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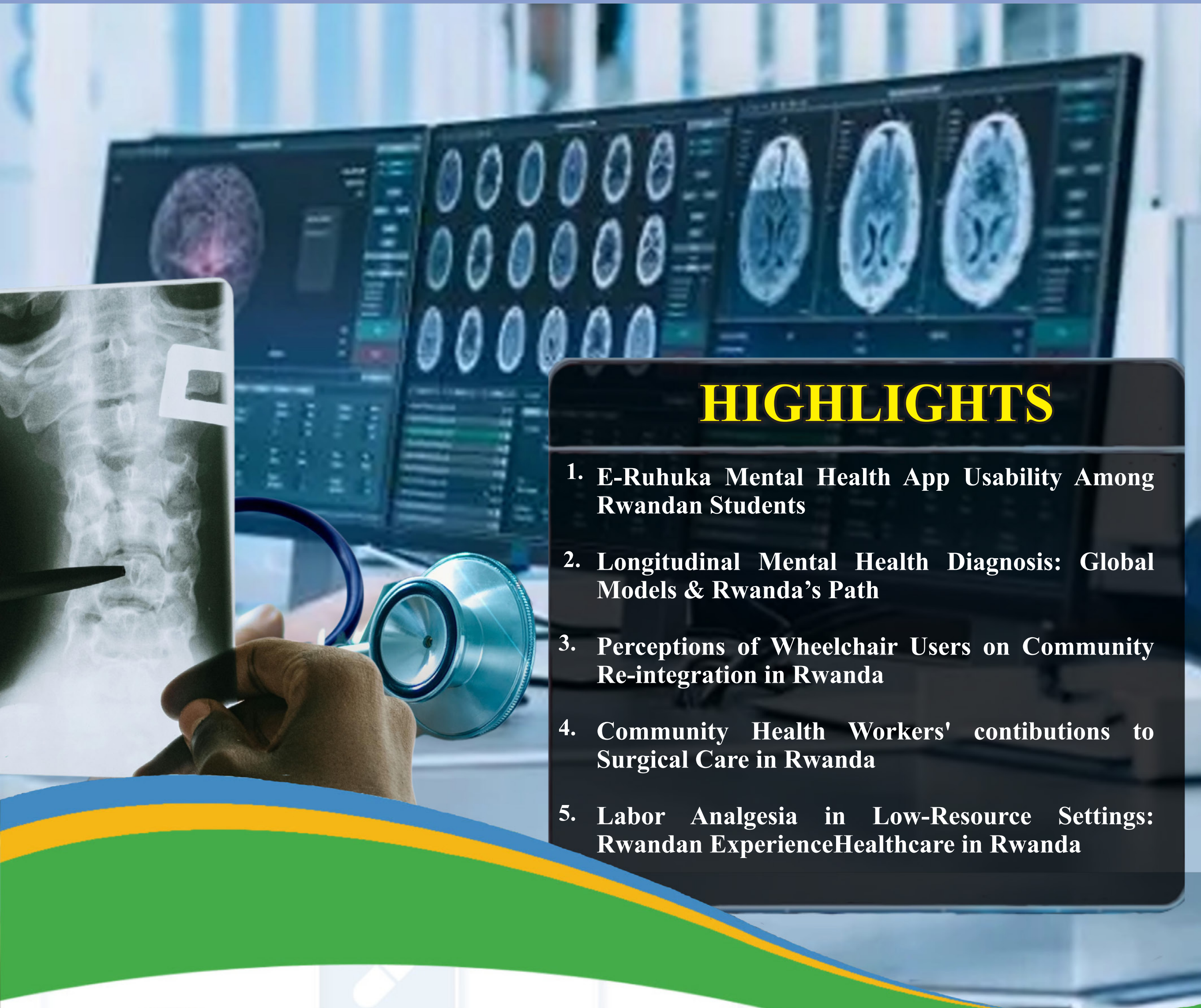

HIGHLIGHTS

1. E-Ruhuka Mental Health App Usability Among Rwandan Students
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General Information

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Its mission is to serve as a knowledge sharing platform for national and international public health scientific information. Content published under RPHB will be used to control and address potential public health outbreak threats and strengthen health systems through real time availability of information.

This will allow more and effective communication between policy makers, researchers and health practitioners.

A new issue is published quarterly with supplements and special reports. Publication materials are submitted online at https://www.rbc.gov.rw/publichealthbulletin/manuscripts/submission and should fulfil the RPHB's instructions.

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Contacts

Email: rwandapublichealtbulletin@gmail.com
Website: https://www.rbc.gov.rw/publichealthbulletin/

Address

Rwanda Public Health Bulletin Secretariat
KG 203St., City of Kigali, Rwanda

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FOREWORD

ORIGINAL RESEARCH

Foreword

Dear readers,

I am pleased to introduce this publication of the Rwanda Public Health Bulletin (RPHB), which brings together critical research focusing on advancing the quality, accessibility, and person-centeredness of healthcare in Rwanda through context-specific innovations and inclusive approaches. The studies and insights shared in this issue exemplify the forward-looking, equity-driven public health research vital for building a resilient, responsive, and inclusive health system.

This publication captures a diverse range of health system challenges and innovations, from the role of community health workers in improving surgical care outcomes, to the development and assessment of digital tools for mental health support, to the introduction of labor analgesia in low-resource settings, and the lived experiences of wheelchair users with spinal cord injuries. It also features a comprehensive review of global models for longitudinal mental health diagnosis, assessed through the lens of local relevance and feasibility.

The role of community health workers in surgical care and post-operative follow-up demonstrates the power of task-shifting and community-based models in expanding access to quality care. The evaluation of the E-Ruhuka mental health mobile application among university students signals the importance of leveraging digital innovation to address emerging mental health needs, particularly among the youth. The implementation of labor analgesia in a major teaching hospital reflects our dedication to improving maternal care and ensuring that every woman receives safe and respectful care during childbirth.

Equally important is the attention given to the rehabilitation and reintegration of persons with disabilities. The qualitative study exploring the experiences of wheelchair users after spinal cord injury rehabilitation reminds us that health does not end at hospital discharge. True healing requires support for social inclusion, accessibility, and dignity. Moreover, the review of longitudinal mental health diagnostic models offers a valuable lens for thinking about how Rwanda can better identify, monitor, and support individuals living with mental illness across their lifespan.

The findings in this publication share a common commitment to understanding and addressing health needs from the perspective of those most affected, such as patients, healthcare users, and communities. They highlight the importance of designing and implementing health interventions that are scientifically sound, culturally sensitive, inclusive, and sustainable. In this regard, the studies in this publication align with Rwanda's broader health sector vision to deliver person-centered care that respects dignity, enhances experience, and promotes health equity.

May this publicaion serve as both a source of knowledge and a call to action for policymakers, health professionals, researchers, and communities to continue investing in inclusive, evidence-based, and person-centered health care in Rwanda.

As we move forward, let us remain steadfast in our mission to build a health system that is equitable, resilient, and centered on the needs of the people we serve.

Yours sincerely,

Prof. Claude Mambo Muvunyi, MD, PhD
Editor-In-Chief -The Rwanda Public Health Bulletin (RPHB)
Director General- The Rwanda Biomedical Centre (RBC)

Original Research

Open Access

Rwanda Public Health Bulletin

Evaluating the Usability, User Experience, and Satisfaction of the E-Ruhuka Mental Health Mobile Application Among University Students in Rwanda, 2025

Vincent Sezibera[1], Celestin Twizere[2], Josias Izabayo[1,*], Jean de Dieu Bugingo[4], Cedric Manirafasha[4], Joseph Kalisa[1], Pauline Atete[1], Prince Uwizeye[5], Belise Blandine Isingizwe[1], Juliette Gasana[1], Aurore Nishimwe[2], Yves Gashugi[6], Pasteur Butoya[1], Christian Ndahiriwe[1], Chaste Uwihoreye[6], Darius Gishoma[3], Robert N. Jamison[7]

[1]*College of Medicine and Health Sciences, University of Rwanda, Kigali, Rwanda*
[2]*Centre of Excellence in Biomedical Engineering and E-Health, University of Rwanda, Kigali, Rwanda*
[3]*Mental Health Division, Rwanda Biomedical Center, Ministry of Health, Kigali, Rwanda*
[4]*Eritcus, Kigali, Rwanda*
[5]*Uyisenga Ni Manzi, Kigali, Rwanda*
[6]*Rwanda Psychological Society, Kigali, Rwanda*
[7]*Pain Management Center, Departments of Anesthesia and Psychiatry, Brigham and Women's Hospital, Harvard Medical School, Boston, USA*

ABSTRACT

INTRODUCTION: Mental illness affects millions of people worldwide, and Innovative digital solutions are essential to improving mental health literacy, overcoming access barriers, and enhancing engagement with care. This is a pilot cross-sectional survey study designed to evaluate a mental health application (App) usability in Rwanda.

METHODS: A cross-sectional study design was employed to assess the usability, user experience, and satisfaction with the E-Ruhuka app. A total of 78 students from the University of Rwanda, College of Medicine and Health Sciences, participated in the study. The evaluation utilized the System Usability Scale (SUS), the User Experience Questionnaire (UEQ), and the Client Satisfaction Questionnaire (CSQ) to measure key outcomes.

RESULTS: The majority of participants (78.3%) rated their experience with the App as good or excellent, with 74.4% expressing high satisfaction. However, only 51.3% rated the App's usability as good or acceptable based on the System Usability Scale Questionnaire (SUSQ). Participants provided specific recommendations to enhance usability, including improved navigation, multilingual support, offline access, interactive features such as live chat with mental health professionals, and an emergency support function.

CONCLUSION: Findings from this pilot study indicate high user satisfaction and positive engagement with the E-Ruhuka app. However, usability challenges highlight the need for refinements to improve functionality and accessibility. Implementing suggested improvements will be essential to maximizing the App's effectiveness in promoting mental health awareness and support.

***Corresponding author:**
Josias Izabayo

College of Medicine and Health Sciences, University of Rwanda, Kigali, Rwanda

Email: izabayojosias@gmail.com

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INTRODUCTION

Mental illness is a major global health challenge, significantly impacting individuals and societies [1]. According to the World Health Organization (WHO), approximately one in eight people, the equivalent of 970 million individuals, suffer from mental and behavioral disorders, with anxiety and depression being the most prevalent [2]. Mental and substance use disorders were the fifth leading cause of global disability-adjusted life years (DALYs) in 2010 [3], and more recent estimates suggest that these conditions account for 32.4% of years lived with disability (YLDs) and 13.0% of total DALYs worldwide [4]. This burden is particularly pronounced in Low- and Middle-Income Countries (LMICs), including sub-Saharan Africa, where mental disorders contribute to approximately 10% of their total disease burden [5]. Despite this high prevalence, mental health services in these regions remain critically underdeveloped. The rising prevalence of mental disorders can be attributed to different risk factors such as poverty, violence, poor education, unemployment, lack of housing, oppression, stigma, and trauma [1,6,7]. In particular, there are serious gaps in knowledge and mental health treatment in Sub-Saharan Africa [1,3].

Mental health disorders are of particular attention in Rwanda, whereby more than 20% of Rwanda's general population, and 52% in the sub-sample of survivors of the 1994 genocide against the Tutsi [8] have evidence of significant trauma and mood disorders. Despite the high prevalence of these mental disorders, the utilization of mental health services is still very low [8]. This may be due to different factors, including fear of mental health stigma and lack of awareness of mental health, sociocultural barriers, and financial and geographical accessibility [1]. Prior studies indicate that the major barriers comprise limited availability and affordability of mental healthcare services, insufficient mental healthcare strategies, lack of education about mental disorders, and negative attitudes toward mentally disordered patients [1,9]. In response, the government of Rwanda has established mental health services in district hospitals [8]. In addition, the Government of Rwanda has tried to implement universal health coverage (UHC) that allows all Rwandans access to health services and ensures that these services do not expose the users to financial hardship. Despite these initiatives, there is still a major gap in mental health service utilization [1].

The development of the E-Ruhuka application was informed by Rwanda's ongoing investment in digital infrastructure and the increasing demand for accessible mental health services. National statistics indicate that mobile phone ownership has grown significantly in recent years, reaching 85% of households by 2024, with internet penetration at 34.4% [15]. However, smartphone penetration remains limited at 14.6% [16], underscoring the need for inclusive, low-bandwidth solutions. Companies like Babyl have built on these efforts by the government of Rwanda through delivering medical services via phone calls and internet-based applications [17]. However, these telehealth services have not yet incorporated mental health services. We believe that e-Mental health presents a valuable opportunity to address existing challenges and to enhance mental health care in Rwanda. It can offer a means to meet patients' emotional and psychological needs while expanding access to essential services. As a multidisciplinary approach integrating information technology and computer science, e-Mental health enables the remote delivery of psychiatric care to improve service accessibility in underserved and distant clinical areas.

The aim of this pilot study is to evaluate the usability, user experience, and satisfaction of the E-Ruhuka e-Mental health app among University of Rwanda students and gather recommendations for improving the App.

METHODS

Settings

Researchers recruited participants from two campuses in Rwanda: one located in the City of Kigali at Remera Campus and another located in the Southern Province at Huye Campus. The campuses were specifically chosen because they host two main mental health centres that can provide mental health support services. The Remera campus hosts the University's Center of Mental Health, while the Huye campus has a facility that provides clinical psychology services. These settings included participants who spoke and read English and were used to using smartphone apps.

Study Subjects

The target group for this study consisted of students aged 18–25 years who attended the University of Rwanda, College of Medicine and Health Sciences, and who had a self-reported history of a mental health disorder. All interested participants completed an informed consent and were trained in using the App. Inclusion/exclusion criteria consisted of 1) owning a smartphone, 2) being able to understand and write English, 3) being 18 years or older, and 4) having a self-reported history of a mild to moderate mood disorder. A convenience sampling method was used to recruit individuals who were accessible and willing to participate in the study.

Data Collection Tools

The following questionnaires were used in this study. The System Usability Scale Questionnaire (SUSQ) is a 10-item self-reported measure used to assess the usability of the E-Ruhuka app. Each item is scored on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The scale has demonstrated good reliability, with a Cronbach's alpha of 0.62. Total scores range from 10 to 50. These scores were then converted to percentages, resulting in a range of 20 to 100. Based on score interpretation, a score of 100-90 is considered excellent, 89-80 good, 79-70 acceptable, 69-60 poor, and 59 or below bad. This tool is widely used in assessing usability in testing systems and applications [18,19].

The User Experience Questionnaire (UEQ) is a 6-item self-reported questionnaire used to measure participants' user experience of the interactive App. Each item is scored on a 7-point Likert scale, ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). Total scores range from 6 to 42. The scale has demonstrated good reliability, with a Cronbach's alpha of 0.84. A score of 42-38 is considered excellent, 37-34 good, 33-30 acceptable, 29-26 poor, and 25 or below bad. This tool is popularly used to determine whether an app is user-friendly and has features that are easy to navigate. This measure possesses excellent reliability and validity [19,20].

The Client Satisfaction Questionnaire (CSQ) is an 8-item self-reported questionnaire designed to assess the participants' satisfaction with the App. It has demonstrated good reliability (Cronbach's alpha=0.91). Total scores range from 8 to 56. Scores between 56-50 are excellent, 49-44 good, 43-38 acceptable, 37-32 poor, and 31 and below very poor. This tool is a standardized measure to assess satisfaction with services provided. It was adapted to assess services and products an app may offer to users [19,21].

Intervention: E-Ruhuka Application

We developed an e-Mental health application (E-Ruhuka) (Figure 1), which is the first-ever e-Mental health app in Rwanda, designed to support mHealth professionals and to serve as an alternative to traditional mental health services. The App includes features that provide essential mental health education, self-help advice, and practical tips for managing mental health challenges. Additionally, it offers self-screening tools to help users identify and assess their mental health status. E-Ruhuka offers three distinct user interfaces, each tailored to serve its respective users effectively: clients, therapists, and technology/server administrators.

The client interface provides essential self-help tools and facilitates access to professional mental health support. It includes self-screening tools that allow users to assess their mental health status through validated measures, which can be shared with psychologists and other mental health providers. It offers psychoeducation resources that provide evidence-based materials on mental health, coping strategies, and wellness. Mindfulness and relaxation exercises, such as guided meditation and breathing techniques, are available to help users manage stress. A journaling feature enables users to track their thoughts and emotions, designed to promote self-reflection. Finally, the platform allows patients to have full information on available mental health services and to book appointments with therapists directly if needed. The therapist interface is designed to support mental health professionals in effectively managing patients. Therapists can access patient screening scores to review assessment results and to make informed clinical decisions. The system also includes an appointment management feature, enabling therapists to view and manage scheduled appointments. The technology/server administrator interface ensures the platform's smooth operation and security. This interface includes backend management for system maintenance, data storage, and technical updates, and helps to ensure security and data privacy to meet ethical and legal standards.

Data Analysis

Quantitative data collected from the online surveys were analyzed using IBM SPSS Statistics 29. Descriptive statistical methods were utilized to summarize the data, including the calculation of percentages and frequencies, and to evaluate participants' responses regarding the usability, user experience, and satisfaction with the App. These analyses provided insights into the participants' overall interaction with the system, their level of satisfaction, and the ease of use of the platform. Furthermore, three open-ended qualitative questions were asked to gather participants' recommendations for improving the App: 1) What additional features could be incorporated to increase the App's impact on promoting mental health awareness? 2) How could the App be improved to offer more comprehensive and personalized mental health support? 3) What design or accessibility considerations could be implemented to ensure the App is user-friendly and accessible to all users?

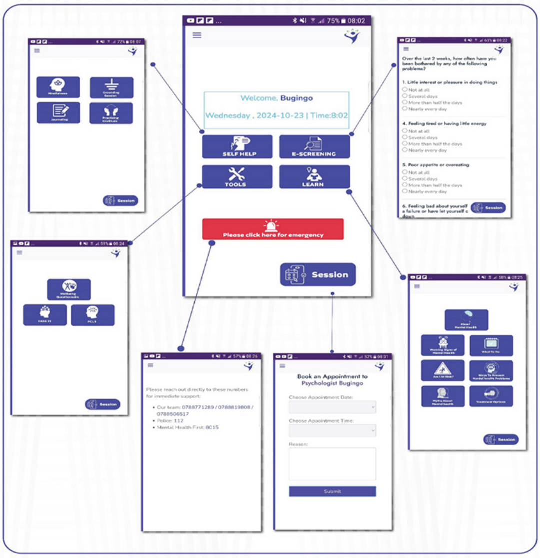
Ethical Considerations

Ethical approval for this cross-sectional study was obtained from the University of Rwanda, College of Medicine and Health Sciences Institutional Review Board (No 544/CMHS IRB/2023).

RESULTS

Characteristics of participants

Seventy-eight (N=78) participants were recruited for this study (Table 1). They averaged 22.7 years of age (SD = 1.9), and the majority were male (63%). More than half (51.3%) were second-year students, and 28% were in their fourth year. Ten percent (10.3%) were enrolled in a master's program (Table 1). Nearly all participants were single (98.7%).



Welcome, Bugingo

Wednesday , 2024-10-23 | Time:8:02

Over the last 2 weeks, how often have you been bothered by any of the following problems?

1. Little interest or pleasure in doing things
○ Not at all
○ Several days
○ More than half the days
○ Nearly every day

4. Feeling tired or having little energy
○ Not at all
○ Several days
○ More than half the days
○ Nearly every day

5. Poor appetite or overeating
○ Not at all
○ Several days
○ More than half the days
○ Nearly every day

6. Feeling bad about yourself a failure or have let yourself o down

Please reach out directly to these numbers for immediate support:

- Our team: 0788771289 / 0788819808 / 0788506517
- Police: 112
- Mental Health First: 8015

Book an Appointment to Psychologist Bugingo

Choose Appointment Date:

Choose Appointment Time:

Reason:

Figure 1: *Graphic client interface of E-Ruhuka*

Table 1: *Sociodemographic characteristics of participants (N=79)*

Variables	Frequency	Percentage
Gender		
Male	49	62.8
Female	29	37.2
Education		
year 2	40	51.3
year 3	8	10.3
year 4	22	28.2
Master's student	8	10.3
Marital status		
Single	77	98.7
Married	1	1.3
Age [mean (SD)]	[22.3 (1.9)]	

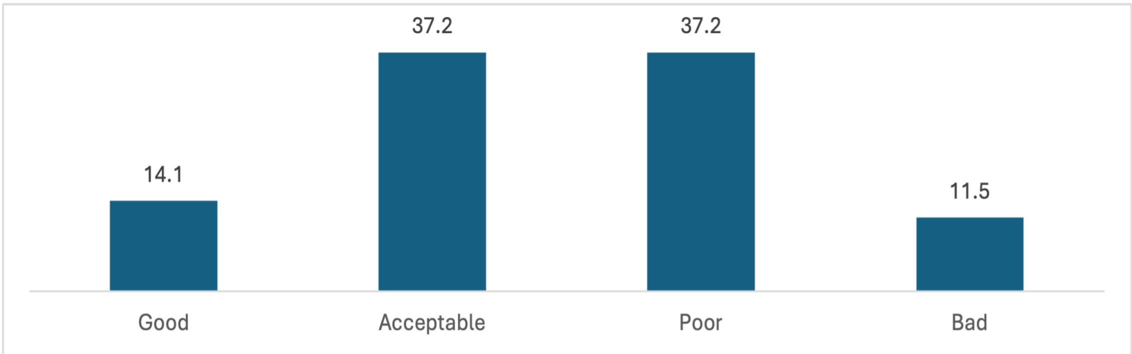


Figure 2: *Usability rating of the E-Ruhuka application on the SUSQ.*

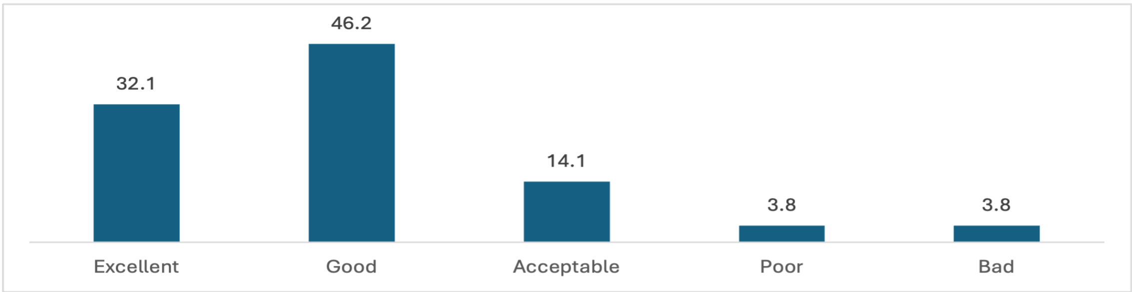


Figure 3: *User experience rating of the E-Ruhuka App on the UEQ.*

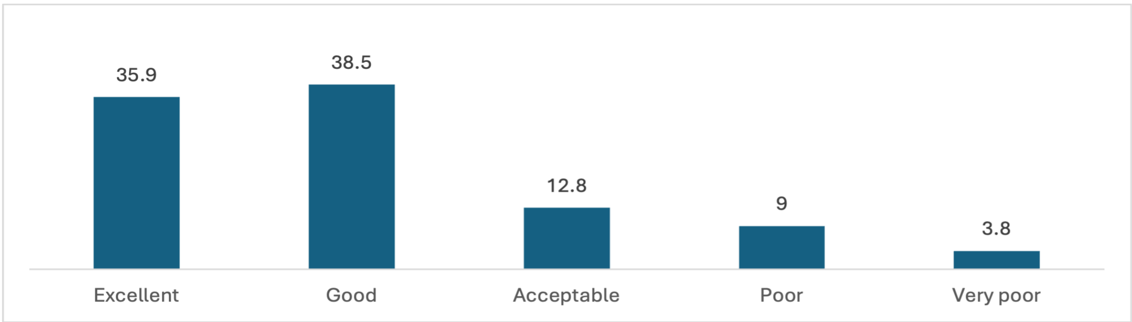


Figure 4: *Level of satisfaction with the E-Ruhuka App on the CSQ.*

Table 2: *Additional features to be incorporated to increase the App's impact in promoting mental health awareness*

Theme	n	Sub-theme	Quotes
Educational content	8	Include more educational videos on coping strategies.	Add videos of those who were helped by the App (of course, with their permission to do so), which would give testimony and courage to other users who came after them
Gamification	8	Adding gaming features	You can incorporate gaming features; the game could be designed as a way of relieving stress. When possible, it should be fun.
Social interaction	6	Allow users to interact with mental health experts.	The App could be improved by incorporating AI-driven personalized recommendations, tailored mental health plans, mood tracking, integration with wearable devices for real-time feedback, and access to live chats with mental health professionals for more comprehensive support.
Chat bot	5	Include chatbot	Include a chat assistant AI
Peer-to-peer chat	4	Provide a peer-to-peer chat	Create spaces for users to share experiences and support each other. Connect users with trained peer supporters for one-on-one conversations.

n: Frequency

Usability of E-Ruhuka

The results on the SUSQ (Figure 2) indicated that 51.3% of participants rated the App as having good or acceptable usability, while 37.2% reported poor usability, and 11.5% gave it a low usabil-ity score.

The results of the UEQ (Figure 3) showed that 78.3% of users reported excellent or good experiences, while 14.1% found it acceptable, and 7.6% rated it as poor or bad.

Table 3: *Improvement of the App to offer more comprehensive and personalized mental health support*

Theme	n	Sub-theme	Quote
Follow-up reminders	9	Send personalized check-ins based on user history.	Personalize reminders for mindfulness exercises would add a supportive touch. More localized resources, like contacts for a nearby support group, would be beneficial.
24/7 support	7	Offer live chat with mental health professionals.	You should provide reactions and respond to the patients.
Data insights	4	Allow users to track their progress over time.	The App could be improved by incorporating AI-driven personalized recommendations, tailored mental health plans, mood tracking, integration with wearable devices for real-time feedback, and access to live chats with mental health professionals for more comprehensive support. Use simple terms in questions and provide updates concerning mental health issues. Notifications by either messages or email to notify when the user has booked an appointment, paid for the appointment, and any changes made to their account.
Wide range availability	4	Make it broader	There should be more mental health campaigns in the larger population and different areas with the purpose of increasing knowledge about mental health conditions in Rwandans. As technology continues to advance, it is essential for software development companies to prioritize accessibility features to ensure that all users can access and interact with their products. Accessibility features not only improve user experience but also make technology more inclusive for individuals with disabilities.
	4	Provide a questionnaire to tailor recommendations	You should leave a space for recommendations
Emergency	2	Crisis management helps	Crisis Management Tools and Emergency Action Plans should be used to help users develop personalized crisis plans that outline steps to take in times of distress, including emergency contacts and coping strategies.

n: Frequency

Satisfaction with the E-Ruhuka

In terms of overall satisfaction with the E-Ruhuka app, the majority of participants (74.4%) rated their experience as excellent or good on the CSQ, while 12.8% found it acceptable and 12.8% reported poor or very poor satisfaction levels (Figure 4).

Proposed Enhancements to Strengthen the App's Impact on Mental Health Awareness and Accessibility

Respondents provided suggestions on ways the App could be improved to maximize its effectiveness in promoting mental health awareness, offering personalized support, and ensuring accessibil-ity for all users. To expand the App's role in mental health awareness, respondents suggested inte-grating additional educational videos on coping strategies, incorporating interactive gaming fea-tures, enabling direct communication with mental health practitioners, integrating a chatbot, and in-troducing a peer-to-peer chat function (Table 2). To enhance the App's capacity to provide tailored mental health support, the participants recommended adding follow-up reminders, incorporating a live chat feature with mental health professionals, and enabling users to track their progress over time. Furthermore, respondents emphasized the importance of broadening the App's reach, creating a dedicated space for user recommendations, and introducing an emergency support feature for crisis management (Table 3). Finally, to enhance usability and accessibility, respondents proposed

Table 4: *Design or accessibility considerations could be implemented to ensure the App is user-friendly and accessible to all users*

Theme	n	Sub-theme	Quotes
Simple navigation	9	Ensure the menu is easy to navigate.	To ensure the App is user-friendly and accessible to all users, implement features like customizable font sizes, high-contrast themes, screen reader, and compatibility. Additionally, consider adding offline access, voice commands, and inclusive design principles to accommodate users with varying abilities.
Multilingual support	8	Add options for multiple languages to reach a wider audience.	The user could choose different languages, including our local language, Kinyarwanda. This way, there won't be a language barrier to anyone who needs help. Being able to change the language from English to other languages, like Kinyarwanda, is important because most of the clients will be Rwandan.
Visual accessibility	6	Increase text size and contrast for better readability.	Increase the font size of the advice on the App.
Offline mode	3	Provide offline access to certain features.	Provide offline access and links to educational content, exercises, and self-help tools.

n: Frequency

several design improvements. These included ensuring an intuitive and easy-to-navigate menu, in-corporating multiple language options to serve a diverse audience, optimizing text size and contrast for better readability, and enabling offline access to key features for users with limited internet connectivity (Table 4).

DISCUSSION

To the best of our knowledge, this is the first study to evaluate the usability, user experience, and satisfaction with an e-Mental health tool in Rwanda. The study findings indicate mixed scores for usability but mostly good to excellent ratings for participant user experience and satisfaction with the E-Ruhuka application. These findings align with previous research that has shown the usability and effectiveness of e-Mental health applications in improving accessibility, engagement, and user satisfaction [6,11,12,22].

Existing literature highlights the growing global use of mental health apps in health education and care, particularly in mental health settings [6,10,11]. Prior research conducted in clinical settings suggests that mobile health (mHealth) can complement face-to-face treatments, enhance patient en-gagement, improve adherence to therapy, optimize clinician time and resources, and ultimately lead to better treatment outcomes while reducing the risk of relapse [11]. Our findings are consistent with this evidence and confirm that well-designed digital mental health tools can serve as effective adjuncts to traditional care services.

Moreover, e-Mental health tools have been shown to reduce stigma, improve mental health literacy, and encourage help-seeking behavior [12]. This is particularly important in Rwanda, where cultural stigma around mental illness may hinder access to care. The COVID-19 pandemic has further emphasized the role of digital health, with lockdowns accelerating the adoption of online mental health services globally [13]. The E-Ruhuka application, tailored to the Rwandan context, reinforces these findings by demonstrating that culturally adapted digital mental health tools can be effective, engaging, and well-received by users.

Our findings highlight that the App is easy to use and offers a positive user experience with rela-tively high satisfaction ratings, yet specific significant improvements could be made. These results are consistent with prior evaluations, emphasizing the growing role of digital platforms in mental health care. Despite the easy usage of the App, specific recommendations were given to improve the App, including the use of a 1-time password as an alternative recovery option for users without email access, ensuring easier account recovery. Others suggested ways for users without smartphones or reliable internet access to have access to these services to promote equity and inclu-sivity, such as offering services compatible with non-smart basic mobile phones, including the use of USSD Code and short message service (SMS).

Although Rwanda has made substantial progress in expanding ICT infrastructure, mobile phone ownership has risen from 67% in 2017 to 85% in 2024, and internet penetration reached 34.4% [15]. However, smartphone ownership remains relatively low at 14.6% [16]. As such, future iterations of the E-Ruhuka app should consider multi-platform delivery options to ensure broad accessibility, including USSD and SMS-based services. This echoes findings from other low-resource settings where hybrid digital approaches have helped reach underserved populations.

As noted in earlier research, however, challenges such as digital literacy, accessibility barriers, and sustained engagement remain key concerns in digital mental health adoption. During this piloting phase, the App was available only in English. To ensure cultural relevance and inclusivity, it will need to be adapted to the Rwandan context, with all content translated into Kinyarwanda, the primary language spoken and understood by the target users. Future studies should explore strategies to enhance long-term user engagement, address digital disparities, and improve intervention effectiveness across diverse populations. Some students rated the App as having poor usability, possibly due to their prior exposure to more advanced or feature-rich applications [23,24]. Users accustomed to high-functionality apps may find simpler applications lacking, even if these are purposefully designed to be minimalistic and user-friendly [23,24].

There are a number of limitations of this pilot study that deserve mention. First, this was a survey study among young students, and the results may not be generalized to older individuals who are less familiar with mHealth technology. Second, this survey included a limited number of partici-pants and feedback from a larger number of diverse subjects could offer more generalized sugges-tions for improvements to the App. Third, all the participants were able to read and speak English. A translated version of the App to be used among Rwandese is currently being created. Finally, we did not assess changes in mental health literacy based on information supplied through the App. We are currently implementing a clinical trial designed to assess the impact of the App among per-sons with mental health problems and trauma in Rwanda.

CONCLUSION

Despite the limitations, the findings of this study demonstrate that E-Ruhuka is a highly usable and well-received digital tool, with the majority of participants reporting positive experiences and high satisfaction levels. These results highlight the potential of E-Ruhuka to enhance mental health liter-acy, accessibility, and service delivery, particularly in resource-limited settings. While the study provides promising insights, future research should focus on long-term engagement, effectiveness in diverse populations, and integration with existing mental health services. Scaling up E-Ruhuka could play a critical role in bridging the mental health care gap in Rwanda and beyond, offering an innovative and accessible solution to address mental health challenges.

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Review

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Towards Longitudinal Mental Health Diagnosis in Rwanda: A Narrative Review of Global Models and Local Relevance

Yves Gashugi[1,2,*], Samuel Ishimwe[2], Egide Ishimwe[2], Queen Gihozo[2], Kanyana Ernestine[2], Louange Bienvenu Byiringiro[3], Janvier Rukundo[3]

[1]Rwanda Psychological Society, Kigali, Rwanda.
[2]University of Global Health Equity, Burera, Butaro, Rwanda
[3]Rwanda Food and Drug Authority, Kigali, Rwanda

***Corresponding author:**
Yves Gashugi
University of Global Health Equity, Butaro, Rwanda
Email: gashuyves1998@gmail.com
ORCID: https://orcid.org/0000-0002-1976-6693

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ABSTRACT

In Rwanda and many low-resource settings, mental health diagnosis often relies on one-time clinical assessments guided by global standards like DSM-5 and ICD. These tools, while useful, risk overlooking the complexity of lived experiences shaped by historical trauma, socioeconomic challenges, and cultural interpretations of distress.

We explored the limitations of single-time diagnosis in mental health care and assessed the relevance and applicability of longitudinal diagnostic models, such as Ecological Momentary Assessment (EMA) and Experience Sampling Method (ESM), within the Rwandan mental health context.

A narrative literature review was conducted, drawing from global research on longitudinal diagnostic approaches. In addition, contextual analysis was applied to synthesize data in Rwanda.

Findings indicate that longitudinal diagnostic models capture the fluctuating nature of psychological symptoms more effectively than one-time assessments. They reduce diagnostic errors, help differentiate between transient distress and chronic mental disorders, and enable more nuanced, culturally sensitive interventions. In Rwanda, such approaches resonate with the need for trauma-informed, community-based care.

Rwanda's mental health system would benefit from integrating longitudinal diagnostic practices that align with local realities. This requires investment in digital tools, community-based data collection, and clinician training. Longitudinal diagnosis offers a pathway to more ethical, accurate, and effective mental health care in culturally complex and historically burdened contexts.

INTRODUCTION

Longitudinal diagnostic models in psychiatry refer to diagnostic approaches that involve repeated assessments of a patient over time to observe the development, fluctuation, or resolution of symptoms. These models provide a dynamic and context-rich understanding of mental health trajectories, reducing misdiagnosis that can occur from single-time-point evaluations [1, 2].

Psychiatric diagnosis is a fundamental component of mental health care, serving as the basis for treatment planning, clinical communication, and

research standardization [3]. Globally, diagnostic systems such as the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) and the International Classification of Diseases (ICD) have shaped how mental health conditions are defined and identified, primarily through categorical models based on single-time assessments of symptoms [4].
This model has contributed to the standardization of psychiatric practice and facilitated research on mental disorders [5]. However, it presents significant challenges, particularly in capturing the complexity, variability, and progression of mental health conditions over time. Mental disorders are not always static entities with clearly defined boundaries but are often characterized by fluctuating symptoms influenced by biological, psychological, and environmental factors [6].

The reliance on single-time assessments poses several limitations. First, it increases the risk of misdiagnosis, particularly for disorders with overlapping symptomatology. For instance, mood instability in bipolar disorder may be mistaken for major depressive disorder, leading to inappropriate treatment strategies [7]. Second, the approach fails to account for symptom fluctuations, which are common in conditions such as schizophrenia, post-traumatic stress disorder (PTSD), and borderline personality disorder. Symptoms may worsen, improve, or present differently over time, necessitating an approach that considers longitudinal symptom trajectories rather than a one-time snapshot [8]. Third, the one-time diagnostic model contributes to premature medicalization, where natural emotional responses to stress, trauma, or grief may be classified as pathological conditions without sufficient longitudinal data to justify such diagnoses [9]. This issue is particularly relevant in cases of childhood and adolescent mental health, where transient developmental changes may be mistaken for psychiatric disorders [10].

Emerging longitudinal methodologies such as experience sampling, ecological momentary assessment (EMA), and digital phenotyping offer promising alternatives. These approaches allow for the real-time data collection of symptoms across various contexts and timeframes, improving diagnostic accuracy, treatment personalization, and our overall understanding of mental health trajectories [11].
Although these critiques and innovations are well documented in global literature, their relevance and application in Rwanda remains underexplored. The country continues to face a growing demand for culturally responsive and context-sensitive mental health services, yet current diagnostic practices largely mirror imported models with limited adaptation to local realities. This paper aims to bridge that gap by critically reviewing global models of psychiatric diagnosis and advocating for the integration of longitudinal assessment approaches in Rwanda. Doing so calls for a rethinking of mental health diagnosis in Rwanda—one that is both informed by global evidence and grounded in the country's unique sociocultural and healthcare context.

THE FLUCTUATING NATURE OF MENTAL HEALTH SYMPTOMS

A major limitation of current psychiatric diagnostic models, particularly within the Rwandan mental health system, lies in their insufficient capacity to capture the fluctuating nature of mental health symptoms over time. Unlike many physical illnesses, psychiatric conditions, such as mood disorders, anxiety, and trauma-related disorders, often manifest episodically or change depending on social, psychological, and environmental influennces [12,13]. Global scholars such as Insel argue that psychiatric symptoms frequently exhibit patterns of remission and relapse, which challenge the rigidity of fixed, one-time diagnostic criteria [14]. Similarly, van der Kolk emphasizes that trauma-related symptoms can be reactivated by emotional and environmental triggers, further highlighting their dynamic nature [15].

In Rwanda, where communities continue to grapple with the psychological aftermath of genocide against the Tutsi, poverty, and emerging mental health concerns, this fluctuating symptomatology is particularly significant. Individuals experiencing depression, for example, may oscillate between deep emotional pain and relatively stable functioning. Anxiety symptoms may spike during periods of social or economic stress and decline when conditions improve. Such patterns make it difficult to capture an accurate diagnostic picture through a single clinical assessment—yet most mental health evaluations in Rwanda still rely on brief, one-off encounters due to resource constraints.

Evidence from global conflict and trauma-affected populations—contexts that resonate with Rwanda's history—demonstrates considerable variability in symptoms of PTSD, depression, and anxiety across time [16]. This underscores the need for context-sensitive, longitudinal diagnostic models that are better suited to local realities and more capable of capturing the evolving nature of mental distress.

Short-term assessments may result in overdiagnosis, underdiagnosis, or misdiagnosis, particularly when applied without considering the temporal dimension of symptoms. A longitudinal approach allows clinicians and researchers in Rwanda to observe psychological trends over weeks or months, improving diagnostic accuracy and informing more personalized care [17]. It also enables the inclusion of cultural, social, and environmental factors that are essential for understanding mental health in the Rwandan context—factors that are often overlooked in static, imported diagnostic models [18].

DIAGNOSTIC STABILITY AND THE NEED FOR TIME-BASED VALIDATION

Diagnostic stability refers to the consistency of a psychiatric diagnosis over time, indicating whether a patient retains the same diagnosis during subsequent clinical evaluations. This concept is essential in mental health as it reflects both the reliability and validity of diagnostic procedures [19]. However, evidence from global studies suggests that diagnostic stability is often lacking, particularly in the early phases of psychiatric illness or when evaluations are based on single-point assessments.

A Study by Ruggeri et al. [20] showed that only around 50% of patients retained their initial diagnosis after one year, and Chang et al. [21] found significant shifts in diagnosis during the course of early psychosis. Baca-García et al. further reported a diagnostic stability range of just 35% to 80%, depending on the disorder and follow-up duration [22]. These inconsistencies expose the weaknesses of one-time assessments and emphasize the need for a longitudinal diagnostic approach.

In the Rwandan context, mental health services are still developing, and most clinical evaluations are brief and inaccessible due to limited time, personnel, and gaps in infrastructure. This raises serious concerns about the reliability of psychiatric diagnoses issued in such conditions. Cultural idioms of distress, trauma-informed symptoms, and variations in symptom expression—especially among youth and genocide survivors—can be misclassified without sufficient longitudinal data to validate or adjust the diagnosis over time.

Contributing factors to diagnostic instability include the complex and heterogeneous presentation of psychiatric disorders, changes in symptom severity or expression, and the inherently subjective nature of clinical assessment. These are further compounded by variability in how clinicians interpret diagnostic criteria [22]. In Rwanda, where clinicians may use translated or adapted diagnostic manuals, interpretation differences could be even more pronounced, reinforcing the need for repeated assessments and diagnostic validation.

Longitudinal approaches, including follow-ups at 3-month or 6-month intervals, have demonstrated significant improvements in diagnostic accuracy. Regular re-evaluation allows for the monitoring of symptom patterns, response to treatment, and social functioning. As Fusar-Poli et al. have shown, structured follow-ups using standardized tools significantly enhance diagnostic stability and reduce misclassification, particularly in early intervention settings [19].

Adopting such time-based validation models in Rwanda could not only improve the precision of mental health diagnoses but also foster trust in mental health services, tailor interventions more effectively, and reduce stigma through more accurate labelling. Therefore, integrating longitudinal diagnostic strategies is not simply a theoretical recommendation but a practical necessity for strengthening Rwanda's mental health system.

SPONTANEOUS RECOVERY AND AVOIDING OVERMEDICALIZATION

An important argument for longitudinal assessment is its role in distinguishing between conditions that require clinical intervention and those that may resolve without medical treatment. In Rwanda, where social and environmental stressors—

including trauma, poverty, and loss—are prevalent, many individuals experience emotional distress that may not meet clinical thresholds for psychiatric disorders. Spontaneous recovery, defined as the natural resolution of symptoms without formal intervention, is common in such contexts, particularly in mild to moderate cases of anxiety and depression [23].

When mental health assessments are conducted at a single time point, there is a significant risk of misclassifying adaptive human responses as psychiatric pathology. This can lead to unnecessary prescription of psychotropic medication, potentially exposing individuals to side effects, fostering dependency, and diverting attention from psychosocial interventions that might be more appropriate [24]. Furthermore, premature diagnoses may contribute to stigma, reduce resilience, and undermine trust in mental health systems—issues that are particularly salient in Rwanda's post-genocide and culturally diverse context.

Longitudinal approaches provide an alternative by allowing clinicians to track the course of symptoms over time before reaching a conclusive diagnosis. This enables more tailored interventions, including non-pharmacological options such as watchful waiting, lifestyle adjustments, psychoeducation, and brief counseling [25]. These strategies are especially valuable in community-based mental health settings where access to psychiatric specialists is limited and culturally sensitive, low-intensity interventions are often preferred.

Empirical evidence suggests that for certain cases of anxiety and depression, less intensive interventions can be as effective as medication in the long term [26]. For example, in contexts like Rwanda, a child presenting with inattentiveness and irritability might be prematurely diagnosed with attention-deficit/hyperactivity disorder (ADHD) after a brief consultation. However, a more time-sensitive, longitudinal approach could reveal an underlying adjustment disorder linked to family or school stress, avoiding unnecessary medication and ensuring more appropriate care. This case underscores the importance of time-sensitive evaluation and cautious diagnostic practice, particularly in children and adolescents.

In the Rwandan context, adopting longitudinal diagnostic frameworks not only improves accuracy but also aligns with public health priorities aimed at minimizing harm, optimizing resource use, and promoting culturally congruent, patient-centered care. Avoiding overdiagnosis through time-based clinical judgment is essential for building trust in mental health systems and ensuring that treatment is reserved for those who truly need it.

IMPLEMENTING LONGITUDINAL DIAGNOSIS IN RWANDA: BRIDGING THE GAP WITH A STRATEGIC CALL TO ACTION FOR MENTAL HEALTH CARE

Advancing towards a more accurate and context-sensitive mental health diagnosis in Rwanda requires the integration of longitudinal assessment strategies into clinical practice. Longitudinal approaches offer dynamic, time-sensitive perspectives on symptom progression, treatment response, and patient well-being. This part reviews established global models, practical implementation strategies, and the potential role of digital innovation, while emphasizing their relevance for Rwanda's evolving mental health system.

Models of Longitudinal Approaches: Globally, several longitudinal models have been developed to better understand psychiatric disorders over time. Techniques such as the Experience Sampling Method (ESM) and Ecological Momentary Assessment (EMA) involve collecting real-time data multiple times a day, capturing individuals' emotions, thoughts, and behaviors as they occur in their everyday environments. These methods are particularly valuable in revealing moment-to-moment changes and situational influences on mental health [27]. Prospective cohort studies, often used in psychiatric epidemiology, follow large groups of people over extended periods, sometimes decades, to map the onset and progression of mental disorders and to identify risk or protective factors that might vary across cultural or environmental contexts [28]. Time-series analysis is a statistical method used on frequently collected data (e.g., daily mood logs or sleep metrics) to detect trends, recurring patterns, or abrupt changes in symptoms over time [29]. Repeated-measures designs, commonly used in clinical trials, involve evaluating the same individuals at multiple points during treatment or intervention. This approach helps clinicians track

changes, monitor treatment efficacy, and adjust strategies based on evolving patient needs [30].
In the Rwandan context, adapting longitudinal models like EMA and prospective cohort tracking can be greatly enhanced through the strategic involvement of community health workers (CHWs) and peer-support networks. These individuals can serve a dual role: identifying new cases of psychological distress through routine community engagement and supporting individuals already receiving care. To ensure effectiveness and safety, participants will undergo personalized, context-specific training in basic mental health literacy, psychosocial support, ethical boundaries, and structured observation. This approach not only reinforces the bridge between clinical systems and community-based support but also strengthens early detection and long-term follow-up within culturally grounded care frameworks. Table 1 shows comparison between traditional and longitudinal psychiatric diagnostic models.

Practical Applications in Clinical Settings: Integrating longitudinal assessment into Rwandan psychiatric services requires strategies that are both resource-sensitive and sustainable. Clinicians can introduce structured follow-up assessments at regular intervals (e.g., monthly or quarterly) using brief, validated tools adapted to local languages and cultural frameworks [31]. Such repeated monitoring supports more accurate diagnoses by tracking symptom persistence or resolution over time, which is critical for distinguishing between transient distress and chronic conditions.

However, while clinician-level changes are important, a system-level approach is essential to ensure equitable coverage across all regions. Relying solely on individual clinicians risks leaving out areas without access to such interventions. Therefore, this proposal emphasizes the need for nationwide integration of longitudinal methods into mental health policy, professional training curricula, and standard operating procedures. This approach would enable both public and private practitioners across Rwanda to adopt standardized tools and protocols, improving consistency in care delivery and enabling proper resource allocation [32].

In addition, the role of community-based actors—particularly community health workers (CHWs) and peer-support networks—should not be overlooked. These individuals can help monitor mental health trajectories by supporting both new and existing cases within communities, thereby bridging the gap between clinical and non-clinical environments. To be effective, CHWs and peers would require personalized training tailored to their roles, going beyond basic interpersonal skills to include culturally appropriate monitoring techniques and reporting strategies [33].

Leveraging Digital Tools and Artificial Intelligence (AI): Emerging digital tools and AI technologies offer transformative opportunities for longitudinal psychiatric care, even in low-resource settings. Mobile health (mHealth) solutions, such as smartphone apps and SMS-based surveys, can collect self-reported data on mood, energy, or stress levels, while wearable devices can monitor physiological indicators like sleep, heart rate, or physical activity [34].

These tools enable Ecological Momentary Assessment (EMA) to be conducted efficiently in real time, reducing recall bias and providing clinicians with actionable data. For Rwanda, where mobile penetration is high and digital innovation is growing, such tools could be adapted for use in local languages and integrated into community mental health frameworks.

AI-powered analysis of longitudinal data can detect subtle symptom trends, predict potential relapses, and inform early interventions [35]. Moreover, Natural Language Processing (NLP) offers possibilities for analyzing linguistic patterns in local dialects (e.g., Kinyarwanda) from therapy transcripts or digital communication, with ethical safeguards, to monitor psychological states [36].

While challenges such as data privacy, digital literacy, and ethical considerations must be addressed, digital longitudinal assessment offers scalable solutions to strengthen Rwanda's mental health system. Partnerships between health professionals, data scientists, and community stakeholders will be essential to ensure culturally appropriate, ethical, and equitable deployment of these tools.

Figure 1 illustrates how psychiatric diagnoses, when made from a single time-point assessment,

Table 1: *Comparison Between Traditional and Longitudinal Psychiatric Diagnostic Models*

Feature	Traditional Diagnostic Model	Longitudinal Diagnostic Model
Time of Assessment	One-time (cross-sectional)	Multiple over time (weeks, months, years)
Diagnostic Stability	Often low	Higher through repeated evaluations
Cultural Sensitivity	Limited	Greater adaptability to local idioms and expressions
Risk of Misdiagnosis	Higher (due to static criteria)	Lower (due to dynamic observation)
Applicability in Rwanda	Based on imported models	Encourages integration of local context and CHWs
Overmedicalization Risk	High (labels stress responses as illness)	Lower (permits watchful waiting and psychosocial care)
Use of Technology	Minimal	Emphasizes mobile tools, EMA, digital tracking

can lead to misclassification of mental health conditions. By tracking the clinical trajectories of three fictional patients (A, B, and C), the figure demonstrates how longitudinal follow-up enables diagnostic correction and prevents premature medicalization or misdiagnosis.

Patient A was initially diagnosed with Major Depressive Disorder based on symptoms of low mood, fatigue, and withdrawal. However, longitudinal observation revealed that these symptoms were part of an acute grief reaction following bereavement. The symptoms resolved naturally over time without clinical intervention, illustrating the phenomenon of spontaneous recovery, a recognized outcome in mild to moderate cases of emotional distress [23,24]. This case emphasizes the importance of caution when assigning clinical labels to natural human experiences and supports calls for time-sensitive diagnostic frameworks, especially in culturally contextualized environments like Rwanda.

Patient B presented with mild anxiety and concentration difficulties that were initially diagnosed as an adjustment disorder. Over time, the emergence of trauma-specific symptoms such as nightmares, hypervigilance, and emotional numbing aligned more consistently with Post-Traumatic Stress Disorder (PTSD). This trajectory underscores how trauma-related disorders often exhibit delayed expression, requiring longitudinal assessment to capture the full clinical picture [15,16].

Patient C was prematurely diagnosed with

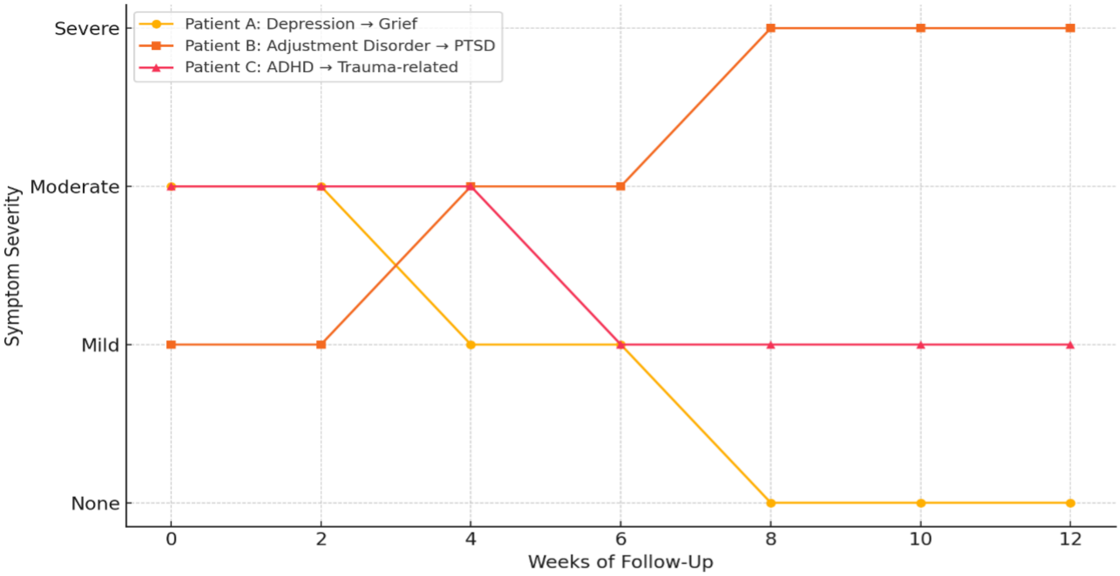

Figure 1: *Misclassification Risk in Psychiatric Diagnosis Over Time*

Attention-Deficit/Hyperactivity Disorder (ADHD) based on inattentiveness and restlessness. However, extended observation revealed that the symptoms were rooted in chronic exposure to domestic violence. This patient was later reclassified with a trauma and stressor-related disorder. Such cases highlight the diagnostic overlap between neurodevelopmental and trauma-related conditions, particularly in children [26]. Without longitudinal assessment, trauma can be misinterpreted through a biomedical lens, resulting in inappropriate pharmacological treatment and missed opportunities for psychosocial intervention.

The trajectories shown in Figure 2 emphasize that diagnostic stability is not static but evolves over time [19-22]. Misclassification risks are particularly high in early stages of illness or under resource-constrained settings, where brief evaluations dominate. In Rwanda's developing mental health system, longitudinal models offer a necessary alternative, accounting for sociocultural dynamics, idioms of distress, and symptom fluctuation [18].

Ultimately, integrating time-based diagnostic strategies enhances clinical accuracy, promotes ethical practice, and aligns with global calls for culturally sensitive and person-centered mental health care [11,32].

CONCLUSION

Rwanda's current reliance on one-time, encounter-based diagnostic tools in mental health care—driven by limitations in resources, personnel, and funding—proves insufficient given the fluctuating and context-dependent nature of mental health disorders. Conditions such as PTSD vary in manifestation across time and location, underscoring the need for socially and culturally tailored diagnostic strategies. The current approach increases the risk of misdiagnosis, overdiagnosis, or underdiagnosis, potentially resulting in inappropriate treatment plans and exacerbation of patients' conditions.

A longitudinal approach offers a promising solution by enabling clinicians to track mental health symptoms over time, improving diagnostic accuracy and treatment personalization. This method enhances diagnostic stability, allows differentiation between transient psychological distress and pathological conditions, and helps avoid unnecessary medication, side effects, and community stigma. It also mitigates issues related to language barriers and resource wastage. Models like Ecological Momentary Assessment (EMA) and Experience Sampling Method (ESM), especially through mobile technology, which is rapidly expanding in Rwanda, can support real-time, patient-centered monitoring outside clinical settings, thereby making longitudinal diagnostics more feasible.

However, implementing this approach raises critical challenges and areas for further research. It is essential to determine how to ethically and effectively manage care when immediate treatment is needed but a diagnosis is still pending. Studies should examine how stigma persists despite accurate diagnoses and explore strategies to minimize its harm. Particular attention must be given to patients who are psychotic or critically ill and may be lost to follow-up without inpatient care. Tools like EMA/ESM must also be adapted for individuals with sensory impairments or those in low-resource contexts without access to smartphones. Finally, ethical safeguards must be established to ensure that vulnerable patients undergoing prolonged diagnostic evaluation do not feel abandoned or neglected.

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Original Research

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Perceptions of Wheelchair Users with Spinal Cord Injury on Community Re-integration Following Inpatient Rehabilitation in Rwanda: A Qualitative Study, 2024.

Theogene Niyonsenga[1,*], Gerard Urimubenshi[2]

[1]*Department of Occupational Therapy, School of Health Sciences, College of Medicine and Health Sciences, University of Rwanda, Kigali, Rwanda.*
[2]*Department of Physiotherapy, School of Health Sciences, College of Medicine and Health Sciences, University of Rwanda, Kigali, Rwanda.*

ABSTRACT

INTRODUCTION: Spinal cord injury (SCI) is a life-altering condition that significantly impacts physical health and community reintegration. Despite the global prevalence of SCI, wheelchair users often face barriers to reintegration, particularly in low-resource settings like Rwanda. This study explored the perceptions of wheelchair users with SCI regarding community reintegration, focusing on facilitators and barriers.
METHODS: A qualitative phenomenological design was employed, with nine participants recruited via purposeful sampling from two Rwandan healthcare facilities. Semi-structured interviews were conducted in Kinyarwanda, transcribed verbatim, and translated into English. Thematic analysis was performed using Braun and Clarke's framework to identify key themes.
RESULTS: Four main themes emerged: (1) Family and societal attitudes, including negative stigma and diminished social support; (2) Environmental accessibility, with challenges such as inaccessible pathways, bathrooms, and public transportation; (3) Activity limitations, particularly in daily living tasks and wheelchair mobility; and (4) Participation restrictions, such as reduced involvement in communal and religious activities. Participants reported dependence on caregivers, social isolation, and environmental barriers as major hindrances to reintegration.
CONCLUSION: The study highlights multifaceted challenges faced by wheelchair users with SCI in Rwanda, emphasizing the need for comprehensive interventions. Recommendations include pre- and post-discharge education, community awareness campaigns, home assessments for accessibility modifications, and policy changes to improve infrastructure. Addressing these barriers is crucial for enhancing community reintegration and quality of life for individuals with SCI.

***Corresponding author:**
Theogene Niyonsenga

Department of Occupational Therapy, School of Health Sciences, College of Medicine and Health Sciences, University of Rwanda, KG 11 Ave, Kigali, Rwanda.

Email: niyonsengatheogene1@gmail.com

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INTRODUCTION

According to the World Health Organization (WHO), approximately 15% of the global population, around one billion people, live with some form of disability, including spinal cord

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injury (SCI), physical disabilities, and visual, auditory, communication, cognitive, or learning impairments [1]. The global incidence of spinal cord injuries, both traumatic and non-traumatic, is estimated to range from 40 to 80 cases per million individuals annually [2]. Based on 2012 world population estimates, between 250,000 and 500,000 new cases of spinal cord injury occur each year, an event that is often life-altering and catastrophic [3].

Spinal cord injury (SCI) represents a major global health concern [4], frequently resulting in varying degrees of paralysis, sensory deficits, bowel and bladder dysfunction, and chronic pain [5]. These impairments profoundly affect physical health and contribute to limitations in daily activities and restrictions in social participation [6]. Understanding individuals' perspectives on community reintegration is, therefore, essential for addressing their needs post-injury.

For most people with SCI, wheelchairs are vital for mobility. Selecting an appropriate wheelchair and necessary accessories is crucial for optimizing functionality, fostering independence, and preventing secondary complications [7]. In Rwanda, studies have shown poor community reintegration outcomes among individuals with SCI, with gender and level of injury being significant influencing factors [8]. Effective community reintegration is strongly associated with increased life satisfaction and a sense of competence, which are key determinants of psychological and economic well-being [6].

Evidence indicates that individuals with newly acquired SCI are often discharged from hospitals after relatively short rehabilitation stays, without adequate knowledge or functional skills needed for life in the community. This gap in preparation is linked to poor reintegration outcomes and even higher mortality rates [4]. It is therefore crucial to explore how individuals with SCI perceive their own reintegration into the community.

A recent systematic review and meta-analysis reported that approximately 69% of wheelchair users with SCI experience falls annually and remain poorly integrated into their communities [7]. Community reintegration is a dynamic and ongoing process influenced not only by rehabilitation services but also by family and social support, personal attributes, access to attendants, transportation, housing availability, and broader environmental factors. Although community reintegration is a central goal of SCI rehabilitation, it remains challenging to achieve through clinical care alone [9]. Rehabilitation professionals often assume that improved physical function will naturally result in greater community participation, yet community integration is a multifaceted concept encompassing diverse aspects of societal engagement.

Therefore, the aim this qualitative study was to explore the perceptions of wheelchair users with spinal cord injury regarding community reintegration, identifying facilitators and barriers to active participation in the community and functioning following discharge from inpatient rehabilitation.

METHODS

Study Design

This study employed a qualitative phenomenological design, selected to explore the lived experiences and perceptions of individuals with spinal cord injury (SCI) through rich, descriptive narratives.

Study Population and Setting

The study population included male and female outpatients with spinal cord injury who use a wheelchair as a mobility aid. Participants were recruited from two healthcare facilities in Rwanda: Gahini District Hospital and HVP/Gatagara Orthopedic and Rehabilitation Hospital.

Sampling Strategy

A purposeful sampling technique was used to recruit participants who met the inclusion criteria. This method was chosen to identify individuals with direct experience of community reintegration following SCI, as they could provide in-depth and meaningful insights [10]. This approach is beneficial for studying information-rich cases, which yield greater understanding rather than generalizable data [11]. The sample consisted of individuals with diverse characteristics, including different age groups, education levels, socioeconomic status (homeowners vs. renters), sex, and residence (urban vs. rural), to capture a wide range of perspectives.

Sample Size

The final sample size was nine participants. Recruitment continued until data saturation was achieved—that is, no new themes or insights were emerging that would significantly contribute to answering the research question.

Inclusion and Exclusion Criteria

Participants included males and females aged 18 years and above, with either traumatic or non-traumatic SCI, who use a wheelchair for mobility and had been discharged from inpatient rehabilitation.

Excluded were individuals with SCI who did not use a wheelchair, and those who were still hospitalized and had not yet returned to the community after injury.

Data Collection Tool

Data were collected using a semi-structured interview guide developed based on the study objectives and relevant literature. The guide was designed to explore participants' experiences and perceptions of community reintegration following hospital discharge.

Procedure for Data Collection

The researcher met participants at outpatient rehabilitation clinics, where the study's aim and purpose were explained clearly. Individuals meeting the inclusion criteria were purposively selected, provided with informed consent forms, and interviewed only after obtaining written consent.

Interviews were conducted face-to-face in private rooms to ensure confidentiality and allow participants to speak freely. All interviews were held in Kinyarwanda, the participants' native language, to facilitate expression. A digital audio recorder was used to capture the conversations, and interviews were later transcribed verbatim. This process helped minimize recall bias and preserved the authenticity of participants' responses.

The interviews began with a grand tour question: "Can you please tell me about any challenges you encountered at home and in the community after being discharged from the hospital?"

This approach encouraged open dialogue since probing questions were used to elicit deeper responses [12]. The researcher also took field notes during interviews to complement audio recordings. At the conclusion of each session, participants were thanked for their time and contribution.

Data Analysis

Data were analyzed using thematic analysis with a deductive approach, which allows themes to be identified based on the research objectives and existing literature [13]. Braun and Clarke's six-step framework was followed: Familiarization with the data; Generating initial codes; Searching for themes; Reviewing themes; Defining and naming themes; and Producing the final report [14].

The researcher transcribed the recorded interviews in Kinyarwanda and compared transcripts to the original audio to ensure accuracy. A professional translator then translated the transcripts into English. The translated data were thoroughly reviewed to identify recurring patterns, commonalities, and divergences in participants' responses.

Themes were developed by coding shared impressions and responses. Then, a second round of independent coding was performed one week later to ensure consistency. Discrepancies were resolved through comparison and refinement of emerging themes. Thematic development was grounded in the participant narratives and supported theoretical understanding of community reintegration. Open coding was conducted line by line, followed by a second level of codingto group and conceptualize the findings.

Ethical Considerations

Ethical approval was obtained from the College of Medicine and Health Sciences Institutional Review Board (Ref: CMHS/IRB/132/2024). Permission to conduct the study was also secured from both participating hospitals. The researcher also obtained permissions from Gahini District Hospital and HVP/Gatagara Orthopedic and Rehabilitation Hospital to conduct the study. All participants received a detailed explanation of the study objectives and procedures. Informed consent, including consent for audio recording, was obtained in writing before participation.

Confidentiality was maintained by using codes and initials instead of names. Participation was voluntary, and participants were informed of their right to withdraw from the study at any point without any adverse consequences.

RESULTS

Participant Characteristics

The study involved nine individuals with spinal cord injuries, most of whom were male, with only one female participant. The injuries were broadly categorized as cervical, thoracic, or lumbar, based on the areas of the body affected. Most participants had thoracic injuries, while the remaining had either cervical or lumbar injuries.

Chronicity here defined as the period (in years) a person has been living with a spinal cord injury, ranged from 1 to 6 years. Ages ranged from 18 to 59 years, with an average age of 39.3 years (27-53 years). In terms of education, some participants had completed only primary school, a few had completed high school, and others had attained a bachelor's degree or higher.

All participants used manual wheelchairs for mobility. Regarding marital status, some were married, others were single, and one participant had become separated after the injury. Most participants were unemployed at the time of the study, with only one employed and another still a student. The majority lived in rural or remote areas, while a few resided in urban settings. Table 1 shows the characteristics of the participants.

Perceptions on Community Reintegration

During the in-depth interviews, participants were asked about their perceptions of community reintegration following discharge from inpatient rehabilitation. Four main themes emerged related to the reintegration of spinal cord injury survivors who use wheelchairs: (1) Family members' and societal attitudes and relationships; (2) Environmental accessibility; (3) Activity limitations; and Participation restrictions.

These themes were further divided into subthemes, including: attitudinal environmental barriers, social support challenges, inaccessible pathways, inaccessible bathrooms, public transportation difficulties, limitations in activities of daily living, restrictions in wheelchair mobility, inability to participate in communal and religious activities, and challenges in social interaction.

Family Members' and Societal Attitudes and Relationship Challenges

When participants were asked about the attitudes and relationships of their family members and society at large, many perceived negative attitudes. Two key subthemes emerged: negative attitudes and social support challenges.

Attitudinal Environmental Barriers: The perceived attitudinal barriers involved frequent insults directed at wheelchair users with spinal cord injury, ranging from family members to broader society, as reported by several participants:

"The attitude of my family towards me changed, primarily because their living conditions changed since I am no longer able to provide the financial support I used to before my injury." (P2)

"After the accident, it was very hard for some of my family members to accept me." (P5) He further expressed, "One of my family members discriminates against me, and some have not even checked on me by phone for a year, to the extent that they consider me as if I were no longer alive." (P5)

"After my health condition worsened, I lost all my friends and some family members because they see

Table 1: *General characteristics of participants*

No.	Gender	Age	Marital status	Employment status	Education	Residence	Housing	Chronicity (Years)	Injury level
1	Male	35	Separated	unemployed	A level	Urban	Rent	6	Thoracic
2	Male	42	Married	unemployed	Bachelor	Rural	Rent	3	Cervical
3	Male	39	Married	employed	Masters	Urban	Owner	2	Lumbar
4	Male	34	Single	unemployed	Bachelor	Rural	Owner	3	Thoracic
5	Male	27	Single	unemployed	Primary	Rural	Rent	1	Thoracic
6	Male	18	Single	Student	A level	Urban	Owner	1	Lumbar
7	Male	47	Married	unemployed	Primary	Rural	Rent	2	Cervical
8	Male	59	Married	unemployed	Primary	Rural	Owner	5	Thoracic
9	Female	53	Married	unemployed	Primary	Rural	Owner	3	Thoracic

me as a burden and wish I would die." (P7)

Social Support Barriers: Lack of social support, as a subtheme related to societal attitudes, revealed strong emotions among participants. When asked about their relationships with family and social circles, some reported receiving support, while others described a lack of support from relatives and society. For example:

"…I didn't receive family support. I was living alone, which made it very difficult to perform basic daily activities." (P1)
"Neighboring families discriminate a lot, often saying discouraging things to me." (P7)
"I lost all my friends except for some family members who try to care for me." (P7)

Several participants noted that support from family and friends diminished over time. One participant shared:

"At first, they would reach out to you, but as time passes, they seem to give up on visiting or talking to you." (P2)
He added, *"I can now go up to two months without a visitor, unlike before."*
"My disability has made some relatives tired of my condition. They may not say it openly, but their behavior shows it." (P2)

Environmental Accessibility

Participants regularly reported physical and social barriers affecting their reintegration. Subthemes related to physical barriers included inaccessible pathways, bathrooms, and public transportation.

Inaccessible Pathways: When asked about challenges faced in daily community life, many participants emphasized problems with physical accessibility, such as narrow doorways, uneven ground, and stairs:

"I was renting a place that was not designed for people with disabilities, which made mobility difficult. For example, there were stairs in the house that prevented me from moving easily in my wheelchair." (P1)
"It remains difficult to fully access my home, including the bathroom and kitchen, due to uneven outside ground. The owner built the house without considering wheelchair users." (P2)
"My home environment, especially the walkways and corridors, are too small to accommodate my wheelchair. I often need family members to help transfer me from the wheelchair to a chair, and then pull the chair into the bathroom." (P3)
"Moving inside and outside the house and going to the toilet is a challenge. When the house was built, I did not plan on having a disability. The toilet is far from the house." (P4)
"I live in a house built in 1982, with door widths of about 70 centimeters. It's always hard for me and my caregiver to move around the home. Sometimes, I prefer to stay in the living room to reduce the burden." (P8)

Inaccessible Bathrooms: Some participants described difficulties with bathrooms that were not accessible or suitable for wheelchair users, as illustrated by the following quotes:

"The washrooms in the house were not designed to accommodate a person with a disability like me who uses a wheelchair, as they had pit latrines." (P1)
"I usually need support from family members to transfer me from my wheelchair to a chair, and then they pull the chair into the bathroom. I depend on my caregiver when using the bathroom and toilet. For quick needs, I use a basin after the caregiver locks the children in another room." (P3)

Public Transportation

Participants reported significant barriers when accessing public transportation, which limited their ability to attend important places. Some shared the following experiences:

"Public transport does not accommodate us comfortably; it is difficult to get on, and there is no space for a wheelchair." (P1)

Activity Limitations and Participation Restrictions

When asked about challenges and facilitators encountered at home and in the community after discharge from hospitalization, two main themes emerged: activity limitations and participation restrictions.

Two subthemes related to activity limitations arose: limitations in activities of daily living (ADLs) and difficulties with wheelchair mobility.

Limitations in Activities of Daily Living: Most participants reported dependence on others for self-care activities such as dressing, bathing, eating, and toileting. They emphasized their need for assistance to carry out these daily tasks, as shown by the following quotes:

"I depend on my caregiver when using the bathroom and toilet. For quick needs, I use a basin after the caregiver locks the children in another room." (P3)
"Toileting is difficult because of pain when sitting on the toilet. Dressing is also a challenge due to pain when flexing my legs." (P6)
"When my wife is not around, it's very hard for me to manage basic daily activities." (P8)
"Bathing is a big challenge because the caregiver has to help me while I am sitting in the wheelchair. I cannot reach the bathroom on my own, so someone has to bathe me in the wheelchair." (P9)

Limitations in Wheelchair Mobility: When asked whether their home setup facilitated or hindered their self-care, some participants identified their limited wheelchair mobility as a barrier to performing activities of daily living:

"I did not receive any formal wheelchair training; my caregiver and I taught myself. No one informed me about wheelchair safety precautions." (P3)
"The main problem I face at home is transferring in and out of the wheelchair." (P6)
"The doors are about 70 centimeters wide, making it very hard for my caregiver and me to move around the house." (P8)
"It is very hard for me because I always need someone to propel my wheelchair. At home, I live with my husband and one grandchild, and finding someone to assist me with wheelchair mobility remains difficult." (P9)

Most participants experienced limitations in wheelchair mobility, which increased their dependence on others. To cope, some developed strategies to help them move around, as one participant shared:

"I usually receive support from family members to transfer me from my wheelchair to a chair, and then they pull the chair into the bathroom." (P3)

Participation Restrictions

Regarding participation restrictions, participants' perceptions during the interviews related mainly to the following subthemes: inability to participate in religious and communal activities and reduced social interactions.

Inability to Participate in Communal and Religious Activities: The subtheme of inability to participate in communal and religious activities emerged when participants were asked whether their level of community participation had changed since being discharged from inpatient rehabilitation compared to before their spinal cord injury. This limitation was often linked to inaccessible roads and environments that hindered their involvement:

"Activities like going to the market, church, or other community gatherings are hard to participate in." (P1)
"Activities such as going to the market or church require someone's assistance because the environment is not wheelchair-friendly." (P2)
"Participating in community activities is challenging because the remote area where I live is not accessible for wheelchair users." (P4)
"Community participation stopped immediately after my injury because the village roads are too rough for wheelchair propulsion. Acceptance is the only remaining option." (P7)
"Getting to public places like churches, markets, or community events is still difficult because they are not designed to accommodate people in wheelchairs." (P9)

Some participants expressed a strong desire to engage in community and religious activities but felt restricted by geographical and environmental factors:

"It is something I always want, but my wheelchair cannot manage hills since my arms are weak, and most areas are difficult to reach due to uneven ground." (P8)

Challenges in Social Interaction

When asked about difficulties in interacting with friends and family, participants reported a decrease in social interaction due not only to stigma but also neglect by friends, family, and neighbors, as described below:

"My disability has made some of my relatives tired

of my condition." (P2)

"The first challenge I faced was stigma from friends, family, and even myself." (P3)

"What I cannot do is visit their homes because I worry about how they perceive me, and I feel like I might damage their houses since they are not accessible for persons with disabilities. It's better to stay home." (P3)

"Social participation and leisure with friends is difficult. I never go to church or other community activities because of self-stigma." (P5)

DISCUSSION

This study explored the perceptions of wheelchair users with spinal cord injury (SCI) regarding community reintegration following discharge from inpatient rehabilitation. Community reintegration encompasses multiple aspects, including recreation, occupation, social activities, and relationships with others. Similarly, inclusion aims to provide equitable access to opportunities, resources, and information for all individuals, regardless of ability. The perceived challenges identified in this study include activity limitations, participation restrictions, negative attitudes from family members and society, and environmental accessibility barriers. The findings are discussed under these four main themes.

Activity limitations emerged as a major concern among wheelchair users with SCI after inpatient rehabilitation discharge. Most participants reported difficulties with activities of daily living (ADLs) and wheelchair mobility, which they perceived as significant barriers to community reintegration. Persons with SCI often experience activity limitations due to the increased physical demands associated with their condition [15]. Participants highlighted difficulties with self-care activities such as eating, bathing, mobility, and dressing, especially involving the lower limbs, often requiring assistance to perform these tasks.

These findings align with previous studies. For example, van Diemen et al. reported that poor self-care significantly affects quality of life and self-efficacy among SCI patients [16]. Participants in their study occasionally required help with basic needs such as eating, dressing, and toileting, leading to increased dependency and poorer health outcomes. Similarly, Benedicto et al. found high levels of mobility dependence, particularly in activities such as stair navigation and transfers between the floor and wheelchair [17].

Participation restrictions, especially in social activities, were commonly reported as hindering community reintegration. Numerous studies have demonstrated that increased participation is associated with higher quality of life for individuals with SCI. Greater social involvement enhances community reintegration and fosters feelings of self-worth and confidence [9]. Therefore, promoting participation is a key goal of rehabilitation for people with SCI.

Environmental barriers have been shown to negatively impact social participation. A Swiss study reported that many community-dwelling individuals with SCI experience participation restrictions due to environmental obstacles and limited physical independence [18]. Community reintegration contributes to life satisfaction and a sense of competence, playing an important role in both psychological and economic well-being.

Consistent with the present findings, social interactions with friends and family, alongside feelings of isolation, were highlighted in the study "Patients, Partners, and Practitioners: Interactions and Meaning-Making Following Spinal Cord Injury" by Alexis Bender [19]. Similarly, Mohammadi et al. identified a lack of social support as a significant challenge [20]. Environmental inaccessibility has also been recognized as a primary barrier to social participation and integration among individuals with SCI in South Africa [21].

Joyce Mothabeng's study found that wheelchair users with SCI often experience limited social participation, live in isolation, and feel unprepared for community life, resulting in poor integration [22]. Participants in the current study similarly perceived their environment as unsupportive, which negatively affects the development and maintenance of a positive self-concept. Successful social involvement requires an unbiased assessment of an individual's abilities, irrespective of mobility limitations.

The daily effort required to perform ADLs, the stress related to significant interpersonal relationships and role interactions, and the loss of satisfaction from previously enjoyed occupational and leisure activities have been noted to compound social difficulties among persons with SCI [23].

Social interaction problems were also reported in a study by Serres-Ade et al. in Tanzania where restricted access to home- and community-based activities was highlighted [24]. Overall, these findings are consistent with numerous studies reporting social interaction challenges within families and communities among individuals with spinal cord injury.

Persons with SCI openly shared their experiences and challenges following discharge from inpatient rehabilitation. The most frequently discussed issues were attitudinal environmental barriers and social support challenges. Negative attitudes from family members and society were reported in various studies. For example, Hanass et al. found that people with disabilities often face negative attitudes from their community, friends, and family [25]. Similarly, Halvorsen et al. reported poor relationships with family and friends among people with spinal cord injury [26]. As echoed by participants in this study, such negative social dynamics contribute to a reduced quality of life, highlighting the importance of positive relationships with family and friends for wheelchair users with SCI.

Inadequate social support from family, friends, and colleagues, combined with negative societal attitudes, has been shown to make life more difficult for persons with SCI. This was documented in a Swiss study by Lucian et al., consistent with participant experiences in the current study [15]. A systematic review by Müller et al. demonstrated that social support positively correlates with physical and mental health, pain management, coping strategies, adjustment, and life satisfaction in individuals with SCI [27]. Family support, in particular, has a positive effect on social reintegration [9], and early social support is considered essential during rehabilitation to enhance community integration. Many people with SCI describe their current community involvement as substantially reduced compared to the past, often due to negative attitudes from others, a finding also reflected in this study [28].

A significant number of participants perceived environmental accessibility as impacting their daily lives. The most problematic areas identified were inaccessible pathways, public transportation, and bathrooms. Similar challenges have been documented elsewhere; for example, Joseph et al. reported public transport as a major barrier for persons with SCI in South Africa [28]. Farzana et al. found environmental accessibility barriers among SCI patients in Bangladesh [29]. Rapidi et al. noted that home accessibility is a major challenge and that public transportation often remains unavailable to wheelchair users [30]. These findings align with the current study, where participants reported similar challenges upon returning to the community. Comparable results have also been observed in South Africa, where an inaccessible built environment and insufficient support systems limit participation in various activities [31]. Accessibility is essential for effective community reintegration and plays a crucial role in overall satisfaction for wheelchair users with SCI.

Rehabilitation professionals can benefit from these findings by looking beyond the physical needs of wheelchair users with SCI. Focusing on the individual needs of each client is vital to support successful reintegration into their communities and enable participation in meaningful activities.

This study included only patients attending outpatient rehabilitation services; persons with SCI still undergoing inpatient rehabilitation were excluded. Another limitation is the variability in chronicity (time since injury) among participants, which may affect community reintegration due to differences in adaptability over time. Finally, unequal resource distribution among Rwandans could have influenced the results, as environmental modifications vary and are likely to impact accessibility and participation differently.

CONCLUSION

The findings of this study revealed that wheelchair users with spinal cord injury (SCI), upon discharge from inpatient rehabilitation, face numerous challenges in their communities. These challenges span across environmental accessibility, activity limitations, attitudinal barriers, and participation restrictions. Participants expressed the need for comprehensive interventions both before and after discharge to support successful reintegration into society.

The findings of this study highlight the urgent need for comprehensive and multifaceted interventions to support individuals with spinal cord injury (SCI) in their transition from inpatient rehabilitation to community life. First, education for both SCI clients and their families should be an integral part of the discharge process. Providing information about the challenges of reintegration, self-care techniques, wheelchair use, and available community resources can better prepare individuals and their caregivers to navigate life after rehabilitation.

In addition, raising community awareness about disability is essential. Negative societal attitudes and stigma were consistently reported by study participants, indicating the need for targeted awareness campaigns that promote inclusion, empathy, and understanding of people with disabilities. These efforts can play a crucial role in changing perceptions and fostering a more supportive environment for individuals with SCI.

Home visits should also be incorporated into discharge planning to assess the living conditions of the person with SCI and identify necessary environmental modifications. Personalized home assessments can help ensure that the physical environment is adapted to the user's needs, thus promoting independence and reducing caregiver burden.

Lastly, there is a pressing need for wheelchair accessibility to be integrated into national and local urban planning policies. Ensuring that public spaces, roads, transportation systems, and buildings are accessible is fundamental to achieving full community participation for wheelchair users. Inclusive infrastructure not only supports reintegration but also affirms the rights and dignity of persons with disabilities as active members of society.

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Original Research **Open Access**

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

Emmanuel Munyaneza[1,2,*], Viviane Umutesi[1], Alphonsine Imanishimwe[1], Espoir Mwungura Ngabo[1], Joel Nshumuyiki[1], Esperance Muhawenayo[1], Jean de Dieu Haragirimana[1], Jean Pierre Nganabashaka[1], Isaie Ncogoza[1], Allen Ingabire[1], Michael L. Bahrami-Hessari[3,4], George Bucyibaruta[5], Faustin Ntirenganya[1]

[1]*College of Medicine and Health Sciences (CMHS), University of Rwanda, Kigali, Rwanda*
[2]*University Teaching Hospital of Kigali (CHUK), Kigali, Rwanda*
[3]*National Institute for Health Research (NIHR) Global Health Research Unit on Global Surgery, University of Birmingham, Birmingham, United Kingdom*
[4]*Institute of Applied Health Sciences, University of Birmingham, Birmingham, United Kingdom*
[5]*Centre for Equity in Global Surgery, University of Global Health Equity, Butaro, Rwanda*

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.

***Corresponding author:**
Emmanuel Munyaneza

University of Rwanda(UR), Kigali, Rwanda
University Teaching Hospital of Kigali (CHUK), Kigali, Rwanda

Email: emamunyaneza@gmail.com

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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,

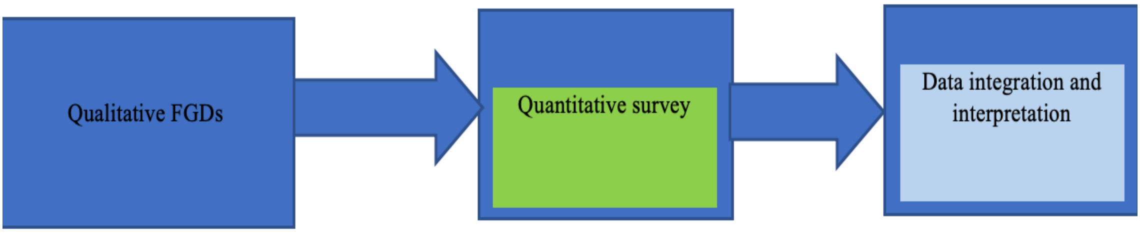

Figure 1: *Sequential exploratory mixed-methods design*

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
Category of CHWs	ASM	53	28.65
	Binômes	129	69.73
	Health Promotion	3	1.62
Location of CHWs	Rural	78	42.16
	Urban	107	57.84
Marital Status of CHWs	Married	132	71.35
	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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Original Research

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Implementing Labor Analgesia Program in Low-Resource Settings: The Experience from a Major Teaching Hospital in Rwanda, 2023

Edouard Uwamahoro[1], Angelique Ntegerejuwampaye[1], Vincent Dusingizimana[2], Alice Igiraneza[2], Dylan Bould[3], Eugene Tuyishime[4,*]

[1]Anesthesia and Critical Care Department, University Teaching Hospital of Kigali, Kigali, Rwanda

[2]Obstetrics and Gynecology Department, University Teaching Hospital of Kigali, Kigali, Rwanda

[3]Department of Anesthesiology and Pain Medicine, Hospital for SickKids, Toronto, Canada

[4]Anesthesia, Critical Care, and Emergency Medicine Department, University of Rwanda, Kigali, Rwanda

ABSTRACT

INTRODUCTION: Despite the high demand for pain relief during labor, access to labor analgesia remains limited in low-resource settings due to different challenges such as shortage of staff, inadequate equipment and supplies, insufficient training, high cost, and lack of local protocols. This project aimed to evaluate the feasibility of implementing a labor analgesia program at a major teaching hospital in Rwanda.

METHODS: This was a quality improvement project testing the implementation of the first labor analgesia program at the University Teaching Hospital of Kigali from August 2019 till July 2023. Descriptive statistics in Microsoft Excel (2010) were used for analysis.

RESULTS: 153 women underwent labour analgesia during our evaluation period. All women had adequate pain control (100%). Most women underwent epidural 136 (88.9%), followed by combined spinal epidural 13 (8.5%), and single-shot spinal anesthesia 4 (2.6%). Most labour analgesia procedures were conducted by anesthesiologists with residents 98 (64%) or anesthesiologists alone 45 (29.4%).

Most women had spontaneous vaginal delivery 102 (67%), however, 51 women had cesarian section (CS) mainly due to non-reassuring fetal heart rate (FHR) 30 (58.9%) and labor arrest 10 (19.6%). Most of them had no maternal or neonatal event 44 (86%). No post-dural puncture headache, infection, or epidural hematoma was recorded.

CONCLUSION: The results of this quality improvement project suggest that labour analgesia is feasible in low-resource settings and highlight essential areas for improvement, such as staffing and availability of equipment. This project provides valuable lessons for other anesthesiologists and hospitals in similar settings aiming to establish labor analgesia programs. More investments are needed in order to sustain and expand the labour analgesia program for women in low-resource settings.

***Corresponding author:**
Eugene Tuyishime

Department of Anesthesia, Critical Care and Emergency Medicine, University of Rwanda

Email: tuyishime36@gmail.com,

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INTRODUCTION

Childbirth pain management is a critical aspect of obstetric care, ensuring the well-being and comfort of both mothers and infants during labor. In Rwanda, as in many low-resource settings,

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there is a growing recognition of the importance of providing effective pain relief during labor [1-4]. However, the availability and utilization of labor analgesia services remain limited in many healthcare facilities, including tertiary centers. This is due to too few anesthesiologists, insufficient equipment and medications, and cultural barriers as described in similar settings [1-4]. This deficiency contributes to unnecessary suffering among laboring mothers, impacting their overall birth experience, and potentially contributing to negative maternal and neonatal outcomes [5]. The absence of comprehensive pain management strategies also reflects broader challenges in healthcare infrastructure and resource allocation.

While epidural analgesia is recognized as a gold standard for pain relief during labor and offers effective pain control with a favorable safety profile for both mother and baby, and higher rates of satisfaction, it has been shown to be challenging to implement in low-resource settings [6-9]. Some programs such as the one in Guyana used task sharing allowing non physician anesthetists to place epidurals due to the severe shortage of anesthesiologists, the negative cultural beliefs were addressed by health education initiatives, however, the shortage of resources (equipment and supplies) and staff (anesthesia providers and nurses) was a big barrier to the sustainability of the program [2].

To our knowledge, there was no labor analgesia program in any public hospital in Rwanda, including the University Teaching Hospital of Kigali (UTHK), prior to this project. In order to implement a successful labor analgesia program in Rwanda, an innovative implementation strategy was needed with consideration of the local context [10]. This project aimed to evaluate the feasibility of implementing a labor analgesia program at a major teaching hospital in Rwanda.

METHODS

Design

This was a quality improvement project conducted from August 2019 to July 2023. The reporting followed the Standards for Quality Improvement Reporting Excellence (SQUIRE) guidelines [11].

Settings

This project has been implemented at the UTHK, which is the major teaching and referral hospital in Rwanda, located in Kigali. The maternity department has 2 operating rooms and 10 labor beds with cardiotocography (CTG) monitoring, staffed by 40 midwives, 15 obstetricians, 20 rotating obstetric residents, 12 non-physician anesthetists, 20 rotating anesthesia residents, and 2 anesthesiologists. The maternity department conducts more than 2,400 deliveries annually, and half of them under caesarean section.

Program Design

Prior to January 2018, at the start of this project, labor analgesia was almost non-existent at the UTHK maternity department. Before the establishment of the labor analgesia program, our team including Dr Edouard Uwamahoro, Dr Servent Izabayo, Dr Eugene Tuyishime, and Prof. Adeyemi J. Olufolabi, visiting professor from Duke University, USA, conducted a pilot survey to evaluate patients and healthcare providers' perception about labor analgesia before the initiation of a context relevant labor analgesia program. While surveying healthcare providers (98 in total) from the maternity service including 47 doctors, 39 midwives and 12 non-physician anaesthetists, 86 (88%) believed that labor pain was severe and should be managed, but 91 (94%) of healthcare providers described not having sufficient knowledge and skills in labor analgesia. We did not assess the availability of equipment and supplies because the administration ensured to avail them, especially that this was a new service. We also surveyed patients on day 1 post-delivery (20 in total), 14 (70%) rated their pain as severe, 17 (85%) were not given any pain relief medication, 18 (90%) had never heard of pain medication for labor, and 16 (80%) felt medication should be available.

The results of this survey were presented to all members of the maternity department and the hospital administration, which provided support to test the implementation of the labor analgesia program while closing the identified gaps, especially a lack of skills.

Program Implementation

Our implementation strategy followed the 3 main steps below:

Guidelines and Protocols Development: First, in March 2018, our team developed the locally relevant labor analgesia guidelines.

Table 1: *Labour analgesia safety checklist*

Checklist Item	Details
Before Labour Analgesia	
Patient identification	Confirm patient name
Procedure to be performed	Epidural / CSE / Spinal
Consent	Anesthesia consent is obtained
Allergies	Check and record any allergies
Comorbidities	Note relevant conditions: pre-eclampsia, coagulopathy, cardiac disease, etc.
Platelet count	>75,000/mm³ for Epidural or CSE; >50,000/mm³ for Spinal
Anticoagulant/antiplatelet usage	Verify recent administration
Peripheral IV	Ensure it is functioning properly
Fetal status	Reassuring CTG tracing
Cervical dilatation	≥ 4 cm
After Labour Analgesia Procedure	
Monitoring every 5 minutes (first 30 min)	Blood pressure, heart rate, pulse oximetry (SpO_2)
Hourly monitoring	Pain score <3 (NRS), block level (T10 bilateral), vital signs (BP, HR, SpO_2), CTG assessment

CSE: Combined Spinal-Epidural, IV: Intravenous, CTG: Cardiotocography,, SpO_2: Peripheral Capillary Oxygen Saturation, NRS: Numerical Rating Scale, T10: Thoracic spinal nerve level 10

This guideline was intended to be comprehensive, including different documents such as the labor analgesia safety checklist (Table 1). The pain score evaluation used the existing numerical rating scale (NRS) adapted from the previous study done in Rwanda and translated into Kinyarwanda [10]. Both the labor analgesia checklist and protocol were posted in the delivery ward, and their copies were made available within patient charts.

Resources and Education: From March 2018 to August 2018, our team designed a labor analgesia trolley containing necessary medical supplies and drugs (Table 2). In addition, we ensured that necessary monitoring equipment (non-invasive blood pressure, pulse oximetry, and cardiotocography) was available. Moreover, we conducted regular morning staff teaching about labor analgesia, covering different topics such as guidelines and protocols, indications, techniques, drugs, monitoring, effectiveness, advantages, and complications of labor analgesia.

Implementation: From September 2018 to July 2019, our team initiated the labor analgesia program. Due to a shortage of anesthesia staff, the labor analgesia program was initiated only during day shifts, excluding weekends, by availing one anesthesiologist, one resident, and one non-physician anesthetist to offer the service. Regular feedback was requested from the labor analgesia team (midwives, obstetricians, non-physician anesthetists, anesthesia residents, and anesthesiologists), and mentorship was provided by the consultant anesthesiologist to the rest of the team. By the end of the implementation period, the final labor analgesia program was established with good feedback.

Table 2: *Labour analgesia protocol*

Medication / Technique	Dosage / Description
Paracetamol	1 g IV every 4 hours as needed
Tramadol	100 mg IM every 4 hours as needed
Spinal Analgesia Components	- Bupivacaine 2.5 mg - Fentanyl 20 mcg - Morphine 150 mcg
Epidural Analgesia	Intermittent bolus of 10–20 mL per hour of 0.125% or 0.0625% Bupivacaine with Fentanyl 2 µg/mL

IV: Intravenous, IM: Intramuscular

Program Evaluation

During the evaluation of our labor analgesia program, we evaluated the quality of labor analgesia from August 2019 to July 2023. This project was granted ethics approval by the UTHK Ethics Committee (Ref.: EC/CHUK/131/2023). We included all women with a viable pregnancy who requested neuraxial analgesia for labor at the maternity department at the UTHK. All participants provided their written informed consents prior to enrollment in the study. After signed consent, parturients were managed as per departmental protocol including paracetamol 1gm IV/4 hours as required and tramadol 100mg IM/4 hours as required followed by either single shot spinal analgesia (bupivacaine 2.5mg with fentanyl 25mcg), or an epidural or combined spinal-epidural analgesia maintained with intermittent bolus of 10 cc to 20 cc per hour of 0.125% or 0.0625% Bupivacaine and Fentanyl 2µg·ml. We excluded parturients who had incomplete information or non-neuraxial techniques of labor analgesia. We collected data on patients' characteristics, type of labor analgesia, labor analgesia provider, quality of pain control measured by NRS, complications, delivery mode, maternal outcomes, and neonatal outcomes.

Statistical Analysis

Data were entered electronically into an Excel spreadsheet from paper forms. Descriptive statistics were then used to report patient demographics and key variables. Data were analysed using Excel version 2010, and we reported the frequency and rate of occurrence of key variables such as level of labour progress, type of labor analgesia, profession of the health provider, level of pain control, delivery type, and complications.

RESULTS

One hundred fifty-three women underwent labor analgesia during our evaluation period, with 67% in the latent phase versus 33% in the active phase. All women had adequate pain control, 153 (100%), with a pain score < 3. Most women underwent epidural 136 (88.9%), followed by combined spinal epidural 13 (8.5%), and single shot spinal anesthesia (SSSA) 4 (2.6%).

Most labor analgesia procedures were conducted by anesthesiologists with residents, 98 (64%) or anesthesiologists alone, 45 (29.4%).

Table 3: *Characteristics of labour analgesia among 153 patients at the UTHK*

Criteria	Number (%)
Labor progress	
Latent phase	103 (67)
Active phase	50 (33)
Type of labor analgesia	
Epidural	136 (88.9)
CSE	13 (8.5)
SSSA	4 (2.6)
Health Provider	
Anesthesiologist alone	45 (29.4)
Anesthesiologist/Resident	98 (64.1)
Anesthesiologist/NPA	5 (3.3)
Resident/NPA	1 (0.6)
Resident	3 (2.0)
NPA	1 (0.6)
Adequate pain control	
Yes	100 (100)
No	0 (0)
Delivery type	
Vaginal	102 (66.6)
CS	51 (33.3)
Indications for CS	
NRFHR	(58.9)
Labour arrest	(19.6)
Others*	(21.5)
Post CS events#	
No	44 (86)
Yes	7 (14)
Labour analgesia utilization	
Yes	153 (1.3)
No	11384 (98.7)

**:Maternal request (8%), Abruptio placentae (8%), and Malpresentation (6%), #: vacuum extraction use (2.5%), perineal tear (2.5%), hypotension (1.3%), birth asphyxia (1.3%), fetal bradycardia (0.6%), bag mask ventilation for babies (11.8%), and NICU admission (7.2%), CSE Combined Spinal Epidural, SSSA: single shot spinal anesthesia NPA: Non physician anesthetist, CS: Cesarean section, NRFHR: Non reassuring fetal heart rate.*

Most women had spontaneous vaginal delivery 102 (67%), however, 51 women had cesarian section (CS) mainly due to non-reassuring fetal heart rate (FHR) 30 (58.9%) and labor arrest 10 (19.6%). Most of them had no maternal or neonatal event 44 (86%). No post-dural puncture headache, infection, or epidural hematoma was recorded.

Overall, among 153 deliveries, 18 (11.8%) babies required bag mask ventilation and 11 (7.2%) were admitted to the Neonatal Intensive Care unit (NICU). There was no maternal or neonatal death during the evaluation period. No post-dural puncture headache (PDPH), infection, or epidural hematoma was recorded (Table 3).

DISCUSSION

Our findings demonstrate the feasibility of establishing a labor analgesia program in a resource-limited setting such as Rwanda. Achieving adequate pain relief (pain score of 0-3 among 100% of patients) and favorable maternal and neonatal outcomes suggest that with proper planning, training, and resource allocation, significant improvements in the quality of labor analgesia can be achieved.

Our findings are in line with results from multiple studies conducted in other low- and middle-income countries (LMICs) [12-22]. In sub-Saharan African countries such as Kenya, Nigeria, Ethiopia, Cameroon, and Ghana, there are ongoing efforts to implement labor analgesia programs despite resource constraints [12-22]. Labor analgesia programs in these countries face some challenges, such as a shortage of trained personnel, equipment shortages, and negative cultural beliefs [11-20]. In the Middle East, countries like Egypt and Jordan have implemented labor analgesia programs in select urban centers [21-22]. These initiatives benefit from comparatively better resources but face challenges related to cost, cultural acceptance, and disparities in access between rural and urban areas.

Our labor analgesia program faces challenges similar to those from other LMICs, requiring appropriate intervention [12-22]. Good progress has been made towards the right direction; our team developed appropriate protocols, trained a multidisciplinary team including anesthesia residents, NPAs, and midwives; and negotiated administration support for the availability of required equipment, supplies, and drugs.

However, there are remaining challenges explaining a very low utilization of labor analgesia (1.34%) in comparison to a 7.5% utilization rate in Nigeria and more than 80% in high-income countries [18], [23-26]. The UTHK still faces a shortage of anesthesiologists; for example, there is only 1 anesthesiologist dedicated to the obstetric unit and the gynecology list, making it difficult to offer labor analgesia while managing the cesarian sections and gynecology cases. In addition, the need to provide hourly bolus of bupivacaine by the anesthesiologist makes it also inefficient; there is a need to invest in current infusion pumps with ability to deliver patient controlled, programmed intermittent bolus, or continuous infusions which can be managed by midwives allowing anesthesiologists to manage other patients for efficiency use of their limited time [26]. Establishing specialized training programs such as obstetric anesthesia fellowships and formal obstetric anesthesia residency rotations can potentially increase the number of personnel dedicated to obstetric anesthesia and sustain the labor analgesia program at the UTHK.

Moreover, it is also important to consider the impact of the COVID-19 pandemic, which led to the pause and slowdown of the project from March 2020 until June 2021, where anesthesiologists were managing critically ill patients or clearing the surgical backlog from the COVID-19 pandemic.

Another challenge our team observed during the implementation and supported by the literature is the low price of the epidural program at the UTHK ($7 per procedure). While the low price has the intention to make this service affordable, this leads to an unintended consequence of lacking enough resources to run the program. There is a need to negotiate a true market price of this important service based on other low-resource settings like Nigeria, with a higher but reasonable price of $35 [14].

The financial model used to run the labor analgesia program at King Faisal Hospital (KFH) and some private hospitals in Rwanda should also be examined. Lessons learned applied to the situation of CHUK while considering the difference in settings where CHUK receives mainly patients with public insurance and with a low-income background. In contrast, KFH and private hospitals usually care for high-income patients with private insurance.

It may be reasonable to initially implement labor analgesia at CHUK as a private practice before investing in the return on investment in the public labor analgesia program.

No patient should suffer from manageable pain while in the hospital, as recommended by different regulatory and advocacy organizations [27-29]. On top of that, these investments in labor analgesia also have the potential to contribute to the overall quality of care and outcomes because the obstetric anesthesia team will be involved in care of all pregnant women earlier, allowing timely optimization of comorbidities, recognition of complications, and establishment of labor analgesia and anesthesia plan. Another potential benefit is the reduction of the cesarean section rate and cost as demonstrated in similar settings [30], [31]. However, cultural beliefs and patient preferences may influence acceptance and uptake of labor analgesia services [32], [33]. Addressing misconceptions and providing education to both healthcare providers and patients is crucial. More community outreach and education programs are needed to raise awareness about the benefits and safety of labor analgesia.

More importantly, the Rwandan Society of Anesthesia and Critical Care (RSACC) should conduct more advocacy efforts for policy changes and financial support from government health agencies to prioritize labor analgesia in the national healthcare agenda. Some effective interventions in low-resource settings, such as task shifting and single short spinal anesthesia, should be tested in Rwanda and other similar settings [20], [34], [35].

There are multiple limitations to consider while interpreting the results of this quality improvement project. It is limited by its single-center design and relatively short evaluation period. The generalizability of findings may be restricted to similar hospital settings in low-resource environments. Additionally, the reliance on retrospective data analysis may introduce bias.

CONCLUSION

The results of this quality improvement project suggest that labor analgesia is feasible despite the challenges of a shortage of anesthesiologists and equipment.

We recommend that public hospitals and their stakeholders, such as health insurance, promote access to labor analgesia by providing appropriate funding for affordable equipment, supplies, and drugs, and ensuring a sustainable funding model considering the local context and the market value of the labor analgesia service. In addition, public hospitals and the Ministry of Health should implement innovative solutions such as the 4 x 4 program to provide adequate staffing for the labor analgesia program within teaching hospitals. Moreover, the Rwanda Society of Anesthesia and Critical Care (RSACC) should design policies and guidelines for adequate labor analgesia in Rwanda in collaboration with key stakeholders such as the Ministry of Health.

By implementing these recommendations, labor analgesia has the potential to become more accessible in Rwandan public hospitals, leading to higher quality of care for pregnant women, which is a priority for the Ministry of Health.

Lessons learned from this project can also be applied in other low-resource settings. Further quality improvement projects should evaluate the feasibility, cost-effectiveness, accessibility, and sustainability of the labor analgesia program in different public hospitals in Rwanda.

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Rwanda
Public Health Bulletin

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The Rwanda Public Health Bulletin (RPHB) is a printed and open access, peer-reviewed journal, published as the flagship scientific and technical periodical publication. RPHB is a public health bulletin launched in March 2019 by the Rwandan Ministry of Health, through the Rwanda Biomedical Centre (RBC) in collaboration with the CDC Foundation and with support from Bloomberg Philanthropies Data for Health Initiative.

Mission

To serve as a scientific information dissemination platform of national and international significance, mainly in areas related to the Rwanda Ministry of Health's essential mission to strengthen national and local health systems and improve the health of the people of Rwanda. The Rwanda Public Health Bulletin publishes disease surveillance summaries, public health response guidelines, public health notices, case reports, outbreak reports, original research papers, and policy briefs among others. It generally features issues of importance to its targeted audience, which is health professionals, academic researchers, policymakers and anybody interested in health issues. Articles for publication are received from doctors, nurses, allied health professionals, students, policymakers, government bodies, non-governmental bodies and others.

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INSTRUCTIONS TO AUTHORS

All works submitted to this bulletin will have to belong to the types of articles stated below:

1. ORIGINAL RESEARCH

Referred to as "Primary Research" pioneer in a determined domain. It can be from various aspects: Clinical features, pathophysiology, biochemistry, molecular biology, etc.

THE TITLE

The title of the article should be concise and informative. It should contain enough thoughts on the subject.

ABSTRACT

Abstract of 250 words maximum must accompany each manuscript and be divided into 4 paragraphs with the following headings and MeSH keywords:

Introduction: stating the purposes/aims of the work; the research undertaken, the hypothesis tested or the procedure evaluated.
Materials and methods: briefly stating what was done and what materials were used, including the number of subjects, the methods to assess the data and to control bias.
Results: Providing key findings of the study, including indicators of statistical significance, actual numbers, as well as percentages.
Conclusion: Summarizing in 1 or 2 sentences the work on the basis of the findings. It emphasizes new and important aspects of the study or observations.

THE MAIN TEXT

The text of observational and experimental articles is divided into sections with the following headings: Introduction: should always begin the text, and requires brevity and focuses. It conveys the nature and purpose of the work, and quotes the relevant literature. Only strictly pertinent background information is necessary for understanding why the topic is important. We suggest the final paragraph clearly states the hypothesis or purpose of the study.

METHODS

Details of clinical and technical procedures should follow the introduction. A clear description of the selection of the observational or experimental subjects should be given. The identification of all aspects of the study, its reasoning, and the related relevance should be explicitly justified. In case, the study was done in a particular way, the guiding principles should all be clarified. Exclusion and inclusion criteria or partial inclusion, the reliability index, the confidentiality index, the analysis step, and the data collection processes should be also carefully specified. This section should provide sufficient details on the methods, instrumentation, procedures, all drugs and chemicals used (including generic names, doses, routes of administration). It should allow other workers to reproduce the study if necessary.
This section should also state the self-evaluation of the study by: independent/consensus readings blinded or unblinded to other information and estimate the fluctuation of recall biases by random ordering of studies.

Be clear about the retrospective or prospective nature of the study. Finally, provide references to established methods, including statistical methods that have been published, forthcoming, or that may not be well known. New description or substantially modified methods may be used however, give reasons for the use of these techniques, and evaluate their limitations. Statistical methods should be described with enough details to enable a knowledgeable reader with access to the original data to verify the reported results. A general description of methods would be defined in the methods section, whereas a specific statistical method used into analysis would be summarized in the results section. Any general use of the computer program should be specified, and more details have to be clarified about any randomization issues.

RESULTS

Logical sequence of presentation of results is required in the text; along with tables, and illustrations. Repetition of data from illustrations into the text should be avoided; however, emphasize or summary of only important observations would be helpful. Avoid the ‘’non-technical use’’ of technical terms in statistics which should be defined and reserved for the right purpose. Moreover, define all those statistical terms aside with or including abbreviations and/or most used symbols. Any complication and/or unexpected finding should be reported and the more possibly explained and the author should report lost to follow up and dropouts from a clinical trial.

DISCUSSION

Use ample subheadings. Emphasize the new and important aspects of the study and the conclusions that follow from them. Avoid repetition of details included in other parts. This section requires the mention of the implication of the findings, and their limitations for future research, involving relating the observations to other relevant studies.

Finally, the conclusions should be linked to the goals of the study; though mostly avoiding:

Unqualified statement not completely supported by the data

Statement on economic benefits and costs unless the report includes economic data and analyses

Claim of priority and alluding to work that has not been completed.

Whereas new hypotheses could be suggested when warranted, but they should be clearly labeled as such and recommendations, when appropriate and needed, may be given.

Acknowledgments

List all contributors who do not meet the criteria of authorship, such as those who provided purely technical help, writing assistance, or a department chair who provided only general support; and their respective contribution will be headed as provided. Everybody must have given written permission to be acknowledged. References: References should be numbered consecutively in the order in which they were first mentioned in the text. They will be identified in the text, tables, and legends by arabic numbers. This bulletin uses the IEEE style (Institute of Electrical and Electronics Engineers) for referencing the citations. It is advised to avoid citations or personal communication unless they provide essential and pertinent information. In all case, the name of the person and date of communication should be cited in parentheses in the text.

2. CHECKLIST FOR SURVEILLANCE REPORTS

Disease surveillance summaries are reported following the checklist below:
Title: Compose a title that includes the name of the health condition, population, time and place.
Abstract: Provide a structured abstract including the following sub- headings: Background; Objectives; Methods; Results; and Conclusion.

INTRODUCTION

Context: Summarize the current situation regarding the health condition under surveillance and identify why it is important. Objectives: State the objective of the surveillance report.

METHODS

Setting: Describe the setting, locations and dates of the surveillance period.
Population: Describe the population under surveillance. Definitions: Provide definitions for each health event under surveillance, including

case definitions and any public health interventions.
Information sources: Describe all data sources, including the objective of any surveillance systems, what data were collected and how data were gathered, transferred and stored. Supplementary data: If appropriate, note where to access supplemental material (e.g., www.opendata.gc.ca).
Data quality, missing data and reporting delays: Describe how the data quality was assessed. Explain how missing data were addressed. If data is reported by date of diagnosis or symptom onset, include a statement about whether the data for the most recent periods may be revised.

DATA ANALYSIS

Describe any analytical methods used providing sufficient detail to enable a knowledgeable reader with access to the original data to judge its appropriateness and to assess the reported results.

RESULTS

Descriptive: Provide a summary of the descriptive data, including demographics.
Data Quality: Report on data quality (e.g., completeness, missing data, under reporting)
Analytic data: Provide a summary of the analysis including (when indicated) estimates of trends. When applicable, point estimates should include appropriate indicators of measurement error such as 95% confidence intervals (e.g., average annual percentage change used to describe trends or odds ratios used to describe subgroup differences).
Figures: Create the minimum number of figures to highlight key results. Create a title that includes person, time and place.

DISCUSSION

Key results: Summarize key results with reference to study objectives
Comparison: Consider these findings in relation to the current literature. Strengths and weaknesses: Discuss the strengths and weaknesses of the study (data quality, completeness, sources of potential bias). Interpretation and generalizability: Provide a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies and other relevant evidence.
Conclusion: Ensure conclusions address objectives and follow from the results.

3. PUBLIC HEALTH NOTICES / OUTBREAK REPORTS

Following the Center for Disease Control recommendations, for public heath notices and outbreak reports to be published they need to cover all four components as stated below:

INTRODUCTION

Generally, the introductory paragraph should begin with 1 to 3 sentences establishing the existence of the outbreak or underlying public health problem. E.g., “On January 2, 2008, the Nevada State Health Division contacted CDC concerning surveillance reports received regarding two persons recently diagnosed with acute hepatitis C.” The introductory paragraph also usually contains: a) a statement that an investigation was conducted, when and by whom; b) the most important finding(s); c) the actions taken to stem the outbreak; and d) a statement of the public health implications and actions that should be taken in response to the investigation. Investigation and results: First, present the initial investigation and its findings. This might include: 1) a description of the setting and a statement of how the outbreak came to the attention of health authorities; 2) a clinical description of the index case or initial cases; 3) initial key test results; and 4) hypothesis generation activities and results. Next, summarize the full investigation, including: case definition, case-finding activities, method of investigation, and results. Cases should be counted and described by clinical characteristics, treatment, and outcome, as well as time, place, and person descriptive results. Next, present the methods and results of any analytic epidemiologic studies (e.g., cohort or case-control studies). Finally, provide the results of any relevant microbiologic, genetic, or toxicologic results, followed by the results of any testing of environmental samples. Public health response: When appropriate, a brief description summarizing any public health interventions taken and the results of the interventions follows.

DISCUSSION

Same as for a Full Report, except that a Limitations paragraph might not be required for an Outbreak Report.

4. POLICY BRIEFS

This bulletin will use guidelines on reporting/publishing policy notes as they are suggested by the Center for Disease Control (CDC). As the CDC defines them; Policy Notes are intended to announce new official policies or recommendations (e.g., from ACIP or CDC). These reports can be thought of as briefs. Maximum word count at submission is 1,400 words. Up to three tables, figures, or boxes may be included. Policy Notes contain no Discussion or Limitations, and a summary box is not required. Although policy notes or brief might vary, following is a rough guide of what basic notes should have: Introduction: The introductory paragraph should be limited to 150–200 words. It might contain all or some of the following components: a brief introductory statement orienting the reader to the topic and placing it in context, a brief description of the public health problem, a brief statement of the rationale for the policy or recommendation, mention of the most important parts of the policy or recommendations, and one or two sentences stating the conclusions and the public health implications of the new policy or recommendations.

BACKGROUND

The Policy Note should include a paragraph after the introduction that summarizes background information relevant to the policy or recommendation that can help the reader understand the context and need for the policy or recommendation.

Methods: Should include a summary of the methods used to establish the policy or recommendation, including answers to some or all of these questions: Who was involved in the production of the guidelines or recommendations, and how? What evidence base was considered? What was the rationale for considering this evidence base? Was other evidence excluded from consideration and, if so, why? Rationale and evidence: The Policy Note should provide a concise review of the rationale for the policy or recommendation and a descriptive review of the scientific evidence used to establish it. It should include an explanation of how the policy or recommendation adds to, or differs from, relevant policies or recommendations established previously. Presentation of the policy or recommendation: The policy or recommendation should state clearly when it takes effect and to whom and under what circumstances it applies.

DISCUSSION OR COMMENT

The Policy Note should comment on the likely impact of the new policy or recommendation and plans for assessment of the policy or recommendation

5. CASE REPORTS

These are reports of an individual patient on their symptoms, treatment reactions on a disease or condition of interest. These reports normally focus on unusual reactions or occurrences. Similar cases to other research reports, case reports might include a literature review of previous similar. Case reports might also address positive patient outcome on particular treatment guidelines or individual impact of a particular intervention. These are mainly used for educational and decision-making purposes. Case reports are normally reported following a checklist found at the CARE Guidelines.

6. CASE STUDIES

We recommend authors to follow the "EQUATOR Network" for ample explanations and guidelines in the writing of such articles. They have to be well-described case studies on health care interventions of public health concern. These could be:

Rigorous assessments of processes and program interventions.

Recommendations on possible health interventions.

Never on individual patient (= case report)

7. COMMENTARIES / OPINION / METHODOLOGY ARTICLES

We recommend authors to follow the "EQUATOR Network" for ample explanations and guidelines in the writing of such articles. Though these articles are moderated, they should be:

Short, focused, opinionated to previous articles or any subject related to the journal entirely.
Contemporary and focusing on specific issues.
Normally up to 800 words.

Frank critics to the journal are bravely motivated and would be as much as possible published.

8. FORMATTING THE MANUSCRIPT

Please note that articles which are not correctly formatted will be returned to the authors

Format text: Style: No Spacing, Single column, Single Spacing
Font: Single Spacing, Times New Roman - size 12
Titles: Capitals and bold, size 14
Format tables: Times New Roman, Font size 9 No vertical lines. Horizontal lines in the table can be removed. No table should be larger than a single A4 page. Footnote should be size 9 and italic

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