

# Using a human centered design (HCD) approach to strengthen interpersonal relationships in maternal and child health care in rural Tanzania: Study Design

Kahabi Isangula, Constance Shumba, Eunice Siaity, Columba Mbekenga, Eunice Ndirangu-Mugo

Submitted to: JMIR Research Protocols  
on: March 12, 2022

**Disclaimer:** © The authors. All rights reserved. This is a privileged document currently under peer-review/community review. Authors have provided JMIR Publications with an exclusive license to publish this preprint on its website for review purposes only. While the final peer-reviewed paper may be licensed under a CC BY license on publication, at this stage authors and publisher expressly prohibit redistribution of this draft paper other than for review purposes.

## ***Table of Contents***

---

<b>Original Manuscript</b> .....	<b>5</b>
<b>Supplementary Files</b> .....	<b>18</b>
Multimedia Appendixes .....	<b>19</b>
Multimedia Appendix 1.....	<b>19</b>
Multimedia Appendix 2.....	<b>19</b>
Multimedia Appendix 3.....	<b>19</b>

Preprint  
JMIR Publications

# Using a human centered design (HCD) approach to strengthen interpersonal relationships in maternal and child health care in rural Tanzania: Study Design

Kahabi Isangula<sup>1</sup> MD, MPH, PhD; Constance Shumba<sup>2</sup> BSc, MSc, PhD; Eunice Siaity<sup>1</sup> BSc, MSc, PhD; Columba Mbekenga<sup>1</sup> BSc, MSc, PhD; Eunice Ndirangu-Mugo<sup>2</sup> BSc, MSc, PhD

<sup>1</sup>Aga Khan University, School of Nursing and Midwifery P.o.Box 125 Dar Es Salaam TZ

<sup>2</sup>Aga Khan University, School of Nursing and Midwifery, Nairobi, KE Nairobi KE

## Corresponding Author:

Kahabi Isangula MD, MPH, PhD

Aga Khan University, School of Nursing and Midwifery

P.o.Box 125

Salama House, 4th Fl.

344 Urambo St

Dar Es Salaam

TZ

## Abstract

**Background:** Evidence indicates that clients' dissatisfaction with providers' competences within maternal and child health (MCH) continues to impact trust in formal health care systems, service uptake, continuity with care and MCH outcomes. A major problem with existing interventions is the failure to address all the complexities of provider-client relationships necessitating targeted contextualised innovative solutions that place providers and clients at the forefront as agents of change in optimizing intervention design and implementation. In attempt to improve provider-client relationship, the Aga Khan University is piloting a human centered -design (HCD) intervention where MCH nurses and clients are invited to partner in the intervention design and evaluation process to better understand and address the identified challenges.

**Objective:** The objective of this intervention is to co-design a prototype for improving nurse-client relationship in Shinyanga region of rural Tanzania by piloting HCD; a problem-solving approach that utilizes a series of iterative steps to tailor-make solutions for complex problems

**Methods:** A five step HCD approach will be implemented, including: (i) Community-driven discovery through qualitative research methods using Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs); ii) Co-design of an intervention package through ideation meetings and creation workshops with nurses, clients and other stakeholders; iii) Prototype validation through qualitative insight gathering using FGDs; iv) Refinement/Adaptation meetings and; (v) Documentation and sharing of lessons learnt before the final prototype is tested and validated in a broader community (phase 2).

**Results:** The results of the intervention are expected to include a co-designed prototype characterized by a package of interventions for improving nurse-client relationships in maternal and child health care in rural contexts.

**Conclusions:** Human centered -design approach provides a novel entry point for strengthening provider-client relationships where clients are invited to partner with providers in the design of highly acceptable and feasible interventions. Clinical Trial: None

(JMIR Preprints 12/03/2022:37947)

DOI: <https://doi.org/10.2196/preprints.37947>

## Preprint Settings

1) Would you like to publish your submitted manuscript as preprint?

✓ **Please make my preprint PDF available to anyone at any time (recommended).**

Please make my preprint PDF available only to logged-in users; I understand that my title and abstract will remain visible to all users.  
Only make the preprint title and abstract visible.

No, I do not wish to publish my submitted manuscript as a preprint.

2) If accepted for publication in a JMIR journal, would you like the PDF to be visible to the public?

✓ **Yes, please make my accepted manuscript PDF available to anyone at any time (Recommended).**

Yes, but please make my accepted manuscript PDF available only to logged-in users; I understand that the title and abstract will remain visible to the public.

Yes, but only make the title and abstract visible (see Important note, above). I understand that if I later pay to participate in [JMIR Publications](#), I will be able to make the full manuscript PDF available to the public.

Preprint  
JMIR Publications

**Original Manuscript**



## Original Paper

# Using a human centered design (HCD) approach to strengthen interpersonal relationships in maternal and child health care in rural Tanzania: Study Design

## ABSTRACT

**Background:** Evidence indicates that clients' dissatisfaction with providers' competences within maternal and child health (MCH) continues to impact trust in formal healthcare systems, service uptake, continuity with care and MCH outcomes. A major problem with existing interventions is the failure to address all the complexities of provider-client relationships necessitating targeted contextualized innovative solutions, that place providers and clients at the forefront as agents of change in optimizing intervention design and implementation. To improve provider-client relationship, the Aga Khan University is piloting a human-centered design (HCD) intervention where MCH nurses and clients are invited to partner in the intervention design and evaluation process.

**Objective:** The objective of this research is to co-design an intervention package (prototype) for improving nurse-client relationships in the rural Shinyanga region of Tanzania by utilizing a series of iterative HCD steps, involving key stakeholders to tailor-make solutions for complex problems impacting provider-client interactions in MCH care.

**Methods:** A five step HCD approach will be implemented, including: (i) Community-driven discovery through qualitative descriptive research methods using Focus Group Discussions (FGDs), and Key Informant Interviews (KIIs); ii) Co-design of an intervention package through consultative ideation and co-creation meetings with nurses, clients and other stakeholders; iii) Prototype validation through qualitative insight gathering using FGDs; iv) Refinement/Adaptation meetings and; (v) Documentation and sharing of lessons learned before the final prototype is tested and validated in a broader community.

**Results:** A prototype characterized by a package of interventions for improving nurse-client relationships in MCH care in rural contexts, is expected to be developed from the co-design process.

**Conclusions:** A human-centered design approach provides a novel entry point for strengthening provider-client relationships, where clients are invited to partner with providers in the design of acceptable and feasible interventions.

**Ethical Clearance:** NIMR/HQ/R.8a/Vol. IX/3906

**Keywords:** Human-centered design; provider-patient relationships; nurse-client relationships; nurses; maternal and child health; primary health care; rural; Tanzania; Africa

## INTRODUCTION

Nurses and midwives form a critical component of maternal and child health (MCH) services globally. They play a vital role in the delivery of primary health care services related to pregnancy monitoring, delivery and postnatal care for women and newborns around the world [1-4]. In sub-Saharan Africa, nurses and midwives are often respected members of the community and provide advice and evidence-based information on a range of health issues, including care of newborns and young children [2-4]. In the presence of sufficient, well supported and competent nurses and midwives, 83% of maternal deaths, stillbirths and neonatal deaths could be prevented [5-7].

Competent nurses and midwives have the potential to increase client service uptake, continuity, and consequently improve health outcomes, such as increased breastfeeding initiation and duration, and reductions in caesarean sections, maternal infections, postpartum hemorrhage and preterm births [8]. Literature suggests that investing in nurses and midwives has the potential to yield a 16-fold return on investment resulting from improved MCH outcomes [9].

Despite the critical role of nurses and midwives, there has been increasing clients' dissatisfaction with nurses and midwives' interpersonal and perceived technical competences within MCH care in recent years [10-19]. Perceived technical incompetence associated with skills, reliability, assurance, confidentiality and patient engagement, and behavioral incompetence involving demeanor/attitudes empathy, communication skills/language, violation of client rights and respect, continue to obscure the positive value of nurses and midwives in the delivery of MCH interventions in Tanzania and other settings [10-21]. Recent studies indicate that clients' dissatisfaction with nurses' interpersonal and technical aspect of care continues to erode client trust in formal healthcare system, service uptake, continuity and MCH outcomes [19-23].

To address clients' dissatisfaction, healthcare service governance instruments including policies, client service charters, health facility governance committees, complaints mechanisms and professional bodies have been emphasized in both high- and low-income settings, however, their effectiveness is not well-established. Consequently, political interventions such as employment termination and labelling of nurses as 'bad, lazy and incompetent' are the current actions utilized in addressing this complex problem, creating tension between clients and nurses as well as contributing to the poor morale of providers [24-25]. Competence-based interventions focusing on provider communication skills, patient centered care, patient literacy, information seeking, participation and questioning skills are often implemented erratically yielding unsatisfactory results. A major challenge with existing interventions documented in literature, is the failure to address all the complexities of nurse-client relationships along the continuum of MCH care. Patient's socio-economic fragility, literacy and behaviors coupled with providers' poor interpersonal skills, and health system challenges add to the complexity of nurse-client relationships. This complexity necessitates targeted contextualized and innovative solutions, that place nurses and clients at the forefront as agents of change in optimizing the design and implementation of interventions [26].

Rather than replicating existing interventions that may not be contextually applicable, new and innovative interventions to improve the provision of high quality and satisfactory care, are needed within resource constrained settings such as rural Tanzania [26-32]. If embraced, a step-wise incremental process from intervention design to evaluation of effectiveness could offer flexibility in problem-solving while using a standardized process that has the potential to be applied in diverse settings. It is within this context that the Aga Khan University is piloting a human-centered design (HCD) intervention in rural Tanzania, where nurses and MCH clients are invited to partner in the intervention design and evaluation process to deepen understanding of, and address the identified challenges. Abookire *et al.* [31] consider HCD as "an innovative approach to problem-solving that leverages insights from the end-users of new products, services, and experiences in order to develop best-fit solutions that are rapidly prototyped and iteratively refined" [p.1]. HCD is considered to facilitate improvements in client, provider, and community satisfaction, and increased efficiency and collaboration in public health intervention development and implementation process [30-32]. Furthermore, HCD may result in more successful and sustainable interventions compared to traditional problem-solving approaches in health care and public health [31]. Melles, Albayrak and Goossens [30] recently proposed that the implementation of HCD in health care needs to focus on developing an understanding of the people facing a particular barrier and their needs, and engaging them as stakeholders throughout the design process. The HCD approach also embraces a system-

wide outlook by considering interactions of factors at different levels and harmonizing individual interests to form collective interests when developing solutions. Therefore, we aim to co-design an intervention package (prototype) for improving nurse-client relationship in Shinyanga region of rural Tanzania by utilizing a series of iterative HCD steps involving key stakeholders to contextualize solutions for complex problems impacting interactions in MCH care. We hypothesize that the emerging prototype will have high potential in improving nurse-client relationships, thereby leading to increased client satisfaction, MCH service uptake and service continuity in rural communities.

## METHODS

### Design

A five-step HCD approach will be employed as an investigative framework to co-design interventions for improving nurse-client relationship using qualitative descriptive design with FGDs, KIIs and consultative meetings. This approach was deemed appropriate to answer two key questions: i) what are the drivers of poor nurse-client relationship in MCH care and; ii) what is the best intervention co-developed by nurses and clients for strengthening nurse-client relationships to address these drivers' considering feasibility and acceptability? A qualitative descriptive approach is appropriate for this inquiry as it aims to develop understanding and describe nurse-client relationships without testing an existing theory (33). This approach offers an effective way of gaining a deep and rich understanding of nurses and clients' perceptions, and experiences in the chosen context as this may differ from other contexts in terms of culture, expectations and resources within the health care settings. The qualitative descriptive design also allows us to acknowledge the subjectivity of both nurses, clients and researchers' experiences of nurse-client relationships, the research process, and therefore collect data in a natural setting. Furthermore, by listening to nurses and clients' descriptions, we could learn from these experiences of MCH care and use "...this knowledge to influence interventions design" using HCD process and generate research findings of "specific relevance to practitioners and policy makers" to improve MCH care (33, p.3).

As an investigative framework for this study, HCD is a problem-solving approach that utilizes a series of iterative, often non-linear steps to tailor-make solutions for complex problems [26-32]. While similar to other participatory research frameworks in its inclusion of end-user feedback throughout the research process, HCD differs in its endeavor towards empathy, a deep understanding of the motivations and desires that govern human behavior, as the inspiration and core of intervention development [26]. In HCD approach, end-users are invited to partner in the design and evaluation process in order to better understand, meet, and address the challenge. In a low-resource, complex setting where the drivers of poor nurse-client relationships may differ significantly from well-resourced settings, these key principles of HCD can be leveraged to optimize intervention development and implementation.

### Settings

This study will be conducted in Shinyanga, a region located in the Lake Zone and predominantly inhabited by Bantus. Isangula [23] offers a detailed description of the region. Briefly, Shinyanga falls within the low-income category of the regions in Tanzania. It is administratively divided into five districts: Shinyanga Municipal Council (MC), Shinyanga District Council (DC), Kishapu DC, Kahama MC and Kahama DC. The rationale for choosing Shinyanga is twofold. First, the region ethnically, is predominantly inhabited by Sukuma who share a range of socio-cultural beliefs and practices with minimal diversity. Due to its near homogeneity, the region is a perfect exemplar of many other rural regions of Tanzania. Second, despite a number of capacity building interventions, local data indicates enormous concerns of poor nurse-client relationships in MCH care [23]. Within

Shinyanga Region, Shinyanga DC was purposefully selected because patients in these districts have wealthier access to both the formal healthcare system (mostly public and few private and faith-based facilities) and traditional care [23].

By focusing on Shinyanga region, we will embrace the importance of deepening our understanding of the unique barriers to nurse-client relationships in this setting, and aim to provide a context specific intervention model that is applicable in this and similar contexts. The UK Medical Research Council's framework for the development and evaluation of complex interventions underlines the crucial role of the context in the adaptation and implementation of interventions [34]. The region, like many other parts of Tanzania and Sub-Saharan Africa (SSA) has a wide range of rural and urban populations with varying socio-economic status including high marginalized populations with immense potential to positively impact population health. However, given the contextual differences within Tanzania and across Africa, the prototype generated may differ but still provide an applicable and exemplar model for feasibility testing and adaptation in diverse settings.

The concerns of poor nurse-client relationships in MCH documented in Shinyanga have been previously documented in other rural regions of Tanzania and Africa. This means, the prototype developed in Shinyanga may be feasible in other rural regions of Tanzania and Africa with some minor adaptations. However, further testing and refinement of the prototype during the feasibility study may offer more insights on the feasibility of the prototype in other regions of Tanzania and beyond.

## **Study Population, Sample Size, Sampling and Data Collection**

A five step HCD process is envisaged as follows.

### **Step 1: Community-driven discovery inquiry**

A combination of qualitative research methodologies will be employed to explore community and individual perspectives. A minimum of 8 FGDs and 10 key informant interviews will be conducted with purposefully selected nurses and midwives, women attending MCH services and administrators using a semi-structured interview guide in Swahili language. We believe this sample is adequate because recent reviews have found that most qualitative studies achieve data saturation between 9-17 interviews [35]. The semi-structured interview guide will contain questions on the existing drivers of poor nurse-client relationships and, the contextual factors, barriers and facilitators that could impact intervention design, implementation and sustainability. Participants will be recruited through MCH managers. All interviews will be conducted at a convenient location confirmed with respondents in advance to enable them to identify an alternate location if required. Upon arrival, research assistants will provide detailed information on the study, obtain informed consent and engage respondents for approximately 45-60 minutes in a semi-structured audio-taped discussion. The findings will be utilized in Step 2 of the HCD process.

### **Step 2: Consultative co-design meetings**

In this stage, a transdisciplinary team of purposively sampled MCH nurses and midwives, clients, administrators and other relevant stakeholders (30 members) will gather to define the challenges based on discovery findings and design an intervention package (prototype) with the most potential to improve nurse-client relationships considering acceptability and feasibility. Invitation letters will be sent to purposively sampled participants with information on the date of the consultative meeting and preselected venue. This three month process will involve three (3) consultative meetings: (i)

synthesis meetings to review the qualitative data gathered in step 1, share insights, experiences and questions to generate deeper understanding of challenges of nurse-client relationships in Shinyanga; (ii) ideation meetings to brainstorm and generate ‘how might we’ questions that facilitate development of potential ideas for the solution; (iii) prototype and co-creation meeting to evaluate the ideas generated considering pros, cons and feasibility and, to develop initial (rough) prototype model (s) as well as elements crucial to its testing (features, modality, responsible person etc.). Each meeting will be conducted for 4- 6 hours and all key discussion points documented. The findings will inform step 3.

### Step 3: Validation/insights gathering inquiry

This will involve insights gathering on the rough prototype in Shinyanga MC for 3 months depending on the features of prototype model to be tested. The aim is to gather qualitative feedback using guided FGDs (6) with purposively sampled participants to identify features appealing to both nurses and clients for strengthening their relationship in order to increase MCH service satisfaction, uptake and continuity. Nurses and clients will be recruited through MCH managers and engage in 45-60 minutes audio-taped discussions. The findings will inform step 4

### Step 4: Refinement/ Adaptation meeting

The design team will reconvene for one day to evaluate the feedback and rough prototype insights as well as refine and adapt the prototype. Representatives of participants of rough prototype testing (insight gathering inquiry) will be selected by their peers to take part in refinement and adaptation process leading to the final prototype model. The lessons learned in arriving at the final prototype model will inform step 5

### Step 5: Document and share

The lessons will be synthesized and disseminated to local and international stakeholders. These lessons will form the basis for transitioning the intervention package (prototype) to feasibility and definitive testing.

Three research assistants will be recruited and trained on the HCD process and techniques pertaining to this study. The discussion, interview and consultative meeting guides will be pre-tested in purposefully selected settings and refined to ensure readiness for use in the actual data collection process. Close and supportive supervision of research assistants will be conducted throughout data collection and analysis stages to ensure data quality.

## Data management and analysis

HCD process will generate data from FGDs, KIIs and consultative meetings. Data transcription and translation will occur simultaneously by research assistants and verified by the research team. Interview transcripts will be de-identified, pseudonyms generated for each participant and the data uploaded into NVivo 12 software (QSR International, Australia) for management and deductive thematic coding. A stepwise approach will be used for a deductive thematic analysis of the interview transcripts [36]. First, the research team will examine the research questions and generate several themes based on consensus. This will result in an analytical matrix of the main themes and subthemes. Individual transcripts and phrases (codes) representing participants’ responses to investigators’ probes will be exported to relevant themes and related subthemes within Nvivo Software. A consensus-based approach will then be used by the research team on whether to include codes that do not fit within the developed subthemes and themes or disbandment when subjectively

and objectively deemed of no critical value to the study. The data within the Nvivo will then be exported to Ms Word for interpretative analysis and report generation.

## **Ethics**

This study has received ethics clearance from the Aga Khan University Ethics review committee and The National Institute for Medical Research (NIMR/HQ/R.8a/Vol. IX/3906) and local approvals from the Regional Medical Officer of Shinyanga and the Municipal Medical Officer in Shinyanga. At the health facility level where nurses and clients will be accessed from, verbal approvals will be sought from managers of the selected facilities after providing letters from the district medical officers and copies of ethical clearance. We will ensure responsible conduct of research by obtaining written consent from all research participants before participation.

The study does not directly or indirectly expose nurses and clients to any diagnosis or treatment. As safeguards, all study responses will be made confidential, and data analysis and reporting will be conducted at an aggregated level within Shinyanga Region. Further, all data gathered will not be used for purposes other than the present research. Due to the global COVID-19 pandemic, face masks, sanitizers and social distancing will be observed to mitigate infection transmission during fieldwork activities.

## **Data availability**

The authors confirm that the data supporting the findings in emerging publications from HCD intervention will be available within the article as supplementary materials. Additional data on the HCD process that are not part of the published article will be available on request from the Aga Khan University through the corresponding author [KI]. Some data may not publicly available for ethical reasons (i.e., containing information that could compromise the privacy of research participants).

## **RESULTS**

### **Participant demographics**

We will summarize the characteristics of all participants across all stages of the HCD process. Descriptions and tables will be used to present key participant characteristics.

### **Findings from the Community driven discovery inquiry**

We expect to generate results of a qualitative study employing FGDs with nurses and MCH clients and KIIs with MCH administrators and stakeholders conducted as part of the community driven inquiry. The results will include participants' understanding of what nurse-client relationship means, their experiences with good and bad nurse-client interactions, the existing drivers of poor nurse-client relationships and, the contextual factors, barriers and facilitators that could impact intervention design, implementation and sustainability. The findings will include analysis supported by participant quotes and will form the first set of HCD results to guide the co-design step.

### **Findings from consultative co-design meetings**

We expect to generate findings from the consultative meeting proceedings conducted as part of the co-design process. These findings will include the discussions with nurses, MCH clients and key stakeholders in defining the challenges based on discovery findings (synthesis meeting), potential

solutions to addressing the identified challenges generated (ideation meeting) and the intervention package (prototype and co-creation meeting) with most potential to improve nurse-client relationships considering acceptability and feasibility. The findings will be presented in terms of interpretation, participant quotes, tables, and figures and will form the second set of HCD findings and guide the insight gathering/ prototype validation step.

### **Findings from validation/ insight gathering inquiry**

We expect to subject the emerging prototype to a validation process by gathering insights through FGDs with nurses and clients who were not involved in initial HCD steps. The results of FGDs will be analyzed to identify features appealing to both nurses and clients for strengthening their relationship in order to increase MCH service satisfaction, uptake and continuity. The findings will be presented in terms of interpretation and the proposed intervention package (prototype). The findings will form the third set of HCD results and will guide the final adaptation step.

### **Findings from prototype refinement/adaptation meeting**

We expect to refine and adapt the prototype based on the insights of nurses and clients who were not part of initial HCD steps. The findings of refinement and adaptation meeting will be presented in terms of interpretation, participant quotes, tables, and figures. The final prototype (package of interventions) for strengthening nurse-client relationship in MCH care will also be presented. The findings will guide scholarly discussions and future interventions in a broader setting.

## **DISCUSSION**

The purpose of this study is to pilot an HCD approach for improving provider-client relationship in maternal and childcare in rural Tanzania. Using this approach, the research team seeks to partner with nurses, midwives, clients and other stakeholders to develop a prototype for addressing the complex problem of nurse-client relationship in Shinyanga.

The principal results are expected to be fourfold. First, the results of the community driven inquiry including the existing drivers of poor nurse-client relationships and, the contextual factors, barriers and facilitators that could impact intervention design, implementation, and sustainability. These results will be discussed in comparison to previous works that have examined the factors that impact nurse-client relationship in both low- and high-income contexts [10-23]. Second, the results of consultative meeting proceedings conducted as part of the co-design process to define the challenges based on discovery findings and design an interventional package (prototype) with most potential to improve nurse-client relationships. During this phase synthesis, ideation and co-creation meetings will be held to brainstorm and evaluate possible solutions leading to the development of a contextualized rough prototype to address poor nurse-client relationships. The rough prototype may include conventional capacity building interventions such as providers' training on interpersonal communication, development of an interpersonal encounter algorithm for providers, community sensitization and advocacy activities on clients' charter, competitions to incentivize good provider behavior such as the 'nurse of the month/year' all duly informed by the formative research. It is also possible that the capacity building and community mobilization and advocacy activities will leverage technology (mHealth), for instance, with provider algorithms to remind nurses and midwives to conduct themselves in a certain way and/or behavior change and communication strategies for clients through SMS messaging or audio-visual methods. The emerging rough intervention package will be

discussed in view of previous interventions for strengthening nurse-client relationships, for instance [37-43]. Third, the results of prototype validation to identify features appealing to both nurses and clients for strengthening their relationship in order to increase MCH service satisfaction, uptake and continuity. We will gather feedback on the rough prototype for refinement of the prototype accordingly. A preliminary theory of change map will be developed based on the stakeholder consultations. The results of the prototype validation will be discussed considering acceptable and feasible interventions that have been proposed to improve nurse-client relationships for instance [37-43]. Lastly, the results of refinement and adaptation meetings resulting in a final prototype for strengthening nurse-client relationships. We will examine the existing body of literature in both high- and low-income countries to examine the novelty of the emerging prototype, and or whether it has been considered in other settings and key considerations for implementation. We will consider a body of literature on interventions aimed at strengthening both nurse-client relationships as well as general provider-client relationships [23, 37-43]. Intrinsic to the co-design process is the fact that stakeholders jointly understand a problem, act on it, and learn from working collaboratively to contest power relations and effect change [26-32].

As noted above, the strength of HCD methodology is that it is a highly adaptive and creative approach to problem-solving [26-32] and will enable the team to deeply understand the drivers of poor client-provider relationships and ensure a collaborative approach to the design of solutions by stakeholders yielding a final model that is highly feasible as a result. We will document the co-design process, develop the final prototype manual and associated materials to facilitate replication of the intervention in similar or other settings. More specifically, we envision applying for additional funds to test emerging prototype within Tanzania and across East African region to determine whether it could be applicable to a much broader African context.

## Limitations

The application of HCD to develop a prototype for improving nurse-client relationship is not without limitations. The HCD intervention uses nurses as exemplar of providers to co-develop a prototype for strengthening interpersonal relationships in MCH care in a rural setting. However, patients interact with multidisciplinary teams of providers within healthcare settings. Conducting a similar study with other providers such as doctors and, in a different setting may yield a different prototype. However, this being the first study in this context, future inquiry may extend beyond nursing profession and rural contexts.

## Comparison with Prior Work

The discussion of the emerging findings will be contextualized based on previous studies and interventions on strengthening provider-client relationships in Tanzania and beyond, for instance [17-25, 37-42]. In particular, the results will be discussed taking stock of a previous study in a similar setting conducted by the PI that proposed the need for novel approaches to address the complexity of on patient-provider relationships [23].

## Dissemination plan

A number of strategies will be employed to disseminate the results of this interventional study. First, we will employ the Aga Khan University networks by sharing a research report to the funding agency (University Research Council in this case), depositing the reports and publications in eCommons and presentations of the findings in AKU-wide forums including journal clubs and research meetings. Second, we will share the results with local nursing and healthcare authorities by sending a summary of reports to district and regional medical officers, nursing and midwifery

councils, Ministry of Health and the National Institute for Medical Research for dissemination through government channels. This will ensure that the proposed interventions contribute to practice, policy and strategic plan discussions at the local and national level. We will also present the findings in local health care and scientific fora. We plan to develop at least three research manuscripts to be published in reputable scholarly journals. We will also disseminate the findings in international conferences and share a media brief for the general public.

## Conclusions and future directions

In conclusion, the HCD approach may provide a novel entry point for strengthening provider-client relationships where clients are invited to partner with providers in the design of highly acceptable and feasible interventions. The results of this pilot study will inform the design of interventions and policies to strengthen interpersonal relationships in health care settings more broadly. Moreover, future implementation teams and researchers can learn from the experience of this HCD intervention to guide program development.

## Acknowledgements

The authors acknowledge the financial support from the University Research Council at Aga Khan University to support this novel pilot project. We thank the National Institute for Medical Research, the Regional Medical Officer, and the Municipal Medical officer in Shinyanga for approving conduction of this project.

## Author Contributions

KI and CS designed the study, KI solicited for funding and developed initial draft of the manuscript. ES, CM and ENM participated in the project conception and design and critically reviewed and provided input to the manuscript.

## Conflicts of Interest

“None declared”

## Abbreviations

FGD: Focus Group Discussion

HCD: Human Centred Design

KII: Key Informant Interview

MCH: Maternal and child health

PI: Principal Investigator

SSA: Sub-Saharan Africa

URC: University Research Council

## Multimedia Appendix 1

Ethical Clearance Certificate from the National Institute for Medical Research, Tanzania

## Multimedia Appendix 2

Copies of data collection tools

## References

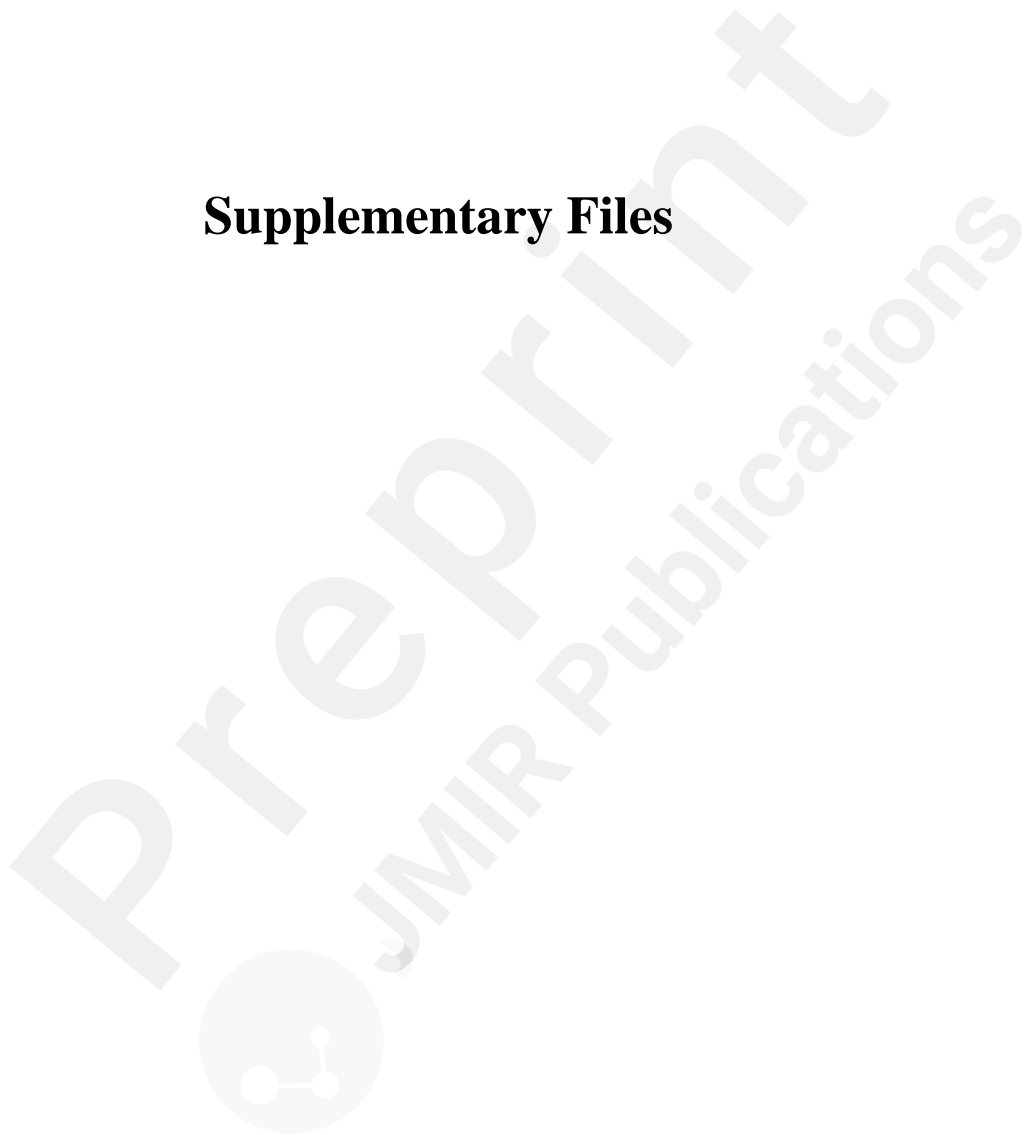
1. World Health Organization & United Nations Children's Fund. Survive and Thrive: Transforming care for every small and sick newborn- Key finding. Geneva: 2018. <https://apps.who.int/iris/bitstream/handle/10665/276655/WHO-FWC-MCA-18.11-eng.pdf?ua=1> [accessed Jan 15, 2022].
2. United Nations Population Fund. Investing in Midwives and Others with Midwifery Skills to Save the Lives of Mothers and Newborns and Improve Their Health. 2006. [https://www.unfpa.org/sites/default/files/pub-pdf/midwives\\_eng.pdf](https://www.unfpa.org/sites/default/files/pub-pdf/midwives_eng.pdf) [accessed Jan 10, 2022].
3. Fraser S, Grant J, Mannix T. Maternal Child and Family Health Nurses: Delivering a Unique Nursing Speciality. *Matern Child Health J.* 2016 Dec;20(12):2557-2564. doi: 10.1007/s10995-016-2081-2.
4. Taft AJ, Small R, Humphreys C. *et al.* Enhanced maternal and child health nurse care for women experiencing intimate partner/family violence: protocol for MOVE, a cluster randomised trial of screening and referral in primary health care. *BMC Public Health.* 2012; 12, 811. doi:10.1186/1471-2458-12-811
5. Homer, Caroline S E, et al. 'The projected effect of scaling up midwifery'. *The Lancet.* 2014; 384:1146-57. doi: 10.1016/S0140-6736(14)60790-X
6. Amiri A, Vehviläinen-Julkunen K, Solankallio-Vahteri T, Tuomi S. Impact of nurse staffing on reducing infant, neonatal and perinatal mortality rates: Evidence from panel data analysis in 35 OECD countries. *Int J Nurs Sci.* 2020 Feb 29;7(2):161-169. PMID: 32685612
7. Nove A, Friberg IK, de Bernis L, McConville F, Moran AC, Najjemba M, Ten Hoop-Bender P, Tracy S, Homer CSE. Potential impact of midwives in preventing and reducing maternal and neonatal mortality and stillbirths: a Lives Saved Tool modelling study. *Lancet Glob Health.* 2021 Jan;9(1):e24-e32. PMID: 33275948
8. World Health Organization. Strengthening quality midwifery education for Universal Health Coverage 2030: framework for action. Geneva: 2019. <https://apps.who.int/iris/bitstream/handle/10665/324738/9789241515849-eng.pdf> [accessed Feb 5, 2022].
9. United Nations Population Fund, International Confederation of Midwives & World Health Organization. *The State of the World's Midwifery 2021.* New York, 2014. <https://www.unfpa.org/sowmy> [accessed Jan 25, 2022].
10. Gilson L, Alilio M, Heggenhougen K. Community satisfaction with primary health care services: an evaluation undertaken in the Morogoro region of Tanzania. *Social Science & Medicine.* 1994;39(6):767-80. doi: 10.1016/0277-9536(94)90038-8
11. Khamis K, Njau B. Patients' level of satisfaction on quality of health care at Mwananyamala hospital in Dar es Salaam, Tanzania. *BMC Health Service Research.* 2014;14:400. doi:10.1186/1472-6963-14-400.
12. Kumbani L, Bjune G, Chirwa E, Malata A, Odland JO. Why some women fail to give birth at health facilities: a qualitative study of women's perceptions of perinatal care from rural Southern Malawi. *Reproductive Health.* 2013;10:9. doi:10.1186/1742-4755-10-9
13. Bassett MT, Bijlmakers L, & Sanders DM. Professionalism, patient satisfaction and quality of health care: experience during Zimbabwe's structural adjustment programme. *Social science & medicine.* 1997; 45(12), 1845–1852. doi:10.1016/s0277-9536(97)00122-6
14. Bukuku DD, Chontawan R, Akkadechanunt T. Nurse Caring Behaviors and Patient Satisfaction in a Tertiary Care Hospital, The United Republic of Tanzania. *Nursing Journal.* 2018; 45:4:217-28. <https://he02.tci-thaijo.org/index.php/cm nursing/article/view/162710/117514> [accessed Feb 12, 2022]
15. Juma D, Manongi R. Users' perceptions of outpatient quality of care in Kilosa District

- Hospital in central Tanzania. *Tanzania Journal of Health Research*. 2009;11(4):196-204. doi:10.4314/thrb.v11i4.50176
16. Ojwang B, Ogotu E, Matu P. Nurses' impoliteness as an impediment to patients' rights in selected Kenyan hospitals. *Health and Human Rights*. 2013;12(2), 101–117. PMID: 21178193.
  17. Gourlay A, Wringe A, Birdthistle I, Mshana G, Michael D, Urassa M. "It Is Like That, We Didn't Understand Each Other": Exploring the Influence of Patient-Provider Interactions on Prevention of Mother-To-Child Transmission of HIV Service Use in Rural Tanzania. *PLoS One*. 2014;9(9), e106325. doi: 10.1371/journal.pone.0106325
  18. Loghmani L, Borhani F, Abbaszadeh A. Factors affecting the nurse-patients' family communication in intensive care unit of kerman: a qualitative study. *J Caring Sci*. 2014 Feb 27;3(1):67-82. PMID: 25276750
  19. Molina-Mula J, Gallo-Estrada J. Impact of Nurse-Patient Relationship on Quality of Care and Patient Autonomy in Decision-Making. *Int J Environ Res Public Health*. 2020 Jan 29;17(3): 835. PMID: 32013108
  20. Mannava P, Durrant K, Fisher J, Chersich M, Luchters S. Attitudes and behaviours of maternal health care providers in interactions with clients: a systematic review. *Global Health*. 2015 Aug 15; 11:36. PMID: 26276053
  21. Madula P, Kalembo FW, Yu H, Kaminga AC. Healthcare provider-patient communication: a qualitative study of women's perceptions during childbirth. *Reprod Health*. 2018 Aug 13;15(1):135. PMID: 30103766
  22. Kaur B. Interpersonal communications in nursing practice - Key to Quality Health care. *Arch Nurs Pract Care*. 2020; 6(1): 019-022. doi:10.17352/2581-4265.000044
  23. Isangula KG. Patient trust in doctors in rural Tanzania: Meanings, factors and benefits in the context of NCDs and hypertension care. A thesis in fulfilment of the requirements for the degree of Doctor of Philosophy. Faculty of Medicine, School of Public Health and Community Medicine, The University of New South Wales, Australia. 2018. <http://unsworks.unsw.edu.au/fapi/datastream/unsworks:54751/SOURCE02?view=true> [accessed Feb 15, 2022].
  24. Uganda Radio Network. Opposition demands reinstatement of sacked health workers [Internet]. *The Observer* [Internet]. 2016 Aug 5. <http://observer.ug/news-headlines/45765-opposition-demands-reinstatement-of-sackedhealth-workers> [accessed Feb 15, 2022]
  25. Buguzi S. Tanzania: Doctors Up in Arms Against 'Unfair' Government Officials. *The Citizen* [Internet]. 2016 Mar 14 <http://allafrica.com/stories/201603140999.html> [accessed Nov 20, 2021].
  26. Leung CL, Naert M, Andama B. *et al*. Human-centered design as a guide to intervention planning for non-communicable diseases: the BIGPIC study from Western Kenya. *BMC Health Serv Res*. 2020; 20, 415. doi:10.1186/s12913-020-05199-1
  27. Altman M, Huang T, & Breland JY. Design Thinking in Health Care. *Preventing chronic disease*. 2018;15, E117. doi:10.5888/pcd15.180128
  28. Roberts J P, Fisher T R, Trowbridge M J, & Bent C. A design thinking framework for healthcare management and innovation. *Healthcare*. 2016; 4(1), 11–14. doi: 10.1016/j.hjdsi.2015.12.002
  29. Bartlett R, Boyle JA, Simons Smith J. *et al*. Evaluating human-centred design for public health: a case study on developing a healthcare app with refugee communities. *Res Invol Engagem*, 2021; 7, 32. doi:10.1186/s40900-021-00273-2
  30. Melles M, Albayrak A, & Goossens R. Innovating health care: key characteristics of human-centered design. *International journal for quality in health care: journal of the International Society for Quality in Health Care*. 2021; 33(Supplement\_1), 37–44.

doi:10.1093/intqhc/mzaa127

31. Abookire S, Plover C, Frasso R, Ku B. Health Design Thinking: An Innovative Approach in Public Health to Defining Problems and Finding Solutions. *Front. Public Health*. 2020; 8:459. doi: 10.3389/fpubh.2020.00459
32. Gong Y, Zhang J. A human-centered design and evaluation framework for information search. *AMIA Annu Symp Proc*. 2005;281-5. PMID: 16779046
33. Bradshaw C, Atkinson S, Doody O. Employing a Qualitative Description Approach in Health Care Research. *Global Qualitative Nursing Research*. 2017. doi:10.1177/2333393617742282
34. Bobrow K, Farmer A, Cishe N, Nwagi N, Namane M, Brennan TP, Springer D, Tarassenko L, & Levitt N. Using the Medical Research Council framework for development and evaluation of complex interventions in a low resource setting to develop a theory-based treatment support intervention delivered via SMS text message to improve blood pressure control. *BMC health services research*. 2018; 18(1), 33. doi:10.1186/s12913-017-2808-9
35. Hennink M, Kaiser BN. Sample sizes for saturation in qualitative research: A systematic review of empirical tests. *Social Science & Medicine*. 2022; 292:114523. doi: 10.1016/j.socscimed.2021.114523
36. Braun V & Clarke V. Using thematic analysis in psychology. *Qualitative Research in Psychology*. 2006; 3:77-101. doi:10.1191/1478088706qp063oa
37. Giacomini J. What Is Human Centred Design? *The Design Journal*. 2014; 17(4), 606–623. doi:10.2752/175630614X14056185480186
38. Loghmani L, Borhani F, Abbaszadeh A. Factors affecting the nurse-patients' family communication in intensive care unit of kerman: a qualitative study. *J Caring Sci*. 2014 Feb 27;3(1):67-82. PMID: 25276750
39. Cleary M, Edwards C, Meehan T. Factors influencing nurse-patient interaction in the acute psychiatric setting: an exploratory investigation. *Aust N Z J Ment Health Nurs*. 1999 Sep;8(3):109-16. PMID: 10661080.
40. Korsah KA. Nurses' stories about their interactions with patients at the Holy Family Hospital, Techiman, Ghana. *Open Journal of Nursing*. 2011; 1:1-9 OJN doi:10.4236/ojn.2011.11001
41. Hartley S, Raphael J, Lovell K, Berry K. Effective nurse-patient relationships in mental health care: A systematic review of interventions to improve the therapeutic alliance. *Int J Nurs Stud*. 2020 Feb;102:103490. PMID: 31862531
42. Molina-Mula J, Gallo-Estrada J. Impact of Nurse-Patient Relationship on Quality of Care and Patient Autonomy in Decision-Making. *Int J Environ Res Public Health*. 2020;17(3):835. Doi:10.3390/ijerph17030835
43. Schalk DM, Bijl ML, Halfens RJ. et al. Interventions aimed at improving the nursing work environment: a systematic review. *Implementation Sc*. 2010;i 5, 34. doi:10.1186/1748-5908-5-34

## Supplementary Files



## Multimedia Appendixes

Ethics Clearance Certificate from the National Institute for Medical Research, Tanzania.

URL: <http://asset.jmir.pub/assets/1ab2f9f5fa740081cf041a60adc44d98.pdf>

Data collection tools.

URL: <http://asset.jmir.pub/assets/5e16ff9c6e0699fdd4f3021ec6457769.pdf>

HCD Steps, population, activities and sample size.

URL: <http://asset.jmir.pub/assets/f4604fce182dd3770b2737ba8389c1db.docx>