

Exploring the Role of Community Health Workers in Improving Surgical Care Outcomes and Research in Rwanda: A Mixed-Methods Study, 2023

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ABSTRACT

INTRODUCTION: Community Health Workers (CHWs) play an increasingly vital role in primary healthcare across low- and middle-income countries (LMICs), yet their involvement in surgical care remains underexplored. In Rwanda, CHWs are well-integrated into the health system, but their potential to support surgical outcomes, particularly in post-operative care and research, has not been systematically examined.

METHODS: This mixed-methods study investigated CHWs' perceptions and roles in surgical care in Rwanda. Data were collected through four focus group discussions (FGDs) with 42 CHWs and a cross-sectional survey administered to 185 CHWs across rural and urban settings. Qualitative data were thematically analysed, while quantitative data were analysed using descriptive statistics.

RESULTS: CHWs demonstrated a comprehensive understanding of the surgical care continuum, including pre-operative education, post-operative follow-up, and complication recognition. Notably, 72.43% of surveyed CHWs reported encountering post-operative patients needing follow-up care, and 64.13% had identified complications such as wound infections or hospital readmissions. Nearly all participants (98.91%) expressed confidence in promoting community engagement and post-operative support. However, gaps in formal training, limited access to surgical knowledge, and barriers to participation in research were frequently cited. Despite this, 98.91% of CHWs expressed interest in contributing to surgical research, underscoring their untapped potential in data collection and health system strengthening.

CONCLUSION: CHWs in Rwanda are well-positioned to support surgical care, particularly through post-operative follow-up, patient education, and early identification of complications. Their trusted role in communities makes them ideal partners for expanding surgical outreach and research. Investing in targeted training and integration strategies could enhance surgical outcomes and reduce complications in low-resource settings.

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INTRODUCTION

Community Health Workers (CHWs) were introduced in Rwanda in 1995 to address the severe shortage of healthcare professionals following the 1994 Genocide against the Tutsis. Elected by their communities, CHWs serve as front-line providers, connecting individuals to formal healthcare services and delivering basic interventions such as health education, immunizations, malaria testing, and treatment for conditions like non-bloody diarrhea. Since the inception of the CHW program, Rwanda's life expectancy has increased from 50 to 70 years, accompanied by notable reductions in under-five and maternal mortality rates [1].

Rwanda currently has 58,567 CHWs, with 3–4 CHWs assigned to each of its more than 15,000 villages. Each village typically includes a male-female pair (*binômes*) responsible for managing childhood illnesses, one CHW focused on maternal health (Agent de Santé Maternelle or ASM), and another on health promotion [2,3]. In 2021, the Ministry of Health adopted a polyvalent model, expanding the scope of CHW responsibilities to deliver comprehensive, patient-centered care in coordination with the broader health system [4]. In 2024, Rwanda launched the 4x4 Health Workforce Reform, aiming to quadruple the health workforce density, including introducing a new cadre of young Community Public Health Workers (CPHWs) and expanding CHW services [5,6].

Despite the growing recognition of the importance of CHWs across various health sectors, their role in surgical care, especially post-operative care, remains underexplored. In many low- and middle-income countries (LMICs), surgical care continues to be perceived as a luxury rather than an essential service [7]. However, Meara et al. and Hagander et al. have argued that surgical care is a critical component of health systems, particularly in LMICs, where timely surgical interventions can significantly reduce morbidity and mortality [8,9].

Although global and regional evidence points to the effectiveness of CHWs in multiple areas of health delivery, there is limited research on their roles in surgical care in Rwanda. In particular, there is a significant knowledge gap regarding their potential to enhance post-operative follow-up care, detect early complications such as surgical site infections (SSIs), and improve surgical outcomes in rural communities [10,11]. Given the high burden of SSIs and the limited surgical workforce in Rwanda, the involvement of CHWs could be instrumental in filling this gap.

This study aims to explore the knowledge and perceptions of CHWs about surgical care in Rwanda, focusing on how they can support post-operative follow-up, enhance patient education, and contribute to early detection of complications.

METHODS

Study Design and Settings

This study employed a sequential exploratory mixed-methods design, conducted between October 2022 and November 2023, to investigate the perspectives, roles, and potential contributions of Community Health Workers (CHWs) in surgical care delivery and research within the Rwandan health system. The study was implemented across two purposely selected health districts, Kibagabaga and Kibogora, chosen to represent contrasting urban and rural contexts.

Kibagabaga Health District, located in Gasabo District, represents an urban setting characterized by high population density, better infrastructure, proximity to referral hospitals, and a well-established CHW network with enhanced digital connectivity. This setting allowed exploration of CHW involvement in surgical care under relatively resource-rich conditions.

Kibogora Health District, situated in Nyamasheke District, represents a rural and resource-constrained environment with a more dispersed population and limited infrastructure. Despite these challenges,

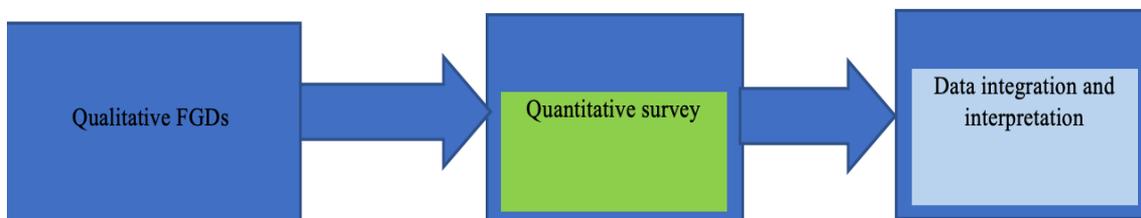


Figure 1: Sequential exploratory mixed-methods design

the district plays a vital role in delivering primary healthcare to remote communities, offering valuable insights into CHWs' roles in low-resource contexts.

The study was conducted in two phases. In the first phase, qualitative data were collected through Focus Group Discussions (FGDs) with CHWs to explore their experiences and perceptions. Findings from this phase informed the design of a structured questionnaire used in the second phase to collect quantitative data. Integration of findings from both phases enabled a comprehensive understanding of CHWs' engagement in surgical care and research. (Figure 1)

Study Population and Eligibility Criteria

The study population consisted of CHWs actively involved in healthcare service delivery in the Kibagabaga and Kibogora districts. Eligibility criteria included CHWs who were at least 18 years old, had a minimum of six months of experience in community healthcare, and had experience in providing surgical care or post-operative services. Participants had to be able to communicate in Kinyarwanda or English. CHWs with less than six months of experience or those unable to communicate in these languages were excluded from the study.

Data Collection Procedures and Tools

Data collection occurred in two phases: qualitative and quantitative. During the qualitative phase, an interview guide for the FGDs was developed in English and translated into Kinyarwanda by a certified translator to ensure consistency. The FGDs were audio-recorded with participant consent, transcribed verbatim, and then translated into English for analysis. Each FGD session lasted approximately 30 to 45 minutes. In the quantitative phase, a semi-structured questionnaire was used to collect data on CHWs' knowledge, practices, and confidence regarding surgical care, with a specific focus on post-operative follow-up. The questionnaire was designed to capture CHWs' roles, knowledge gaps, and their perceived capacity in contributing to surgical care.

Sampling and Sample Size Calculation

Stratified purposive sampling was employed to ensure representation from both urban and rural regions (Kibagabaga and Kibogora). Two-stage cluster sampling was used, first selecting random

clusters and then gathering data from all CHWs within those selected clusters. Systematic random sampling was applied to select cell-villages within each health facility. The sample size for the quantitative survey was calculated to achieve a minimum of 185 respondents, ensuring enough statistical power to detect significant associations between variables.

Data Management and Statistical Analysis

A convergent mixed-methods approach was used. Quantitative data from 185 CHWs were analyzed using SPSS v26, applying descriptive statistics to summarize socio-demographics and perceptions on surgical care. Qualitative data from four FGDs (42 participants) were transcribed, translated, and thematically analyzed using Braun and Clarke's framework. Two independent researchers coded the data to ensure reliability. Findings from both methods were triangulated to enrich interpretation and ensure validity.

Ethical Considerations

Ethical approval for this study was granted by the Institutional Review Board (IRB) of the College of Medicine and Health Sciences, University of Rwanda (No 527/CMHS IRB/2023). Informed consent was obtained from all participants before data collection, ensuring they were fully aware of the study's purpose, their voluntary participation, and the confidentiality of their responses. Data were stored securely, and personal identifiers were removed during the analysis to maintain participants' privacy.

RESULTS

This study employed a mixed-methods approach to explore the perceptions, knowledge, and involvement of Community Health Workers (CHWs) in surgical care in Rwanda. A total of 42 participants took part in four FGDs, while 185 CHWs completed the quantitative survey. The findings are presented in two main parts: (1) qualitative themes emerging from FGDs and (2) quantitative survey results, followed by an integrated analysis of perceptions, roles, barriers, and training needs.

Qualitative Findings

Analysis of the focus group discussions with

CHWs revealed three main themes regarding their experiences and perspectives on surgical care in rural Rwanda: (1) Strong Willingness and Unique Position to Support Surgical Care; (2) Limited Knowledge and Capacity in Surgical Care; and (3) The Need for Empowerment, Training, and Systemic Support. While CHWs touched upon surgical research, their discussions predominantly centered on gaps, roles, and opportunities within surgical care delivery.

Strong Willingness and Unique Position to Support Surgical Care: CHWs expressed strong motivation and readiness to contribute meaningfully to surgical care, especially at the community level. They viewed themselves as trusted community members who could play critical roles in patient education, emotional support, home-based follow-up, and early identification of complications after surgery.

One participant stated:

"I would visit operated patients at home, provide moral support, advise on basic hygiene... and ensure they follow up with healthcare providers as instructed." (FGD1P1)

Others emphasized their availability and proximity to patients:

"We are close to the people; we see them every day. If we are trained, we can help them heal properly after surgery." (FGD3P7)

Some CHWs already provided informal support to patients recovering from surgery, though they lacked the confidence and clinical guidance to do so effectively:

"We try to help, but we're not sure if we are doing the right thing." (FGD2P4)

Limited Knowledge and Capacity in Surgical Care

CHWs consistently reported having minimal training or knowledge in the area of surgical care, especially regarding postoperative management and early identification of surgical complications such as surgical site infections (SSIs). This lack of preparedness limited their ability to support patients effectively during the perioperative period.

One CHW reflected:

"I wish I knew more about what to do for someone after surgery. Sometimes we only hear about it when problems have started." (FGD1P3)

Another participant highlighted the gap between general CHW responsibilities and surgical-specific

tasks:

"We know how to follow pregnant women or check on nutrition, but for someone who had surgery, we don't know what signs to look for." (FGD2P6)

The knowledge gap was not only clinical but also extended to health system navigation and follow-up processes.

Quantitative findings

Table 1 summarizes the demographic characteristics of the Community Health Workers (CHWs) who participated in this study. Most CHWs are female (81.62%), with a smaller male representation (18.38%). The largest age group is 41-50 (38.92%), followed by those over 50 (33.51%). The majority of CHWs are categorized as "Binômes" (69.73%), and most work in urban areas (57.84%). A significant portion are married (71.35%), with smaller groups being single (18.92%) or widowed (9.73%). In terms of education, most CHWs have completed primary education (P6 level, 37.84%), with others holding secondary (28.11% O Level, 17.30% A Level) or vocational education (9.73%). Fewer have a university education (4.86%) or literacy classes only (2.16%).

CHWs' Perceptions

Perception of Surgical Care: CHWs defined surgical care in two main ways: as specific "body opening procedures" like Caesarean sections, or as a broader, more complex process involving diagnosis, surgery, and post-operative care. This aligns with the quantitative finding that a significant proportion (72.43%) of CHWs encountered post-operative patients requiring follow-up care, emphasizing their active role in post-operative care support.

CHWs understand that surgical care is multifaceted, involving both the procedure itself and the comprehensive care that follows, highlighting that CHWs' role may be essential in the continuum of surgical care, especially in surgical follow-up and surgical site infections prevention.

Perception of Surgical Research: CHWs expressed strong support for surgical research, viewing it as a means to address unknown surgical issues and improve community knowledge. They saw research as an avenue to uncover unmet

Table 1: Socio-Demographic Characteristics of the Study Participants (n=185)

Variable	Categories	Counts	Percentages
Gender of CHWs	Female	151	81.62
	Male	34	18.38
Age	31-40	37	20.00
	41-50	72	38.92
	≤30	14	7.57
	>50	62	33.51
	ASM	53	28.65
Category of CHWs	Binômes	129	69.73
	Health Promotion	3	1.62
Location of CHWs	Rural	78	42.16
	Urban	107	57.84
	Married	132	71.35
Marital Status of CHWs	Single	35	18.92
	Widowed	18	9.73
Highest Education level completed	Literacy classes only	4	2.16
	Primary P6 Level	70	37.84
	Secondary A Level	32	17.30
	Secondary O' Level	52	28.11
	University	9	4.86
	Vocational training	18	9.73

needs, promote early interventions, and encourage healthcare-seeking behaviors.

Almost all (98.9%) of CHWs in the survey expressed confidence in contributing to post-operative follow-up, suggesting that they perceive their role in surgical care as both important and aligned with broader healthcare improvement efforts, including those informed by research.

Potential Roles and Responsibilities of CHWs in Surgical Care

Supporting Patient Care and Education: CHWs highlighted their ability to provide basic post-operative care, including wound management, follow-up visits, and patient education. This was consistent with the quantitative finding that 60.11% of CHWs recommended "simple dressing" as a crucial follow-up task, with 58.04% already providing such support. Both qualitative and quantitative data show that CHWs are seen as crucial in promoting adherence to medical advice

and supporting patients in recovery, demonstrating their indispensable role in surgical aftercare.

Mobilizing the Community for Surgical Care:

CHWs described their role in mobilizing the community to seek surgical care and raising awareness about surgical services. This community advocacy was identified as a key responsibility that can help address misconceptions about surgery, particularly in rural areas. Almost all (98.9%) of CHWs believed they could contribute to post-operative follow-up, indicating strong potential for CHWs to engage the community in seeking surgical care and preventing complications.

Preventing Surgical Complications:

CHWs emphasized the importance of early interventions and recognizing warning signs of complications, such as infection or delayed recovery. They identified their role in educating patients and facilitating referrals as key preventive strategies. 64.13% of CHWs encountered post-operative

complications like purulent drainage, delayed recovery, or readmissions. Importantly, 100% of CHWs believed they could play a role in preventing these complications, especially through early detection and follow-up support.

Potential Roles and Responsibilities in Surgical Research

Community Mobilization and Data Collection:

CHWs expressed interest in participating in surgical research, believing that their trust within the community could facilitate higher participation in research initiatives. They also saw themselves as key players in collecting data from the community. While there was limited formal engagement in surgical research, CHWs demonstrated a readiness to contribute to future studies, with 98.91% indicating their willingness to participate in surgical care follow-ups and research.

Barriers to Involvement in Surgical Research:

CHWs identified significant barriers, such as a lack of knowledge about ongoing surgical research and the negative perceptions that sometimes exist in the community. Some also mentioned that they were often unaware of research outcomes after participating. Similarly, the survey highlighted that many CHWs had limited experience with surgical research but were involved in other health-related research activities. A significant number of CHWs (35.87%) expressed a need for more education on surgical research to increase their engagement.

Desire for Further Training and Involvement:

CHWs expressed the need for more training in basic surgical care and research participation to better serve their communities. They suggested that community outreach to raise awareness about surgical care and research was essential to fostering greater involvement. 69.73% of CHWs identified as "Binômes," with a mix of educational backgrounds, including primary and secondary school education. This underlines the potential benefit of further training to enhance their skills and capacity in surgical care provision.

Challenges in Surgical Care Provision

Post-Operative Follow-Up and Readmissions:

The lack of community-based post-operative follow-up services, particularly in rural areas, was

identified as a major barrier to recovery. CHWs expressed concern about patients, especially those undergoing Cesarean sections, who faced complications but lacked home-based follow-up care. 72.43% of CHWs had encountered post-operative patients in need of follow-up care, and 64.13% reported complications such as delayed recovery or readmissions. This highlights a critical gap in post-operative care that CHWs could help bridge, particularly through follow-up activities like simple dressing and patient support.

Lack of knowledge in Surgical Care:

A significant gap in surgical care knowledge was reported, especially in rural areas where misconceptions about surgery, such as the belief that it leads to disability, were prevalent. 35.87% of CHWs reported encountering post-operative complications in their communities, while the survey also revealed a strong desire among CHWs to be involved in preventing such complications, underscoring the need for greater education on surgical care.

DISCUSSION

Rwanda has demonstrated an increasing commitment to closing surgical care gaps through policy initiatives and innovations in healthcare delivery. However, there remains a paucity of research on how CHWs can be effectively integrated into the continuum of surgical care. The active participation of CHWs in post-operative management could significantly reduce surgical complications by ensuring timely follow-up, wound care, infection monitoring, and patient education [12].

The study's qualitative findings indicate that CHWs possess a comprehensive understanding of surgical care as a continuum involving diagnosis, intervention, and recovery. This mirrors trends observed in other LMICs where CHWs are engaged in post-operative recovery support [13,14]. In this study, 72.43% of CHWs reported encountering post-operative patients in need of follow-up care. These echoes result from Tanzania, where CHWs played a pivotal role in reducing complications by facilitating early identification of warning signs and promoting patient adherence to follow-up schedules [15]. Given Rwanda's strained healthcare infrastructure, CHWs' ability to deliver wound management, education, and monitoring

represents a valuable complement to facility-based surgical care.

The qualitative data emphasize the important role of CHWs in mobilizing communities around surgical care, especially in rural areas where myths and misconceptions persist. CHWs' efforts in advocating for surgical intervention reflect broader findings from the community health literature, which consistently highlight their influence on health-seeking behaviour [16]. In this study, 98.91% of CHWs expressed confidence in their ability to engage communities in post-operative care. This is consistent with findings by Mugisha et al., who showed that CHWs in Rwanda have played a key role in overcoming resistance to healthcare interventions, including those related to surgical care [10].

A total of 64.13% of CHWs in the study reported encountering post-operative complications such as purulent drainage and readmissions. Encouragingly, all surveyed CHWs expressed confidence in their ability to help prevent such outcomes. This aligns with evidence suggesting that CHWs, when appropriately trained, can recognize and address early signs of complications, thereby preventing escalation and improving surgical outcomes [17]. Their proactive involvement in monitoring patients post-operatively can serve as a cost-effective strategy for improving surgical care in resource-limited settings like Rwanda. While CHWs' involvement in surgical research remains limited, their willingness to contribute is high: 98.91% of CHWs surveyed indicated interest in participating in research. This aligns with global trends identifying CHWs as underutilized resources in community-based research, particularly for data collection and community engagement [18]. Barriers such as limited training and lack of information about ongoing research were noted, reflecting findings from Kenya, where CHWs similarly expressed enthusiasm but lacked resources to engage fully [12]. CHWs strongly desired training and capacity-building in research and surgical care. Prior studies show that such investments improve CHWs' ability to contribute meaningfully to health system strengthening, patient care, and public health research [19].

Persistent challenges in surgical care were also evident, particularly the absence of structured post-operative follow-up systems in rural areas like Kibogora. This is not unique to Rwanda; similar gaps have been reported in other sub-Saharan

African countries, where limited follow-up contributes to high complication and readmission rates [20]. CHWs are uniquely positioned to address these gaps but require additional training and resources to do so effectively. The study also uncovered a knowledge gap in rural communities concerning surgical procedures, often influenced by stigma or fear. Misconceptions such as surgery being a form of punishment or inherently resulting in disability underscore the need for culturally sensitive education efforts. CHWs, by virtue of their community trust and accessibility, are ideally placed to lead such initiatives. Studies from other LMICs have shown that community-based education led by CHWs is effective in dispelling myths and promoting informed surgical health-seeking behaviour [21].

While this study offers valuable insights into the role of Community Health Workers (CHWs) in enhancing surgical care in Rwanda, it is important to acknowledge its limitations. Firstly, the study relies on self-reported data from CHWs, which could introduce bias, as respondents may overstate their involvement or abilities. Additionally, the research was conducted in specific urban and rural settings, which may limit the applicability of the findings to other regions of Rwanda or to different low-resource contexts.

CONCLUSION

Despite the success of CHWs in improving health outcomes in Rwanda across multiple domains, their potential role in surgical care has yet to be fully explored. The lack of a structured approach to involving CHWs in surgical care delivery poses a critical challenge in improving postoperative outcomes and reducing complications such as Surgical Site Infections (SSIs), which remain a leading cause of morbidity and mortality in low-resource settings. Although research in other countries has suggested that CHWs can contribute significantly to post-operative care, early detection of complications, and community-based health promotion, there is a dearth of studies specifically examining their role in the Rwandan context. Furthermore, geographic barriers and limited access to healthcare facilities exacerbate the need for community-based interventions in surgical care. The integration of both qualitative and quantitative findings highlights the critical role of CHWs in improving surgical care outcomes in Rwanda.

CHWs are indispensable to improving surgical care outcomes, particularly in rural settings. Their trust within the community, coupled with their active role in health care delivery, makes them valuable assets to Rwanda's healthcare system. Expanding CHWs' training in surgical care and research, coupled with increased community awareness, could help bridge existing gaps in surgical care delivery, enhance surgical outcomes, and contribute to broader healthcare improvements in Rwanda.

Future efforts should focus on expanding CHWs' training in basic surgical care and increasing community awareness about surgical services and research. By addressing the barriers to involvement and empowering CHWs with the necessary tools, Rwanda can enhance surgical care delivery and surgical research outcomes at the grassroots level, ensuring more inclusive and effective healthcare.

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