By detailing the adaptation and implementation of CFAR programme in Kinshasa, the research offers an appropriate framework for addressing systemic gaps in OHEC and provides valuable insights for global health interventions. This extends the theoretical understanding by demonstrating how EC can be strengthened in non-resilient health systems and highlights the potential and critical role of prehospital interventions in improving outcomes from time-sensitive conditions such as trauma, obstetric emergencies, exacerbations and acute presentations of NCD and infectious diseases.

Another noteworthy conceptual contribution is the application of CBPR in ECS strengthening, which emphasizes community ownership and cultural alignment, and highlights how engaging local stakeholders can enhance the acceptability and sustainability of health interventions. The collaborative development of the CFAR programme's training curriculum with input from local communities exemplifies a replicable model of participatory health system strengthening.

The research also underscores the importance of contextual adaptation within Implementation Science by providing a structured approach to adapting the CFAR programme to a unique socio-economic and cultural context. It illustrates how iterative processes, stakeholders engagement, and real-time feedback can bridge the gap between global evidence and local applicability. This contribution is particularly relevant for scaling up health interventions in LRS.

Integrating these theoretical and conceptual approaches provides a holistic approach to ECS strengthening and establishes a comprehensive roadmap for programme implementation, from data-driven planning to intervention inputs and long-term outcomes. This thesis makes a significant conceptual contribution by demonstrating how theoretical frameworks and community-centred approaches can be applied to address systemic health challenges in LMICs, with a potential for replicability in similar LRS.

2.2. Empirical contributions

The specific angles and approaches of this research bring a unique perspective and provide empirical evidence that complements previous studies on the integration of community-based strategies into the broader ECS development and overall strengthening of ECO systems in LMICs.

Besides the above key perspective, additional contributions of this research to the literature include (1) insights into the socio-economic and cultural factors influencing access and utilization of EC services in LRS like Kinshasa; (2) evidence supporting task shifting and greater utilisation of CHWs in selected interventions for the ECS development; (3) practical

guidance for implementing CFAR programmes in similar LMICs contexts. A summary of the key findings from the studies is provided in Table 21.

Table 21. Insights from the key findings from the studies

Study	Key findings
Study 1 (DRC ECSA)	Critical deficiencies in the DRC ECS were highlighted, including in governance, infrastructure, and human resources within the ECS. The findings pointed to specific gaps in OHEC, such as the absence of formal EMS, inadequate training of first responders, and a lack of standard protocols. A package of 19 action priorities were established, including the rollout of a CFAR programme in each province to address OHEC needs.
Study 2 (Household survey)	Significant unmet EC needs in Kinshasa communities were highlighted and underscored the need for community-level interventions to reduce delays in EC access. Key findings included households reported economic barriers to accessing care, nearly non-existent ambulance use, a high demand of EC services conflicting with several access challenges...
Study 3 (Needs assessment and acceptability)	Multi-stakeholders' confirmation of non-resilience of the DRC ECS, the usefulness and acceptability of context-specific CFAR programme in Kinshasa as an initial solution. Barriers to implementation included limited resources, governance challenges, and socio-cultural factors. Facilitators included high levels of community engagement and existing networks of CHWs.
Study 4 (CFAR pilot in DRC)	Demonstrated significant gains in knowledge and confidence following a tailored CFAR training. The course's local adaptation included the alignment of the curriculum to the local burden of disease (for example the inclusion of first aid for snake bite), the use of vernacular languages and emphasis on practical skills. However, challenges such as the short duration of the training and logistical constraints were noted.

3. IMPLICATIONS OF THE RESEARCH

The reach of this research findings extends beyond the immediate context of Kinshasa. They offer actionable lessons for LMICs facing similar challenges. The emphasis on community involvement and local adaptation provides a replicable model for enhancing OHEC globally.

1) Implications for health system planners

This research underscores the need for a system-based and community-driven approach to EC planning and development. By integrating OHEC interventions into national or regional health strategies such as the DRC PNDS, health system planners can improve health outcomes and build more resilient ECS in LMICs.

This research provides evidence-based guidance for integrating OHEC into non-resilient health systems. Health system planners must recognize that EC is an essential component of UHC¹⁰⁵. Integrating CFAR programmes into national health policies can provide cost-effective solutions to strengthen EC capacity. The study also demonstrates that engaging communities in EC interventions improves programme uptake, trust, and sustainability. Health planners should incorporate CBPR principles⁷² when designing interventions, ensuring that local knowledge, cultural factors, and existing CHWs networks are leveraged to improve programme effectiveness.

Moreover, health system planners must adopt evidence-based implementation strategies to ensure that EC interventions are contextually adapted, scalable and sustainable. To ensure sustainability, policymakers should strengthen governance mechanisms, secure long-term funding, and integrate CFAR into formal EC pathways to enhance health system resilience, like the EFAR model in South Africa^{161 180}. CFAR programmes must also be aligned with existing general health workforce development plans.

2) Implications for emergency care providers

There is evidence of positive health outcomes associated with successful collaboration and effective teamwork between CHWs and professional healthcare teams¹⁹⁷.

By collaborating with CFARs, improving referral and communication systems, qualified EC providers can significantly enhance survival outcomes and contribute to stronger and more inclusive ECS in LMICs. The EFAR system in SA^{7 161 180} is a robust illustration of this fact. This research provides actionable insights into how EC providers can contribute to improve response efficiency and link up with CFARs to integrate them into EC pathways.

The chronic shortage of health professionals and particularly trained EC personnel in LMICs³² is such that the few available providers must embrace task-shifting and capacity-building strategies. This study highlights how CFARs can represent an effective extension of the EC workforce, reducing delays in life-saving interventions before hospital arrival. Trained providers should support and supervise LFR networks, ensuring their integration into existing systems, or build the system with them, as it has been demonstrated in the South Africa EFAR⁷. Additionally, professional EC providers must advocate for better coordination between health facilities, EMS transport systems, and community responders.

Besides prehospital staff, facility-based EC providers can also greatly benefit from CFARs' field work as some patients would reach the clinic or hospital after being stabilised by CFAR first care. This could improve outcomes and ease the formal care in EUs often complicated by late arrival with no basic FA intervention¹⁶⁷. Moreover, CFARs can help warn EUs staff of their catchment area of the possible arrival of a case^{178 180}, which can be useful in severe trauma and mass casualty incident.

Establishing real-time coordination mechanisms between facility-based EC providers and prehospital personnel of both tiers can improve continuity of care from CFARs to EUs in facilities¹⁹⁸.

The CFAR programme emphasis on contextualized and culturally appropriate EC training equally applies to professional providers who should incorporate locally relevant training modules that address community-specific EC needs, such as trauma, maternal health emergencies, traditional medicine intoxications and drowning. Finally, providers must work toward formalizing the role of CFARs, including by co-developing protocols for handover between CFARs and EMS personnel, establishing guidelines for data collection and reporting

to ensure quality monitoring, and creating feedback loops that allow assessment and refinement of CFAR training.

3) Implications for the public

A growing body of evidence suggests that patients and public involvement in healthcare improvement have several benefits¹⁹⁹; this research shows that building a more resilient ECS in a LMIC can be enhanced by active public participation. By empowering individuals with FA skills, raising awareness about emergency response, fostering community engagement, and advocating for overall health system improvements, the CFAR programme demonstrates that every layperson has a role in improving his community wellbeing¹⁹⁹. Reinforcing public involvement in EC contributes to a more resilient healthcare system in a LMIC. As such, this research carries important implications for the public, particularly in LRSs where availability and access to EMS is limited.

One of the central tenants of this research is that bystanders are often the first and only responders in emergencies, especially in the context of LMICs with no or little EMS capabilities. Operationalising a CFAR system that equips community members with basic FA skills and empowers them to assist during emergencies does increase public awareness of emergency response. Like in many communities in LMICs, most Kinshasa households lacked knowledge about when and how to seek EC, leading to delays and poor outcomes. Through community education campaigns¹²⁷, the CFAR programme can foster a culture of preparedness, enabling people to recognize medical emergencies, respond appropriately, and seek help from trained responders. Heightened awareness can lead communities to demand better EC and infrastructure. By participating in community-led initiatives like CFAR, individuals become advocates for systemic improvements, pushing for more investment in EMS for better OHEC.

By mobilizing local networks and training volunteers, the CFAR programme can promote social cohesion and “Ubuntu” within communities²⁰⁰. The research demonstrates that EC is not solely the responsibility of health professionals—everyone can play a role¹⁹⁹. This collective approach furthers a stronger sense of community resilience in the face of health emergencies. Additionally, by integrating FA training into community structures, the CFAR programme can

provide an accessible and low-cost solution for the wellbeing of the population. This can reduce dependence on often unavailable EMS, ensuring that individuals receive at least the most basic assistance while waiting for formal professional care.

This research highlights how grassroots movements can drive health system change²⁰¹, encouraging public participation in shaping better ECS.

4) LIMITATIONS

The findings of this research must be weighed against the several limitations inherent to the methods and the setting constraints (resource limitations, socio-cultural factors, healthcare organisational and governance challenges). The significant contributions to ECS development it may bring must be considered within the following limitations, despite efforts made to mitigate their impact.

A. Generalisability

Methodological constraints and the uniqueness of Kinshasa limit the generalisability of findings. This capital city has a unique socio-cultural and healthcare environment that does not necessarily represent the DRC as a whole or LMICs. For instance, the household survey and focus group discussions were conducted with the participation of Kinshasa residents, an heterogeneous social group with variable perceptions on health services and health-seeking behaviours. Consequently, extrapolating these findings to more rural areas, other DRC provinces, or even other LMICs must be done with caution, as significant variations in governance, cultural attitudes towards EC, and resource availability may limit the direct applicability of the results.

Furthermore, the self-reported data without any validation (study I) limits generalisability. Additionally, the consensus method of Study 1 relied on a sample that, although by far greater than the ECSA survey recommended population size, does not encompass the full heterogeneity of perspectives that exist across the DRC's 26 provinces, some remote of 2000kms from each other, with sometimes quite variable socio-cultural and economic characteristics. The expert's consensus approach likely ensured robustness but may have

constrained the diversity of views considered. Finally, the cross-sectional nature of some studies limits the ability to infer causality or predict long-term trends in ECS development.

B. Reliability and Validity

Though established research standards were adhered to, and the validity and reliability of the findings were supported by rigorous methodological frameworks such as a mixed-methods approach, there are still questions to be asked. The consensus method used for the ECSA may have introduced biases related to personal experiences and perspectives. In the household survey, the reliability of self-reported data is a concern. Similarly, respondents' misinterpretations of terms likely may have led to misclassifications. Furthermore, social desirability bias may have influenced participants' responses, particularly in focus group discussions.

Qualitative studies faced additional validity concerns, primarily related to translation and transcription errors. Discussions were conducted in Lingala and French before being translated into English, increasing the risk of semantic shifts or loss of nuanced meanings. Although bilingual co-authors reviewed transcriptions for accuracy, the possibility of misinterpretations remains.

C. Methodological constraints

Sample size and composition in the studies imposed limitations. The ECSA surveyed 60 stakeholders, which may not fully capture the broad spectrum of perspectives necessary for a nationwide evaluation in a country the size of the DRC. The consensus meeting was constrained to 40 participants due to logistical and budgetary constraints, potentially limiting the depth and breadth of discussion.

Similarly, the FGD and household survey relied on purposive and convenience sampling within Kinshasa, which may not reflect the full diversity of experiences and needs within the DRC. The sample sizes, particularly in qualitative studies, were relatively small, which, although adequate for thematic analysis, restricts statistical generalisability.

While the use of mixed-methods research strengthened this research, it also introduced challenges. The integration of quantitative and qualitative findings required careful alignment of themes and presented interpretational complexities. Moreover, the quantitative components, particularly in the CFAR pilot programme evaluation, were limited by small sample sizes, making statistical inferences less robust. The methodical triangulation was used to mitigate these limitations.

Additionally, while qualitative methods provided rich insights into community perspectives and system challenges, they lacked the numerical precision required for certain policy-driven decision-making processes. Future research should seek to complement these qualitative findings with larger-scale quantitative assessments to enhance evidence-based policymaking.

D. Constraints related to the setting

Conducting research in a resource-limited setting such as the DRC imposed logistical challenges that impacted study design and execution. Financial constraints dictated the number of participants in consensus meetings and limited the scope of community-based surveys. Additionally, the availability of trained personnel for data collection, transcription, and analysis was constrained, which may have affected data processing timelines and thoroughness.

Infrastructure limitations such as internet connectivity and electricity availability posed challenges. While efforts were made to ensure data integrity through meticulous record-keeping and multiple layers of review, these contextual factors inevitably introduced practical constraints.

The socio-cultural and governance context in which this research was conducted introduced several challenges that may have influenced findings. During groups activities, the strong hierarchical social structure in the DRC may have led to some participants, particularly those with lower professional status, being more silent. Efforts were made to mitigate this by promoting an inclusive and non-judgmental atmosphere, but power dynamics likely persisted to a certain degree.

Finally, government cadres also played a role in shaping responses. For example, the presence of high-ranking officials in one FGD may have inadvertently influenced discussions and may have led some to refrain from having candid reflections.

E. Ethical challenges and bias

Despite strictly adhering to ethical research principles, certain biases may have influenced findings. Social desirability bias was particularly relevant in self-reported data, with participants potentially providing answers that they deemed socially acceptable rather than their true experiences or opinions. The presence of a facilitator who was himself part of the healthcare system may have also led to biased responses, as participants might have hesitated to critique existing structures openly. Similarly, the selection of Study 3 participants (Table 13) by others than the authors could have introduced some selection bias, though the final confirmation was made by the research team.

Additionally, due to ethics boundaries, some sensitive issues, such as governance inefficiencies and corruption within the healthcare system, could not be openly discussed. While anonymity and confidentiality were emphasised, a certain degree of fear of repercussions may have influenced the sincerity of some respondents.

F. Constraints related to the scope of the research

The overarching aim of the research inherently limited its scope. Understandably, adapting CFAR as an initial solution to deficient OHEC in Kinshasa could not include important aspects contiguous to the topic and which affect the integral reach. This, along with the lack of longer-term and real-life follow-up benefit from intervention (study III), likely limited the broad understanding of the worth of CFAR in DRC. A few questions are particularly worth asking:

1. Would CFAR significantly affect clinical outcomes such as morbidity and mortality in DRC?
2. Would CFAR be cost-effective and take precedence over other priorities such as strengthening Primary Health Care or Public Health services for better health outcomes in DRC?

3. What funding model would ensure sustainability of CFAR in DRC?
4. What would be the value of CFAR in a resilient, well-funded and well-functioning EMS system?
5. Are CHWs the best target audience and recipients of CFAR training in the DRC context?

The above questions and limitations underscore the need for continued research to refine and implement more effective solutions for ECS strengthening in LMICs. This will also facilitate the development of adequate strategies for the implementation of recommendations formulated in the closing chapter of the thesis (Chapter 8).

CHAPTER VIII. CONCLUSION AND RECOMMENDATIONS

By addressing critical gaps in OHEC through the adaptation of the CFAR programme, this thesis offers a practical and scalable solution to improving EC in LMICs. The findings underline the importance of community engagement, contextual adaptation, and multi-stakeholder collaboration in ECS development.

The thorough review of available evidence at the onset of this research demonstrated multiple challenges of OHEC systems in LRS. Regarding LFR programmes implemented in nascent ECS as a possible solution to OHEC capacity, various models were studied, particularly the South African EFAR model, the trauma-focused LFR courses and the WHO CFAR model. Though the data showed some degree of success in the implementation and sustainability, the specific complexities of the DRC setting required an in-depth analysis of various factors upstream or components that could impact the implementation and sustainability of a CFAR system in the country.

The initial step was to map the state of the ECS at system level to formally establish the non-resilience of the system (including lack of OHEC capacity) and demonstrate the need for interventions to palliate to these insufficiencies. A community-based survey further detailed the specific gaps in OHEC supply, despite a huge need expressed by Kinshasa residents. These two steps gave invaluable insights and a better understanding of the challenges both at system and population levels, which allowed to envision how a comprehensively rolled out CBHI like the CFAR, deemed useful and acceptable, could potentially help increase OHEC capacity. The pilot conducted as a small-scale feasibility assessment shed light on key outputs such as knowledge and confidence gain, as well as perceptions on the adaptation of the local to the local context. Though the research protocol didn't aim to study clinical outcomes, findings have enough to suggest that further research on that aspect could yield informative results.

Our research findings culminate in a better understanding of the potential for a country-specific CFAR programme as an initial step to improve the offer of EC in LRS. By so doing, the thesis builds on previous evidence, enriches the body of literature regarding EC development and can guide decisionmakers in LMICs more accurately. This research offers the basis from which policies that more effectively address the lack of OHEC capacity in LRS can be developed in a low-cost and sustainable manner. Additionally, technical guidance for difficult decision-making in the choice of strategies for systems evaluation and strengthening is provided.

Though some questions on the topic like those in Section F of Chapter 7 remain unanswered, it is important to consider the extent of the impact of these thesis findings which suggest readily available means to address inequitable access to OHEC in a LMIC. This work justifies the pursuit of a strategy of EC investment, with the ultimate goal of improving outcomes, and broadly reaching the United Nations SDG goals.

Finally, the merit of this work lies in the foundation for developing context-specific programmes aimed at increasing OHEC capacity in LRS. In resorting to robust conceptual framework to critically examine the unique features and OHEC challenges in Kinshasa and recognising the value these programmes can bring to the overall health system, this dissertation offers a platform for decision-makers to take the steps required to strengthen national health systems. While limitations remain, the insights gained provide a robust foundation for future research and implementation efforts aimed at reducing preventable morbidity and mortality in LMICs.

1. RECOMMENDATIONS TO THE DR CONGO HEALTH AUTHORITIES

The findings of the DRC ECSA process and the household survey on community EC needs call for broad actions for the ECS strengthening while the two last studies yield more CFAR-specific recommendations.

1.1. Recommendations for the DRC overall ECS strengthening

The government needs to create a more resilient, accessible, and efficient ECS in sustainably investing in EC while strengthening the broader healthcare system. ECS cannot be strengthened within a non-resilient health care system.

Strengthening governance and policy frameworks

A well-defined governance structure is crucial for the successful implementation of EC reforms in the DRC. The MoH should develop a National Emergency Care Strategy and establish a national EC policy aligned with the PNDS broader framework to ensure EC development is a government priority. This would reinforce the road towards UHC for all. The findings from the WHO ECSA highlighted significant governance gaps that require the empowerment of the National Emergency Care Directorate (PNUAH) with a clear mandate to oversee the

development, regulation, and coordination of EC services. Of note, health emergencies being often assimilated to public health outbreaks, it is vital that health authorities individualise and prioritise the development of ECS.

Additionally, there needs to be an improved coordination in the planning and financing for the health sector development. The significant financial barriers limiting EC access highlighted by the household survey reinforce the need for financial protection for mostly poor Congolese. It is therefore vital for the government to legislate on free access to EC across the DRC to ensure that life-saving EC services are accessible to all, regardless of financial status.

Data-driven decision-making is now the recommended best health system management approach, and crucial for ECS strengthening in DRC. The government should keep improving the current National Health Data System (SNIS) and implement registry system to collect and analyse data on the burden of EC and on patient outcomes. The use of mobile technology for emergency response coordination, training, and patient follow-up is an investment worth making. To ensure a continued improvement process, the government is encouraged to introduce a Quality and Performance system to gauge ECS effectiveness and identify areas for improvement, aligning with the research findings from Study 4.

Ensuring sustainable ECS financing

Financial sustainability is essential for maintaining health services in general and EC services in particular. The MoH should continue with its current plans and efforts to implement UHC and ensure that EC is integrated into the process as Maternal health has been. The financial burden on households underscores the necessity of a health insurance scheme to cover health emergencies. Efforts to increase government budget allocation for health must be sustained, and EC funding should be prioritised for ECS development, including infrastructure and workforce training. As it has been for immunisation programmes and mother and child health, the health authorities can explore Public-Private Partnerships to leverage NGOs and private sector resources for ambulance services, training programs, and facility upgrades. However, global health bodies, international donors and development financial assistance must be incorporated thoughtfully as add-on and not become the core funding source.

Developing the EC health workforce and building capacity

There is no ECS resilience without a skilled workforce. As recommended by the ECSA process, the government should work towards creating EC training pathways for prehospital providers, nurses and doctors, as well as EMS cadres such as dispatchers, medical control officers and EMS administrators. These efforts should start by integrating basic EC training into medical and nursing curricula, and where it is feasible, develop post-graduate training. Alongside formal EC professional education, standardised and certified CFAR training programmes must be developed, keeping in mind the need for integration to the existing healthcare system and community embeddedness. Considering the current shortage of EC providers, it would be motivating to the few practicing EC providers in the country to receive professional recognition, incentives, and career development opportunities as recommended by stakeholders during the ECSA meeting.

1.2. Recommendations for the CFAR programme

Improving OHEC capacity

The MoH should progressively implement the adapted CFAR programme and scale it up across urban and rural areas of provinces. As demonstrated in this research, this relatively well accepted intervention has the potential to bridge critical EC gaps and communities' unmet needs. Developing a National Ambulance System is another priority action reinforced in this research, with an integrate emergency dispatch system, well-coordinated ambulance network equipped with essential life-support resources and trained personnel. For a direct and easier access to the tier-2 system, government should put in place a unique national emergency call number with an efficient response coordination, a need explicitly stated by key stakeholders.

Improving health facilities readiness for EC

Health facilities of all levels must be equipped to handle emergencies effectively. The government should ensure 24/7 emergency management capabilities in health facilities, emergency receiving areas with dedicated staff and essential equipment, especially in general referral hospitals. Standardize emergency triage and treatment protocols must be developed

using evidence-based clinical guidelines to improve patient outcomes. This requires investing in the necessary infrastructure and essential emergency equipment and medications, including diagnostic tools. Government should also establish well-defined referral pathways between prehospital care, local clinics and higher-level hospitals, a necessity underscored in this research.

Consolidating community engagement and public awareness

Community participation is key to the success of any OHEC initiative. The government should promote EC awareness in communities through education on early recognition of emergencies and timely care-seeking, a barrier identified in Study 3. Bystander engagement must be encouraged to empower community members to swiftly act in emergencies. Health authorities and community leaders should partner and conduct campaigns to address sociocultural barriers to EC such as self-medication that hinder emergency care-seeking behaviour.

Methodical adaptation process for CFAR

Implementers aiming to adapt the CFAR framework need to adopt a structured and methodical approach. This will maximize CFAR's effectiveness, ensure informed decision-making and optimized resource allocation. The adaptation process should start with a comprehensive needs assessment to determine how CFAR aligns with the national and provincial governments goals, existing operational structure, and decision-making processes. Key stakeholders must be identified, context-specific challenges and constraints ascertained.

Implementers must establish clear objectives and scope to ensure a targeted adaptation process. This will involve specifying the decision-making contexts where CFAR will be applied and setting measurable goals for incorporating CFAR insights. Unnecessary complexity must be avoided. As a flexible framework, CFAR must be tailored to a context unique environment; this would likely mean provincial or district level in DRC. Implementers must therefore determine cost-effectiveness metrics based and ensure compatibility with existing analytical tools and reporting systems. Additionally, they must establish protocols for consistent data collection as basing the programme on reliable data is essential.

Successful implementation requires a broad buy-in from decision-makers, analysts, and end-users. It could greatly help to conduct workshops to familiarize stakeholders with CFAR

principles, establishing feedback loops for continuous improvement and providing training programs to enhance analytical capacity.

It is critical to pilot-test before full-scale implementation. A phased approach minimizes risks associated with large-scale adoption. It is recommended to first run a pilot programme in a controlled environment, comparing CFAR-driven decisions with traditional approaches, collecting feedback and refining methodologies accordingly.

Implementers should also establish continuous monitoring and iterative improvement system to enhance CFAR improvement based on new data and insights. Regularly reviewing analytical outcomes and impact assessments are required. To sustain long-term benefits, implementers should embed CFAR insights into strategic planning and budget allocation and formalize decision-making protocols that incorporate CFAR findings.

Rolling out CFAR across the country

CFAR sustainability requires a sound long-term financing strategy. The government should broadly integrate EC into UHC to ensure its long-term development, including embedding CFAR in the national health development strategy (PNDS). This would allow health authorities to secure funding for long-term supply of FA materials and personal protective equipment and prevent shortages that could hinder CFAR effectiveness. It is essential to establish FA supply depots at local health centres for easy replenishment of CFAR kits. CFAR implementation should also be supported by a robust incentivisation strategy to provide stipends to CFARs and prevent attrition due to financial hardship.

The government should establish CFAR coordination structures at provincial and district level, involving a dual community health and EMS participation. This coordination should endeavor to progressively integrate CFAR training into existing CHW network in all 536 health zones in the country to leverage their trusted role in the community. One of the key roles of the central coordination structures would be to develop standardized training curricula and certification requirements for CFARs to ensure consistency in care delivery. Additionally, they should also support continued development of protocols and guidelines tailored to CHWs, using algorithms for decision-making.

Establishing quality assurance mechanisms for periodic assessment and programme improvement is another important step in strengthening the programme implementation.

To enhance community acceptance of CFAR, authorities should include educational campaigns to raise public awareness on the role of CFARs and their benefits and provide them with personalized identification cards to enhance legitimacy and trust within communities. All efforts must be made to connect CFARs with both formal healthcare facilities and prehospital providers. The linkage with EMS must involve a basic emergency communication and transportation system, and a monitoring system to review CFARs case management.

Regarding scaling up CFAR across provinces and districts, government should adopt a phased approach, starting with pilot implementations in selected regions, particularly high-burden areas with limited access to EC, and evaluating pilot results and refining the programme before expanding in the region.

Finally, health authorities should invest in local research and monitoring for ongoing improvements, including assessing cost-effectiveness to justify continued investment in CFAR, the impact of CFAR training on reducing morbidity and mortality, as well as the potential for shorter training models for targeted conditions, such as road traffic injuries or maternal emergencies.

2. RECOMMENDATIONS FOR FUTURE RESEARCH

While this thesis provides a strong foundation for ECS strengthening in LMICs, further research is needed to address existing gaps. It is critical to invest in local research to generate context-specific evidence for policy formulation, implementation and evaluation of interventions. Government must create better conditions for universities and research centres to develop EC training and implementation models. It is advisable to start any research initiative by identifying priorities and resources available locally to conduct research projects.

Comprehensive longitudinal studies are needed to investigate several aspects of the long-term impact of the CFAR programme on EC outcomes, including mortality. Documenting the mortality impact of CFAR through comparative studies is needed to ascertain the added value

of CFAR as a low-cost intervention. Furthermore, piloting more extensively the programme in other regions of the DRC and SSA can provide further insights into scalability and adaptability.

Another aspect relevant to LMICs is cost-effectiveness analysis to evaluate the economic implications of the CFAR programme as this is essential for securing funding and policymaker support. This is also critical to ensure the sustainability.

Future research should also explore the economic implications of CFAR implementation to provide data to support policy recommendations and funding allocations.

Other aspects to be investigated include lighter and shorter version of the course in order to respond to specific needs such as road traffic injuries, poisoning, envenomation or pregnancy related emergencies in the community.

Furthermore, investigating the wellbeing and motivation of CFARs, alongside their care practices and the community perceptions of their assistance would be informative.

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APPENDICES

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Appendix 1: UCT Ethics committee approval HREC REF: 086/2021



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



Room G50- Old Main Building
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 Observatory 7925
 Telephone [021] 406 6492
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Website: www.health.uct.ac.za/fhs/research/humanethics/forms

18 February 2021

HREC REF: 086/2021

Prof L Wallis
 Division of Emergency Medicine
 F-51 OMB
 Email: lee.wallis@uct.ac.za
 Student: k.d.ngoy@gmail.com

Dear Prof Wallis

PROJECT TITLE: STUDY ONE OF "ADAPTING A COMMUNITY FIRST AID RESPONDER PROGRAMME TO INCREASE OUT-OF-HOSPITAL CAPACITY IN KINSHASA, DEMOCRATIC REPUBLIC OF CONGO": MAPPING THE EMERGENCY CARE SYSTEM USING THE WHO EMERGENCY CARE SYSTEM ASSESSMENT TOOL- PHD IN EMERGENCY MEDICINE- CANDIDATE- DR KEN DIANGO-STUDY 1

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee (HREC) for review.

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

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

Approval is granted for one year until the 28 February 2022.

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

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

The HREC acknowledge that the student: Dr Ken Diango will also be involved in this study.

Please quote the HREC REF 086/2021 in all your correspondence.

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

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate Institutional approval, where necessary, before the research may occur.

HREC/REF 086/2021sa

Yours sincerely

PROFESSOR M BLOCKMAN

CHAIRPERSON, FACULTY OF HEALTH SCIENCES HUMAN RESEARCH ETHICS COMMITTEE

Federal Wide Assurance Number: FWA00001637.

Institutional Review Board (IRB) number: IRB00001938

NHREC-registration number: REC-210208-007

This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use: Good Clinical Practice (ICH GCP), South African Good Clinical Practice Guidelines (DoH 2006), based on the Association of the British Pharmaceutical Industry Guidelines (ABPI), and Declaration of Helsinki (2013) guidelines. The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.

Appendix 2: UCT Ethics committee approval HREC REF: 087/2021



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



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 Email: hrec-enquiries@uct.ac.za

Website: www.health.uct.ac.za/fhs/research/humanethics/forms

03 August 2021

HREC REF: 087/2021

Prof L Wallis
 Division of Emergency Medicine
 F-51 OMB
 Email: lee.wallis@uct.ac.za
 Student: k.d.ngoy@gmail.com

Dear Prof Wallis

PROJECT TITLE: STUDY TWO OF "ADAPTING A COMMUNITY FIRST AID RESPONDER PROGRAMME TO INCREASE OUT-OF-HOSPITAL CAPACITY IN KINSHASA, DEMOCRATIC REPUBLIC OF CONGO": EVALUATION OF NEEDS AND SUPPLY OF EMERGENCY CARE IN KINSHASA, DR CONGO: A CROSS-SECTIONAL STUDY-- PHD CANDIDATE- DR KEN DIANGO

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

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

This approval is subject to strict adherence to the HREC recommendations regarding research involving human participants during COVID -19, dated 17 March 2020; 06 July 2020 & 01 July 2021.

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

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

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

The HREC acknowledge that the student: Dr Ken Diango will also be involved in this study.

Please quote the HREC REF 087/2021 in all your correspondence.

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

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval, where necessary, before the research may occur.

HREC/REF 087/2021sa

Yours sincerely

PROFESSOR M BLOCKMAN

CHAIRPERSON, FACULTY OF HEALTH SCIENCES HUMAN RESEARCH ETHICS COMMITTEE

Federal Wide Assurance Number: FWA00001637.

Institutional Review Board (IRB) number: IRB00001938

NHREC-registration number: REC-210208-007

This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use: Good Clinical Practice (ICH GCP), South African Good Clinical Practice Guidelines (DoH 2006), based on the Association of the British Pharmaceutical Industry Guidelines (ABPI), and Declaration of Helsinki (2013) guidelines. The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.

Appendix 3: UCT Ethics committee approval HREC REF: 088/2021



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



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 Observatory 7925
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23 February 2021

HREC REF: 088/2021

Prof L Wallis
 Division of Emergency Medicine
 F51, OMB
 Email: lee.wallis@uct.ac.za
 Student: k.d.ngoy@gmail.com

Dear Prof Wallis

PROJECT TITLE: STUDY THREE OF "ADAPTING A COMMUNITY FIRST AID RESPONDER PROGRAMME TO INCREASE OUT-OF-HOSPITAL CAPACITY IN KINSHASA, DEMOCRATIC REPUBLIC OF CONGO": A NEEDS ASSESSMENT FOR THE COMMUNITY FIRST AID RESPONDER PROGRAMME IN KINSHASA, DR CONGO- PHD CANDIDATE- DR KEN DIANGO

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee (HREC) for review.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study, subject to the following: -

1. Please add the contact details of the chair of CIBAF HREC to the informed consent document.
2. DRC local REC approval.

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

Approval is granted for one year until the 28 February 2022.

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

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

The HREC acknowledge that the student: - Dr Ken Diango will also be involved in this study.

Please quote the HREC REF 088/2021 in all your correspondence.

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

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval, where necessary, before the research may occur.

HREC/REF 088/2021sa

Yours sincerely

PROFESSOR M BLOCKMAN

CHAIRPERSON, FACULTY OF HEALTH SCIENCES HUMAN RESEARCH ETHICS COMMITTEE

Federal Wide Assurance Number: FWA00001637.

Institutional Review Board (IRB) number: IRB00001938

NHREC-registration number: REC-210208-007

This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use: Good Clinical Practice (ICH GCP), South African Good Clinical Practice Guidelines (DoH 2006), based on the Association of the British Pharmaceutical Industry Guidelines (ABPI), and Declaration of Helsinki (2013) guidelines. The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.

Appendix 4: UCT Ethics committee approval HREC REF: 056/2023



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



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Tel: 0214066492

Email: hrec-submissions@uct.ac.za

Website: www.health.uct.ac.za/home/human-research-ethics

17 March 2023

HREC REF: 056/2023

A/Prof P Hodkinson

Division of Emergency Medicine

F-51 OMB

Email: Peter.hodkinson@uct.ac.za

Student: k.d.ngoy@gmail.com

Dear Prof A/Hodkinson

PROJECT TITLE: IMPLEMENTATION AND EVALUATION OF A PILOT WORLD HEALTH ORGANISATION'S COMMUNITY FIRST AID RESPONDER TRAINING IN KINSHASA, DEMOCRATIC REPUBLIC OF CONGO- (PHD DEGREE-DR KEN DIANGO)

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee (HREC) for review. Thank you for your response dated 14 March 2023 to the comments raised by the HREC.

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

Approval is granted for one year until the 30 March 2024.

Please submit a progress form, using the standardised Annual Report Form (FHS016) if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.

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

The HREC acknowledges that the following student Dr Ken Diango is also involved in this study.

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

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval, where necessary, before the research may occur.

Please quote the HREC REF 056/2023 in all your correspondence.

HREC/REF:056.2023

Yours sincerely

PROFESSOR M BLOCKMAN

CHAIRPERSON, FACULTY OF HEALTH SCIENCES HUMAN RESEARCH ETHICS COMMITTEE

Federal Wide Assurance Number: FWA00001637. Institutional Review Board (IRB) number:
IRB00001938 NHREC-registration number: REC-210208-007

This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use: Good Clinical Practice (ICH GCP), South African Good Clinical Practice Guidelines (DoH 2020), based on the Association of the British Pharmaceutical Industry Guidelines (ABPI), and Declaration of Helsinki (2013) guidelines. The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.

Appendix 5: University of Kinshasa School of Public Health / Ethics REF ESP/CE/077/2021



REPUBLIQUE DEMOCRATIQUE DU CONGO
Ministère de l'Enseignement Supérieur et Universitaire
Université de Kinshasa
ECOLE DE SANTE PUBLIQUE
COMITE D'ETHIQUE

No d'Approbation: ESP/CE/77/2021

Kinshasa, le 16 avril 2021

Au Dr KEN NGOY DIANGO

Division of Emergency Medicine: PhD program
University of Cape Town
Email: dngken002@uct.ac.za / k.d.ngoy@gmail.com
Tel +27787774077

Objet : L'approbation du protocole de recherche doctorale intitulée :
« Développement d'un programme de formation des relais communautaires en premiers secours pour optimiser l'offre de soins préhospitaliers en République Démocratique du Congo ».

Docteur,

Le Bureau du Comité d'Ethique de l'Ecole de Santé Publique de l'Université de Kinshasa accuse réception de votre lettre du 06 avril 2021 relative à l'objet susmentionné et nous vous en remercions.

Après examen attentif de votre protocole de recherche doctorale dont le sujet est ci-haut repris, le Bureau du Comité d'Ethique de l'Ecole de Santé Publique de l'Université de Kinshasa estime que l'étude que vous comptez entreprendre est pertinente et peut réellement contribuer à optimiser l'offre de soins préhospitaliers en République Démocratique du Congo.

Ainsi, vu que les principes éthiques relatifs au respect du consentement des participants et de la confidentialité sont pris en compte, le Bureau du Comité d'Ethique approuve le protocole et autorise la mise en œuvre de l'étude pour la période allant du 17 avril 2021 au 16 avril 2022.

Toute modification apportée au présent protocole devra au préalable obtenir l'approbation du Comité d'Ethique et tout incident devra lui être notifié sans délai.

Veuillez agréer, Docteur, l'expression de notre considération distinguée.



Prof. BONGOPASI MOKE SANGOL

Vice-Président du Comité d'Ethique

Appendix 6: University of Kinshasa School of Public Health / Ethics REF ESP/CE/160/2022



REPUBLIQUE DEMOCRATIQUE DU CONGO
Ministère de l'Enseignement Supérieur et Universitaire
Université de Kinshasa
ECOLE DE SANTE PUBLIQUE
COMITE D'ETHIQUE

No d'Approbation: ESP/CE/160.../2022

Kinshasa, le 12 décembre 2022

Au Dr KEN NGOV DIANG
Principal Investigator
Division of Emergency Medicine PhD program
Department of Surgery
University of Cape Town

Objet : L'approbation du protocole de recherche intitulé :
« Implémentation et évaluation d'un programme pilote de formation des relais
communautaires en Premiers Secours à l'aide du module de l'Organisation Mondiale
de la Santé à Kinshasa, en République Démocratique du Congo ».

Docteur,

Après examen minutieux de votre protocole dont le
sujet est repris en marge, le Bureau du Comité d'Ethique de l'Ecole de Santé Publique de l'Université de
Kinshasa estime que ledit protocole est bien conçu et l'étude que vous comptez entreprendre est pertinente.

Ainsi, vu que les principes éthiques relatifs au respect
de la confidentialité et du consentement sont pris en compte, le Bureau du Comité d'Ethique approuve le
protocole et autorise la mise en œuvre de l'étude pour la période allant du 13 décembre 2022 au 12 décembre
2023.

Toute modification apportée au présent protocole
devra au préalable obtenir l'approbation du Comité d'Ethique et tout incident devra lui être notifié sans délai.

Veuillez agréer, Docteur, l'expression de notre
considération distinguée.

Prof. BONGOPASI MOKE SANGOL



Vice-Président du Comité d'Ethique

Appendix 7. Ministry of health authorisation to include the ECSA report in the thesis.



REPUBLIQUE DEMOCRATIQUE DU CONGO
MINISTRE DE LA SANTE PUBLIQUE,
HYGIENE ET PREVOYANCE SOCIALE



DIRECTION DE L'EPIDEMIOLOGIE ET
DE LA LUTTE CONTRE LA MALADIE
PROGRAMME NATIONAL DES
URGENCES ET ACTION HUMANITAIRE



Kinshasa, February 6, 2025

Réf : MS/1254/DIR/PNUAH/KKC/34/MKC/2025

To: Professor Brenda Morrow
Chair of the Doctoral Degrees Board
University of Cape Town
Masingene Building, Middle Campus
Cape Town, South Africa

Dear Professor,

Re: Permission to include the Technical Report of the Evaluation of DR Congo Emergency Care System in the doctoral thesis _ Dr. Ken Ngoy Diango

I hereby confirm that I have given permission to Dr Ken Ngoy Diango, registered for a PhD in Emergency Medicine at the University of Cape Town, Student Number DNGKEN002, permission to include the technical report of the DR Congo Emergency Care System Assessment conducted in 2021 with technical support from WHO.

Dr KN Diango played a central role in the design of the study, its coordination, ethical approvals, obtaining administrative authorizations, collection and analysis of data, facilitation of the consensus meeting as well as the development, revision and translation of said report.

In witness whereof this certificate is delivered to him, to certify his important contribution.

Best regards

Dr Chistophe MWALUKA KYEMBE
National Director
Directorate of Emergency and Humanitarian Action
Ministry of Public Health, Hygiene and Social Welfare.



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Kinshasa - Gombe

Appendix 8. ECSA Concept Note and Questionnaire (pages 1-8) for illustration



Emergency and Critical Care System Assessment (ECSA)

System Assessment, Priority Setting and Roadmap Development

BACKGROUND

Emergency care systems address a wide range of medical, surgical, and obstetric conditions, including injury, complications of pregnancy, exacerbations of non-communicable diseases (e.g., heart attacks, strokes), and acute infections (e.g., sepsis, malaria). The emergency care system is the first point of contact with the health system for many, particularly in areas where there are barriers to care. With sound planning and organization, emergency care systems have the potential to address over half of the deaths in low- and middle-income countries.

PURPOSE AND SCOPE

The ECSA is a strategic planning tool designed to help policy-makers and planners assess a national or regional emergency care system, identify gaps, and set priorities for system development in the following domains:

1. System organization, governance, financing
2. Emergency care data and quality improvement
3. Scene care, transport, transfer, referral
4. Facility-based care
5. Emergency preparedness.

The ECSA leads to a set of gaps in emergency and critical care with its associated priority actions that the Ministry of Health may use for its strategic planning. Alternatively, the WHO can support a follow-up process to develop an implementation roadmap for the highest-priority actions.

PROCESS FOR CONDUCTING WHO ECSA

The ECSA is generally a Ministry of Health-driven process conducted with WHO support (across the three levels of the Organization). The process starts with a web-based survey and then proceeds to a consensus meeting, which is currently available via multiple formats – in-person, hybrid and virtual. The main steps for conducting an ECSA are detailed below:

- Confirm group of stakeholders planning the ECSA
- **Identify in-country stakeholders** to take part in the assessment.
 - Participants should represent the geographic and socioeconomic diversity of the country across rural and urban areas. Possible stakeholders include:
 - Government/Ministry representatives (system organizers, policy analysts, financing specialists)
 - Pre-hospital care providers and/or leadership
 - Hospital administrators
 - Nursing, rehabilitation and other providers, such as clinical officers.
 - Heads of nursing, emergency units, surgery, medicine, critical care, and/or obstetrics
 - Other NGO actors
 - Emergency and trauma care researchers or epidemiologists
 - Disaster management representatives from the government
 - The complete list of respondents is shared with WHO (including name, email address, and organization/affiliations).
- **Send initial 'invitation to participate'** to respondents. This invitation letter may be sent on behalf of the country's Ministry of Health, or the WHO country or regional office.
- WHO HQ will then send each respondent an **individual link to complete the survey**. Reminder emails will be sent periodically to facilitate timely completion of the assessment.

www.who.int/emergencycare/ | emergencycare@who.int



- In settings where access to email or network connectivity may pose difficulties for respondents, a local champion (e.g. university or MoH partner) might assist by interviewing respondents, capturing results on paper, and entering the results into the online system.
- Begin discussions on a **potential format and date for a 2-day stakeholder consensus meeting** as soon as possible. Consider funding and other details while defining the desired meeting format. If a hybrid or in-country meeting is chosen, the costs associated are expected to be minimal and will primarily involve local travel expenses for participants.
- WHO HQ will aggregate responses into a slide set for the meeting, highlighting areas of discordance for discussion at the stakeholder meeting.
- Send **meeting invitations** to respondents who have completed the survey.

The goals of the **consensus meeting** are to:

- 1) Interpret and obtain consensus on ECSA results to identify gaps and goals
- 2) Plan priority actions in response to the identified gaps and goals
- 3) Draft an implementation roadmap to complete the priority actions, and
- 4) Agree on ways to monitor the implementation progress towards carrying out the priority actions and achieving the primary goals.



Figure 1. WHO ECCSA Process

Supporting materials for the above steps, including sample budget and template documents, are available by contacting emergencycare@who.int.

ROADMAP DEVELOPMENT

At the end of the process, an emergency care system status report with identified priority actions is generated for use by planners and partners. If the Ministry of Health seeks support in developing an implementation roadmap, a second 2-day consensus meeting is held with the stakeholders responsible for implementation.

The meeting aims to identify the 10-15 highest priority actions that should be implemented to leverage improvements in the emergency care system. The roadmap process leads to a document laying out key implementation steps, resource requirements, timeline, potential barriers, and monitoring and evaluation indicators for each priority.

IMPLEMENTATION

Regardless of how the ECSA report is used, WHO is available to provide full support to the Ministry of Health with implementation of the [Emergency Care Toolkit products](#), including the WHO Basic Emergency Care course, clinical checklists, the Interagency Integrated Triage Tool, standardized clinical forms, and other educational, clinical and process resources that enhance quality care delivery.

Clinical Services and Systems
Integrated Health Services
Universal Health Coverage-Life Course
World Health Organization, Geneva, Switzerland

www.who.int/emergencycare/ | emergencycare@who.int



Emergency and Critical Care System Assessment

Version 4 – Draft 1.2
August 2023
Contact: emergencycare@who.int

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How to Use the Emergency and Critical Care System Assessment Tool

Emergency and critical care are essential parts of an effective health system, ensuring timely access to care for all patients. The WHO Emergency and Critical Care System framework defines a series of essential functions for an emergency and critical care system, spanning from scene-based care, to care during transport, to facility-based emergency unit care, as well as early operative and critical care. Each of the functions described in the framework can be achieved in many ways, depending on available resources, and each is essential to the delivery of effective emergency care.

Identifying relevant stakeholders

The WHO Emergency and Critical Care System Assessment is a structured survey that can be answered in writing or via interviews or focus groups. To ensure an accurate description of system components, respondents should come from a range of settings and might include:

- Policy makers;
- Hospital administrators;
- Heads of nursing, surgery, medicine, critical care, or emergency units;
- Emergency and critical care providers;
- Pre-hospital care leaders;
- Disaster response and Emergency Medical Teams focal points;
- Emergency care researchers or
- Epidemiologists.

Instructions for respondents to answer the survey questions

A minimum of 15 participants should be interviewed, including people from the Ministries, a clinician and healthcare worker.

In general, answers should reflect the average situation across a nation, rather than the highest-performing example in the system.

The assessment tool is divided into 6 sections:

1. Respondent Information
2. System Organization, Governance and Financing
3. Emergency Care Data and Quality Improvement
4. Scene Care, Transport, Transfer and Referral
5. Facility-Based Care and Rehabilitation
6. Emergency Preparedness

The WHO Emergency and Critical Care System Assessment contains two different question formats: 1) basic fact questions with yes/no or tick-box answers, and 2) roadmap questions where the numbered 1 to 5 represent progressive levels of emergency care system development 3) questions addressing proportion of a facility or population for whom a specific resource or service is available.

Please note that the stepwise progression of the roadmap answer choices is approximate. While lower numbers represent the most basic conditions, and the highest number represents a fully developed system component, the answers in between may represent similar levels of development because there are multiple possible pathways for system development. For example, a 2 will always reflect a state of lower development than a 5, but 3 and 4 may represent two equally feasible paths for system advancement. In addition, the scale of the roadmap questions is not linear, and a “4” on one question is not the same as a “4” on another question. Hence, the WHO Emergency and Critical Care System Assessment is not intended to generate a summary score.

Some questions ask respondents to estimate what proportion of the population has access to a certain service. Exact figures are not needed to respond to these questions, and the answers use approximate terms: few, some, most and all. In this tool, few means less than 25%, some means approximately 25-50%, most means over 50%, and all suggests complete coverage. Some questions refer to two specific levels of facilities-- first-level hospitals (in most countries these are district hospitals) and referral. While there are many countries with facilities between these two levels (such as regional or provincial hospitals), these middle terms vary greatly across countries. Here we have focused on conditions at district and referral hospitals as key markers of overall system development. Users wishing to add other levels of facilities could adapt the questions.

Wherever an answer on a roadmap question falls between two options, select the lower number. In other words, an answer should be selected only when every criterion within the description has been met. For instance, if many, but not all components of answer “4” apply, then choose to answer “3” to avoid confusion with in-between answers.

Some questions may be only relevant to certain groups of professionals, so if you are unable to answer a question because it lies outside of the scope of your professional expertise, please indicate this by selecting “I don’t know”. If a question is unanswerable for any other reason (the answers do not fit your setting, for example), please indicate this by selecting “Cannot answer for another reason” and explain in the box provided. Additional comments that can improve future revisions of the tool itself can also be included in the comments section at the end of the tool.

1. Respondent Information

1.1	Country/Region of respondent's work:	
1.2	Respondent's name:	
1.3	Please select your PRIMARY ROLE in your country's/region's health care system. You will be able to select additional roles in the next question. [Select one]	
	☐ Policy maker	☐ Head of trauma care services (if different from surgical services)
	☐ Lead of prehospital services	☐ Head of obstetric services
	☐ Facility-based administrator	☐ Head of emergency care
	☐ Head of critical care	☐ Researcher or epidemiologist
	☐ Head of surgical services	☐ Clinical provider (explain below)
	☐ Head of anesthesia	☐ Other:
	List your clinical role (e.g. pre-hospital provider, doctor, nurse, clinical officer) and specialty, as well any sub-specialties or fellowships:	
1.4	Please select any other PRIOR or CURRENT roles you have in your country's/region's health care system [check all that apply]:	
	☐ Policy maker	☐ Head of trauma care services (if different from surgical services)
	☐ Lead of prehospital services	☐ Head of obstetric services
	☐ Facility-based administrator	☐ Head of emergency care

☐ Head of critical care	☐ Researcher or epidemiologist
☐ Head of surgical services	☐ Clinical provider (explain below)
☐ Head of anesthesia	☐ Other:
List your clinical role (e.g. pre-hospital provider, doctor, nurse, clinical officer) and specialty, as well any sub-specialties or fellowships:	

1.5	Have there been any prior assessments of this emergency care system or its components (e.g. pre-hospital, trauma care, critical care or operative care)?
☐ Yes ☐ No ☐ I don't know	
If Yes :	
Year performed:	
Performed by:	
Tool used:	
PLEASE ATTACH PRIOR REPORTS IF AVAILABLE Comments:	

2. System Organization, Governance and Financing

a- System organization

2.1	Distribution of and access to facilities delivering emergency care: <i>Access implies geographic availability, but also includes functional availability (e.g., no financial barriers for the patients). Where a system is unaffordable for a group of people, they should be counted as having no access.</i> <i>Adequate means that the distribution and resource level of facilities is such that acutely ill or injured persons can access timely care for acute conditions</i>	
There is extremely limited emergency care access across the country, in both urban and rural settings.		1
There is some emergency care in urban settings, though not adequate to population needs; there is no or minimal emergency care availability in rural settings.		2
There is adequate emergency care in most urban settings, and moderate emergency care availability in rural settings. The number and level of emergency care facilities is inadequate or not well distributed for population needs overall.		3
The number and level of emergency care facilities is adequate for population needs overall, but the distribution and coordination between facilities or of access to facilities still leaves gaps in access.		4
There is adequate emergency care across the country. The number, level, distribution, and accessibility of emergency care facilities meets population needs in both urban and rural settings.		5
I don't know.		☐
Cannot answer for another reason (explain):		☐

2.2	Emergency care lead office or agency: <i>An emergency care lead office should hold a distinct and permanent position within the government. By definition, it should not be only a subunit of disaster response.</i>	
-----	--	--

There is no designated office or agency in the government (e.g. within the Ministry of Health or Transport) responsible for emergency care.	1
There is a designated office or agency in the government responsible for emergency care. Central coordination is extremely limited.	2
There is a designated office or agency in the government responsible for emergency care, and some central coordination, but there are no clear standards set for many aspects of emergency care.	3
There is a designated office or agency in the government that effectively coordinates emergency care. Clear standards for emergency care are set, but there is no legal mandate to ensure or enforce compliance.	4
There is a designated office or agency in the government responsible for emergency care. Central coordination is effective and supported by a legal mandate to ensure compliance with standards.	5
I don't know.	☐
Cannot answer for another reason (explain):	☐

2.3	Legislation governing availability of emergency care services:	
There is no legislation mandating access to emergency care services.		1
There is some legislation regarding access to emergency care services, but patients must pay out-of-pocket prior to receiving care.		2
There is legislation requiring that emergency care costs be scaled based on ability to pay; some groups may still be required to pay out-of-pocket prior to receiving care.		3
There is legislation ensuring that no payment is required prior to emergency care. Some groups receive entirely free care; others pay afterwards.		4
There is legislation mandating universal access to emergency care that includes a requirement for financial risk protection or a requirement that emergency care is free of cost.		5
I don't know.		☐

Appendix 9. CFAR Concept Note and Syllabus



Community First Aid Response (CFAR)

Empowering communities to provide emergency care

BACKGROUND

Every day, all over the world, adults and children suffer emergency health conditions that, if not treated promptly and correctly, threaten their life or well-being. Estimates suggest that over half of all deaths in resource limited settings result from conditions that could be addressed by emergency care. In lower resource settings, there are no immediate emergency care resources, long delays exist before a patient can reach emergency services, and individuals do not know when it is appropriate to seek further care. Furthermore, many settings do not have effective prehospital emergency care systems and health personnel is not adequately trained to manage life-threatening emergencies. Delays in effective emergency care result in high rates of mortality and disability, particularly among vulnerable populations, including women, children, and the elderly. Increasing access to timely emergency care can be achieved by focused training of community members who are linked with the emergency care system. Multiple studies have shown that training community personnel improves initial patient stabilization, enhances systems activation to help critically ill and injured people reach care and can be highly cost effective.

PURPOSE AND SCOPE

The Community First Aid Response course (CFAR) is intended to train lay providers or community health workers to recognize emergency conditions, safely provide simple life-saving interventions, and stabilize an individual until further care can be sought, especially in communities where there is limited access to formal emergency care systems. It teaches an understanding of what actions can be taken within a small scope of life-saving care and what actions should not be taken by a non-healthcare professional. **This course is for responders who are formally linked to the health system.** This course supports the development of an integrated system-based approach toward emergency conditions, from community to facility-level care.

OBJECTIVES

The goal of the CFAR course is to equip community members with a connection to the health system with the necessary skills and knowledge to safely engage in immediate first aid and provide immediate life-saving patient care, document information, and assist with the transfer and handover while protecting themselves from disease or injury. The concrete objectives of the CFAR course are to teach learners to:

- Recognize when a scene is safe and with the necessary protective equipment.
- Recognize when immediate care is needed and apply a practical and systematic first aid approach to four common emergency conditions (trauma, difficulty in breathing, shock and altered mental status).
- Perform simple lifesaving interventions and prioritize personal safety while addressing these situations.
- Identify when a patient needs further care, and when transfer is required to an appropriate facility, to facilitate transfer and handover to advanced providers.
- Understand the importance of documenting important health information and communicating what interventions have been done and the response of the patient's conditions to those interventions.

COURSE DETAILS

- The **target audience** for the course includes individuals with no medical training but who are linked to the health care system. The CFAR course will require the ability to think critically, but no set knowledge or skills are required.

www.who.int/emergencycare/ | emergencycare@who.int



- **Duration and delivery modes:** This course is designed to be delivered over 4 days, although may be adjusted to local needs. Active participation in case scenario discussions, as well as hands-on activities, is expected.

COURSE CONTENT

The course is allied to the [WHO-ICRC Basic Emergency Care course](#) and emphasizes a similar approach to the acutely ill and injured. On completion of this course, participants are expected to have increased competence and confidence to safely manage patients with four common emergency conditions (trauma, difficulty in breathing, shock and altered mental status), to initiate appropriate first aid and to facilitate timely and safe patient transfer and handover.

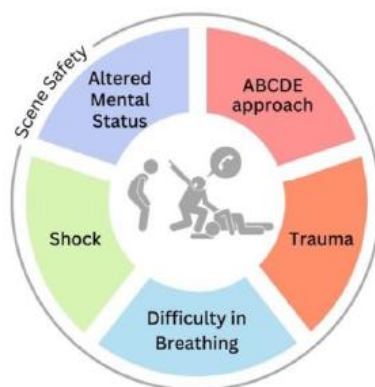


Figure 1. Community First Aid Response course

Course materials and implementation support are available by contacting emergencycare@who.int

Clinical Services and Systems
Integrated Health Services
Universal Health Coverage-Life Course
World Health Organization, Geneva, Switzerland

WHO CFAR COURSE SYLLABUS

Target audience

Community healthcare workers, particularly in low- and middle-income countries. This training has been developed for emergency care first responders with limited or no formal medical training, who are working in connection with the emergency care system e.g., at a community clinic, or with a community response organisation. Participants may also include community members, healthcare assistants and other allied health professionals.

Duration

This course may be delivered in different ways to meet local needs, but it was developed as a suggested 3-day in-person course (Appendix A). The content could also be spread across 3 weekly sessions and additional sessions can be considered depending on local need.

Course content

This course content is distributed in seven core modules described below.

	Module Name	Session name
1	Introduction	Introduction interactive lecture
		Session name
2	Scene Safety	Scene Safety interactive lecture
		Scene Safety Case Scenario
		Scene Safety Skills
3	ABCDE Approach	ABCDE interactive lecture
		ABCDE Case Scenario
		ABCDE Skills
4	Trauma	Trauma interactive lecture
		Trauma Case Scenario
		Trauma Skills
5	Difficulty in Breathing	Difficulty in Breathing interactive lecture
		DIB Case Scenario
		Difficulty in Breathing Skills
6	Shock	Shock interactive lecture
		Shock Case Scenario
		Shock Skills
7	Altered Mental Status	Altered Mental Status Case Scenario
		Altered Mental Status Skills
		Altered Mental Status Case Scenario

Course Strategies

This course is presented through a series of short interactive lectures, case scenarios and practical skills stations to promote the learning of key concepts. The course is designed to be logistically simple for utilization in low- and middle-income countries. Course materials are visual and practical to support individuals in locations where literacy is low. In addition, small group work and practical team sessions are key strategies for developing competencies in caring for emergency patients in the community.

Course Materials

The following materials are used to support learning in this course:

- The course manual will offer participants information and references for the topics reviewed.
- During the course days, participants will complete reflection questions and activities in the course workbook. This will mainly support their learning in relation to their individual settings and goals.
- The course has Quick cards for participants to use, which summarise key learning and action points.

Course assessment

This program assesses participants in three Kirkpatrick levels: reaction, learning, and behaviour. Participants complete pre- and post-course surveys exploring self-perceived confidence in key course competencies. A post-course multiple choice quiz explores the knowledge of course key concepts. Participants must actively participate in all practical sessions to complete the course.

Course Practical Skills Sessions

In this course, participants will be divided into small groups of up to 8 participants to rotate through skills stations. Each skill station aims to teach and provide an opportunity to practice each one of the core skills for initial emergency care.

The skills stations are conducted following a five-step method:

- 1) Teach why the skill needs to be learned
- 2) Demonstrate how to do the skill
- 3) Explain while showing how to do the skill
- 4) Supervise students performing the skill
- 5) Students explain while showing how to do the skill

Appendix 10: Participant informed consent (Study 1).

MAPPING THE EMERGENCY CARE SYSTEM IN THE DRC USING
THE WHO EMERGENCY CARE SYSTEM ASSESSMENT TOOL
Participant Consent Form

Dear Participant,

You are being invited to take part in a research project. This research aims to describe the current status of the emergency care system in the Democratic Republic of the Congo (DRC). You have been invited to participate because you have been involved in the provision or development of emergency care in the DRC.

Please take time to read the information presented here, which will explain the details of this project, and to ask the study team any questions about any part of this project that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research entails and how you could be involved. You will receive a copy of this information and consent form for your own records.

Your participation is entirely voluntary, and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are free to withdraw from the study at any point, even if you do initially agree to take part.

This study has been approved by the University of Cape Town Human Research Ethics Committee (HREC REF: 086/2021) and the Ethics Committee of the School of Public Health of the University of Kinshasa (REF ESP/CE/077/2021).

Participation responsibilities

- You will participate in an hour-long online survey related to emergency care in the DRC.
- You may also be asked to attend a working group session to discuss emergency care development in the DRC.
- Your responsibility will be to give honest input about the status of emergency care in the country.

Risks or benefits to participation

- No risks are expected with participation in this study.
- No identifying information (e.g. name, phone number) will be collected at any point in the ECSA process. All data will be de-identified and your responses will remain confidential.
- You will not be compensated for your time.
- You can decline to participate in this research, or you can stop participating in this research at any time with no negative consequences. This includes withdrawal after the first discussion.

-
- There is the potential for sensitive subjects pertaining to health condition or emergencies to come up during an interview. If needed, participants will be referred through the University of Cape Town for follow-up counselling.
 - You may benefit directly from the further development of emergency care in the DRC.

Who to contact with questions or concerns

Should you have any questions or concerns, you can contact the principal investigator, Prof Lee Wallis, at tel. +27 21 815 8818 or email lee.wallis@uct.ac.za or Prof Eric Mafuta at +243810318918. If you any concerns or complaints remain that have not been adequately addressed by the study investigators, you can contact Prof. Marc Blockman, Chair of the University of Cape Town Human Research Ethics Committee at tel. +27 021 406 6338 or email marc.blockman@uct.ac.za.

Declaration by participant

By signing below, I, (*name*), agree to take part in a research study titled "Mapping the emergency care system in the DRC using the WHO Emergency Care System Assessment Tool."

I declare that:

- I have read or had read to me this information and consent form, and it is written in a language with which I am fluent and comfortable.
- I have had a chance to ask questions, and all my questions have been adequately answered.
- I understand that taking part in this study is voluntary. I have not been pressured to take part.
- I may choose to leave the study at any time and will not be penalised or prejudiced in any way.
- I may be asked to leave the study before it has finished, if the researcher feels it is in my best interests, or if I do not follow the study plan, as agreed to.

Signed at (*place*) on (*date*)

Signature of participant: Signature of witness:

Declaration by investigator

I, (*name*), declare that:

- I explained the information in this document to (*participant name*):
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research

Signed at (*place*) on (*date*)

Signature of investigator: Signature of witness:.....

Appendix 11. Participant consent form (Study 2).

EVALUATION OF NEEDS AND SUPPLY OF EMERGENCY CARE IN KINSHASA, DRCONGO
Participant Consent Form

Dear Sir/Madam

We are part of a research team studying emergency care in Kinshasa. We would like to better understand the emergency care needs, as well as the unmet needs of the community, in order to improve the services.

We would like to ask your permission to:

- Interview you to ask you about the emergency healthcare needs of each householder living in the same house as you. This interview could take 20-30 minutes, and we will write down your answers on paper.
- Allow us to share the information and to publish the information gathered in a medical journal

We will:

- Make sure that all personal information collected on you and your household is kept confidential, and that no-one will be able to identify you or your family and household members from the information that is published.
- Endeavour to help improve emergency healthcare services in your community from the findings of this study.

This study will involve approximately 1217 households in Kinshasa over a month-long period. The study is part of a doctoral thesis and is funded by a research grant from the Royal College of Emergency Medicine. The research team involves people from the University of Cape Town, and interviewers from the School of Public Health of Kinshasa. The study has been approved by the Human Research Ethics Committee of the University of Cape Town and the School of Public Health of the University of Kinshasa.

Your participation in the study is voluntary and if at any time you would like to withdraw from the study, you are perfectly entitled to do so, and this will have absolutely no impact on the quality of care that will be provided to you and your household by any health services. Should you have any questions or concerns, you can contact the principal investigator, Prof Lee Wallis, at tel. +27 21 815 8818 or email lee.wallis@uct.ac.za or Prof Eric Mafuta at +243810318918.

If you any concerns or complaints remain that have not been adequately addressed by the study investigators, you can contact Prof. Marc Blockman, Chair of the University of Cape Town Human Research Ethics Committee at tel. +27 021 406 6338 or email marc.blockman@uct.ac.za/

Interviewed Householders Signature:.....

Printed Name: Date.....

Signature of person obtaining consent.....Role.....

Printed Name Date.....

Signature of Witness:.....Printed Name

Appendix 12. Participant consent form (Study 3)

NEEDS ASSESSMENT AND ACCEPTABILITY OF A COMMUNITY FIRST AID RESPONDER PROGRAMME
TO INCREASE OUT-OF-HOSPITAL CAPACITY IN KINSHASA, DR CONGO
Participant consent form

Dear Participant,

You are being invited to take part in a research project. Please take time to read the information presented here, which will explain the details of this project. Please ask the study staff any questions about any part of this project that you do not fully understand. It is especially important that you are fully satisfied that you clearly understand what this research entails and how you could be involved.

Your participation is entirely voluntary, and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do initially agree to take part.

This study has been approved by the Human Research Ethics Committee at the University of Cape Town and the Ethics committee of the School of Public Health of the University of Kinshasa.

What is this research study all about?

- The overarching aim of this 4-parts research study is to assess how the development of a country-specific CFAR programme could increase out-of-hospital in the DRC.
- This fourth part aim is to describe and evaluate the key aspects of the implementation of a pilot WHO CFAR training including the process, resources, course content and teaching method as well as knowledge acquisition and competency from the perspectives of both organisers and participants

Why have you been invited to participate?

- You are invited to participate because you were identified as a stakeholder whose background and current responsibilities could assist the research team in achieving the study's objectives.

What will your responsibilities be?

- You will attend a structured interview of no more than one hour's duration. At the beginning of this discussion, a summary of the results of the previous study on needs assessment utility and acceptability of a CFAR programme adapted to the DR Congo setting will be briefly presented. A summary of the structure and activities of the CFAR course you just participated in will also be presented as an example. The research team will provide further explanations as needed.
- Your responsibility will be to give honest opinions about the process, resources, course content and teaching method as well as knowledge acquisition from the perspectives of a course organisers / participants (underline whichever applies)

You are unlikely to benefit directly from this study. You will not be paid to take part in the study. There will be no costs involved for you if you do take part. The results from this research will be used to improve and contextualise the course to inform future rollouts and related research. We believe that this will ultimately translate into a more effective programme with to potential increase the out-of-hospital emergency care capacity in the country.

No risks are expected with participation in this study. The interview recording and transcripts will be held in the strictest of confidentiality and all responses will be anonymised.

If you do not agree to take part, what alternatives do you have?

- You can decline to participate in this research, or you can stop participating in this research at any time with no negative consequences.

Is there anything else that you should know or do?

You can contact the investigators:

- Principal investigator: Prof. Peter Hodkinson, Email: peter.hodkinson@uct.ac.za
- Senior coordinator : Prof Eric Mafuta, Ecole de Santé Publique, UNIKIN. Phone: +243810318918at Tel 0816903975 or Prof. Eric Mafuta at Tel. +243810318918 if you have any further queries or encounter any problems.

If you have any concerns or complaints that have not been adequately addressed by the study investigators, you can contact the Chair of Ethics Committee of the School of Public Health of the University of Kinshasa or the University of Cape Town Human Research Committee.

Study monitors, auditors, supervisors or Institutional Review Board members may need to inspect research records. Should this process occur, your identifying information will remain protected. You will receive a copy of this information and consent form for your own records.

Declaration by the participant

By signing below, I agree to take part in a research study entitled “Adapting a community first aid responder programme to increase out-of-hospital capacity in Kinshasa, Democratic Republic of Congo”.

I declare that:

- I have read or had read to me this information and consent form and it is written in a language with which I am fluent and comfortable.
- I have had a chance to ask questions, and all my questions have been adequately answered.
- I understand that taking part in this study is voluntary and I have not been pressured to take part.
- I may choose to leave the study at any time and will not be penalised or prejudiced in any way.
- I may be asked to leave the study before it has finished, if the researcher feels it is in my best interests, or if I do not follow the study plan, as agreed to.

Signed at (place) on (date)

Signature of participant: Signature of witness:

Declaration by the investigator

I (name) declare that:

-
- I explained the information in this document to (participant name):.....
 - I encouraged him/her to ask questions and took adequate time to answer them.
 - I am satisfied that he/she adequately understands all aspects of the research, as discussed above.

Signed at (place) on (date).....

Signature of investigator: Signature of witness:

Appendix 13. Participant consent form _Study 4

IMPLEMENTATION AND EVALUATION OF A PILOT WORLD HEALTH ORGANISATION'S
COMMUNITY FIRST AID RESPONDER TRAINING IN KINSHASA, DEMOCRATIC REPUBLIC OF CONGO

Participant Consent Form

Dear Participant,

We are a research team conducting studies on emergency care in the DR Congo. We are studying how the development of a community-based first aid training program could increase the supply of prehospital care in Kinshasa. For this phase, we want to implement and evaluate a pilot World Health Organisation's Community First Aid Responder (CFAR) training involving community health volunteers in Kinshasa. You were invited to participate to this training in your capacity registered community health volunteer at the health zone of Maluku 2. Therefore, we would like to collect some of your demographics data and evaluate your confidence, knowledge and first aid skills before and after the training to gauge the gain.

This study will involve around 50 participants and has received the approval of the Ethics Committee of the School of Public Health of the University of Kinshasa and the authorisation of the Director of the Ministry of Health's National Program on Emergency care, Disaster and Humanitarian Action. The training faculty comprises instructors from the Emergency Care Association of the DR Congo and the investigation team includes researchers from the School of Public Health of the University of Kinshasa and the University of Cape Town in South Africa. The study also received the approval of the Human Ethics Committee of University of Cape Town.

We assure you that:

1. All information received from you will be anonymised and kept strictly confidential. No one will be able to identify you from this information.
2. The results of this study will be used to contextualise and improve the upcoming CFAR courses involving other community members.

We would like to ask your permission to:

1. Evaluate your first aid confidence and knowledge at the beginning and at the end of the training using a short questionnaire. This survey could take approximately 15 minutes, and we will write down your answers on paper, compile them anonymously and analyse the data.
2. Publish the results of this study in a medical journal to inform the scientific community.

For more information about the study, or if you have any concerns, feel free to ask the investigators questions or contact:

- 1) The main coordinator: Prof Eric Mafuta, Cell 0810318918, Email: eric.mafuta@unikin.ac.cd
- 2) Kinshasa School of Public Health Ethics Committee: Prof D Makindu, Mobile 0815046570 Email: dariusmakindu@gmail.com
- 3) The principal investigator: Prof. Hodgkinson, 0828536116, Email: peter.hodkinson@uct.ac.za

Your participation in the study is voluntary and free. You have every right to decline to participate or withdraw at any time if you wish. It will have absolutely no impact on you.

Name of participant: Signature.....Date.....

Name of researcher obtaining consent.....Signature.....Date.....