“Endless Opportunities”: A Qualitative Study on Improving Two-Way Texting For Medical Male Circumcision Clients In Zimbabwe

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Abstract

“Endless Opportunities”: A Qualitative Study on Improving Two-Way Texting For Medical Male Circumcision Clients In Zimbabwe

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Background: Evidence shows that voluntary medical male circumcision (VMMC) as a one-time prevention method is a cost-effective way to reduce HIV transmission. In Zimbabwe, there is an HIV prevalence of 14.6% among adults, and health systems are strained due to healthcare worker (HCW) shortages. Digital health innovations, such as two-way texting (2wT), could help achieve the desired scale-up of VMMC programs and reduce HCW burden. 2wT-based, interactive follow-up was found to be cost-effective, beneficial to post-operative care, and positively perceived by both patients and HCWs. However, there have been some barriers in the transition from clinical trial to scale-up as part of routine care. To better understand the barriers to 2wT implementation as part of the larger VMMC national strategy, hearing directly from program partners about the challenges they are facing is essential.

Methods: An exploratory qualitative study was conducted to identify the successes and challenges of the 2wT program in order to inform future scale-up efforts. Sixteen in-depth interviews were conducted with 2wT program partners that participated in the design, implementation, scale up, or maintenance of the ZAZIC Consortium's 2wT program, including staff from within the Consortium, as well as program partner Medic, and Ministry of Health and Child Care site nurses. Partners were interviewed on the successes, challenges, and possible improvements of the 2wT program. A combination of inductive and deductive methods was used during data analysis which was conducted using ATLAS.ti.

Results: Program partners who participated in this study largely felt that the successes of the 2wT program outweighed any challenges but shared potential ways that the program could be improved. Program successes included community buy-in, a strong foundational training, and usability of the 2wT app for both HCWs and clients. Factors identified that constrained program function and scale-up consisted of poor mobile network coverage, clients needing to buy airtime, and shortages of 2wT trained HCWs. Partners also discussed strategies to further improve the program, including exploring the optimal number of text messages, cascading the 2wT training, and updating the 2wT system to allow family members, especially youth, to register with the same phone number.

Discussion: ZAZIC's 2wT program highlights the importance of a community-driven approach throughout the various stages of implementation. Indeed, other mobile health studies found that partners who are able to provide numerous rounds of feedback may be more invested and engaged in health programs, something that could be linked with the high levels of 2wT community buy-in partners discussed. Furthermore, this study emphasizes the importance of an iterative process for optimization of care, and the need to adjust and adapt 2wT systems to specific contexts.

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Background

With an HIV prevalence of 14.6%, over 1.2 million people are living with HIV in Zimbabwe.[1] Voluntary medical male circumcision (VMMC) is a medical procedure that reduces the risk of female to male HIV transmission through sex by up to 60%.[2] Evidence shows that VMMC as a one-time prevention method is a cost effective way to reduce HIV, especially when used in combination with another HIV intervention such as pre-exposure prophylaxis (PrEP).[3] The impact of VMMC efforts may not be fully realized yet, as the adolescents and young men, who undergo VMMC at a higher rate than their older counterparts, reach adulthood and become sexually active.[4] The World Health Organization (WHO) and the Joint United Nations Programme on HIV/AIDS (UNAIDS) recommend that at least 90% of 10-29 year old males access VMMC in high-priority countries by the end of 2021.[5] While forward progress was made, this goal was not met and further scale-up is needed in Zimbabwe and other priority countries, However, local health systems are already strained, and Zimbabwe faces national healthcare worker (HCW) shortages, creating barriers to successful postoperative VMMC follow-up.[6]

In Zimbabwe, while the Ministry of Health and Child Care (MoHCC) has made VMMC part of their national strategic program, healthcare facilities often face personnel shortages due to low wages, under-resourced clinics, and 'brain drain', or migration of skilled HCWs out of the country.[6] Although VMMC is a safe and simple procedure, postoperative follow-up is still needed in order to prevent and/or mitigate the risk of unexpected medical issues, or adverse events (AE).[7] Within participating districts in Zimbabwe, only 0.3% of people who completed VMMC experienced a moderate or severe AE.[8] Nonetheless, VMMC guidelines previously encouraged

multiple in-person follow-up visits in the two weeks following the procedure, creating additional burden on healthcare workers.[9]

Mobile health (mHealth) innovations, such as two-way texting (2wT) systems, could help alleviate some of this burden on health systems by allowing clients to opt into postoperative follow-up via SMS (text message) interaction with a VMMC nurse, providing low-cost telehealth. An open source, two-way interaction between patients and providers, 2wT could help achieve the desired scale-up of VMMC programs in multiple settings.[6] In Zimbabwe, as in much of the world, the majority of adults have access to a mobile phone, allowing them to participate in 2wT as part of their post procedure care.[10] Phone ownership rates increase with age, and youth under the age of 18 are more likely to share a phone rather than own their own.[11] One study reported that in Zimbabwe, 16-17 year old youths are two times more likely to own a phone than young people aged 13-15 years.[11]

In Zimbabwe, the ZAZIC Consortium implements the 2wT program in alignment with the national VMMC strategy and as an approved method for routine follow up care.[12] The International Training and Education Center for Health (I-TECH) formed the ZAZIC Consortium in 2013 to conduct VMMC in partnership with MoHCC. ZAZIC is a multi-organizational collaboration, composed of the following partners: Zimbabwe Technical Assistance, Training and Education Center for Health (Zim-TTECH); Zimbabwe Association of Church Related Hospitals (ZACH); and Zimbabwe Community Health Intervention Research Project (ZiCHIRe). In 2019, I-TECH, with technology partner, Medic, conducted a randomized control trial (RCT) for the 2wT system that has since been scaled up as part of ZAZIC's routine VMMC follow-up.[13]

As opposed to returning to the health facility for in-person follow-up, clients interact via 2wT text messages (SMS-based telehealth) for the first 14 days after their procedure.[6] Clients then have the option to respond with "0" (no issues) or "1" (possible problem), indicating whether they have concerns about their healing. Figure 1 (below) illustrates the possible interactions that could occur in the VMMC 2wT system in Zimbabwe.

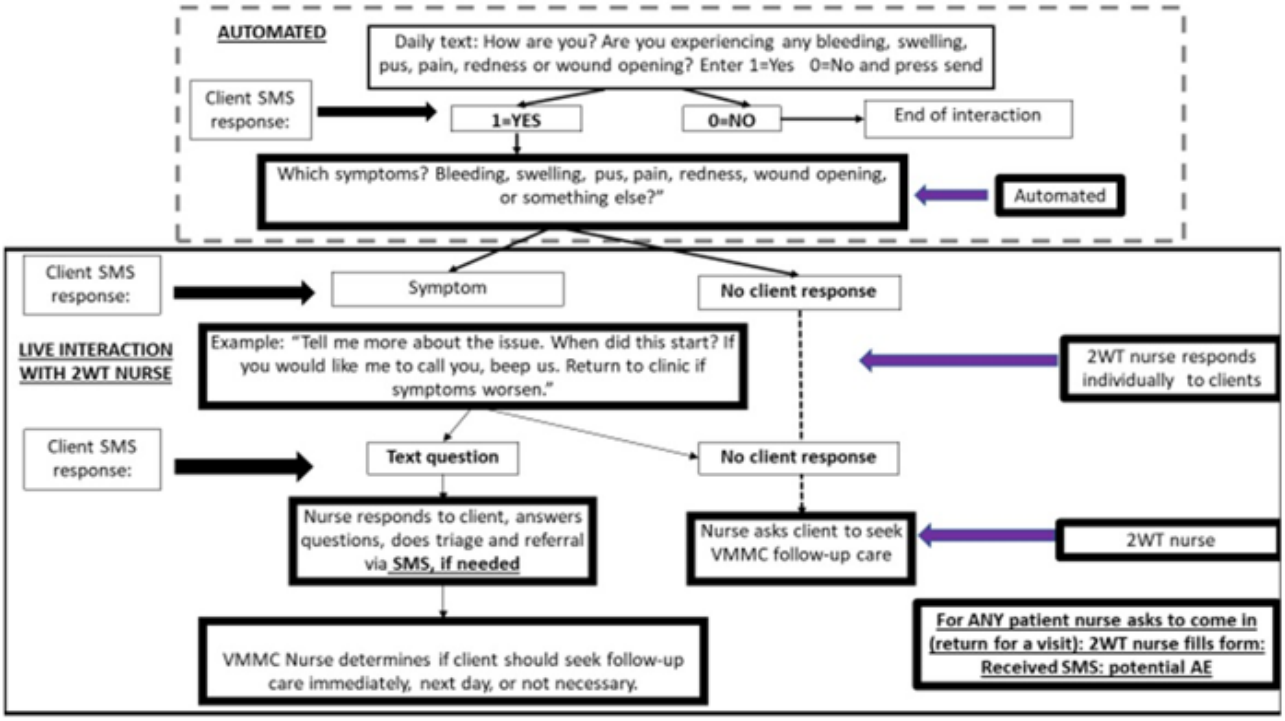


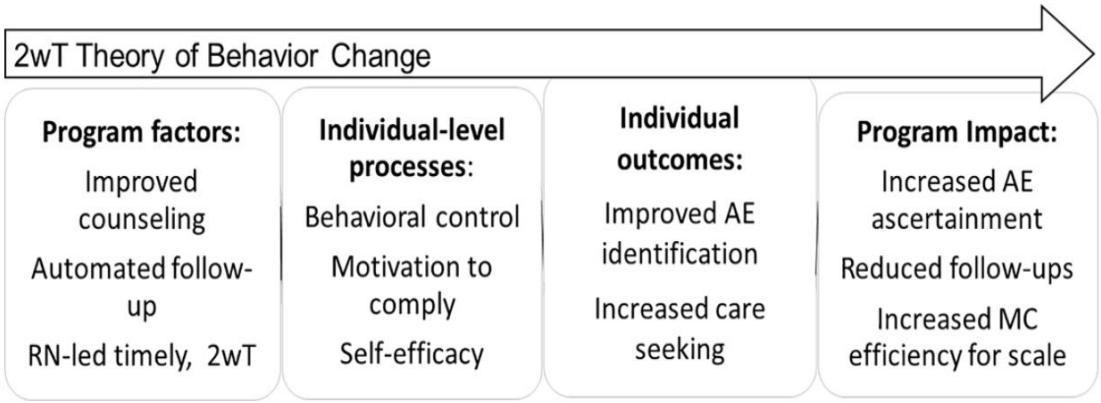
Figure 1: 2wT System VMMC Follow-Up Flow[13]

The RCT was accompanied by high client response rates (92%), with both clients and HCWs feeling that this method of follow-up saved them time, especially as the majority of clients don't have AEs or need postoperative in-person care.[6] Rates of in-person and 2wT moderate to severe AE rates remained similar, with 2wT clients receiving guidance and referral from a 2wT nurse as needed, maintaining quality of care.[13] The RCT found that 2wT reduced HCW workload related

to VMMC follow-up by 87% without decreasing client safety.[13] The perception of HCWs was that clients were proactively engaged with 2wT and their own health.[14]

2wT is also cost effective in Zimbabwe, with each VMMC client who enrolls in 2wT saving health facilities an estimated $2.10 per procedure.[8] Despite the cost of text messaging per patient ($4.42), the system resulted in a net savings by avoiding clinic costs ($2.92) and decreasing outreach costs ($3.61).[7] The program has since scaled up, transitioning to become part of routine care in certain catchment areas in Zimbabwe.[6] ZAZIC's 2wT system decreases the number of in-person VMMC follow-up appointments, therefore increasing the capacity of HCWs and reducing the burden on healthcare systems.[7]

Feldacker et al.'s 2wT Theory of Behavior Change (Figure 2) informed this study, illustrating how 'Program Factors', such as timely 2wT response, affects the 'Program Impact', including improved 2wT and VMMC scale-up.[14]



doi: https://doi.org/10.1371/journal.pone.0233234.g001

Figure 2: 2wT Theory of Change[14]

Methods

An exploratory qualitative study was conducted to identify the successes and challenges of 2wT follow-up as reported by key staff from 2wT program partners, in order to inform future scale-up efforts. A 2wT program partner is defined as an organization that participated in the design, implementation, scale up, and/or maintenance of ZAZIC's 2wT program for VMMC follow-up. Program partners varied in role and represented 2wT users across implementation levels, including 2wT trainers, site nurses, VMMC program coordinators, and technology partners who supported 2wT design, development, and/or optimization.

Data Collection

From December 2021 to February 2022, 16 individual in-depth interviews (IDIs) were conducted with program partners. All interviews were conducted virtually, with the majority of interviews occurring and recorded on Zoom, and one interview taking place over WhatsApp due to connectivity issues. Each interview lasted approximately 20-35 minutes, with an average interview length of 27 minutes. A semi-structured interview guide was used to ask program partners questions regarding the successes and challenges of the 2wT program, as well as how participants felt the program could be improved and in what other settings 2wT could be successful. The lead researcher transcribed the interviews, editing for clarity.

A combination of purposive and snowball sampling was used for this study. Key informants identified the first group of 2wT program partners to approach for IDIs. These early participants then provided referrals to other program partners who participated in the design, implementation,

scale-up, and/or maintenance of 2wT. All participants consented to be interviewed and recorded for this study. No participants withdrew or were excluded from the findings.

Data Analysis

A combination of inductive and deductive methods was used during data analysis, and ATLAS.ti was utilized by the lead researcher to code 16 transcripts. Deductive coding was rooted in the 2wT Theory of Health Behavior Change as well as the semi-structured interview guide.[14] Deductive techniques were used to ensure coding reflected the VMMC 2wT Principal Investigator's (PI) needs for data around challenges as well as scale-up strategies. Open coding was also utilized during the first round of coding, following an inductive approach to identify additional perceptions.

After the first round of coding, axial codes were created as themes and sub-themes were identified. The resulting codebook was used to code all the transcripts by the lead researcher. While the coding was completed exclusively by the lead researcher, the PI reviewed the codebook and codes throughout the process. A second coder will be engaged prior to future publication efforts in order to improve collaboration, compare inter-coder reliability, and update the codebook as needed. After the second coder has completed coding, the research team will utilize inter-coder reliability to discuss coding disagreements and come to consensus.

Ethical Considerations

The study objective was rooted in routine quality improvement and was therefore deemed exempt by the University of Washington Institutional Review Board on December 22nd, 2021. All program partners provided verbal consent prior to participating in this study.

Results

Participant Demographics

Sixteen program partners were interviewed across various organizations involved in the 2wT implementation process. Participating partners worked for the technology partner, Medic (n=5); as MoHCC site nurses (n=2); or within the ZAZIC Consortium (n=9), including Zim-TTECH (n=3); ZACH (n=3), and ZiCHIRe (n=3). Most program partners lived in Zimbabwe, with the exception of Medic partners who were based outside of Zimbabwe, in Kenya, Ghana, Nigeria, or Uganda. Table 1 (below) further defines the various program partners that participated in this study.

Table 1: Participating Program Partners

Program Partner	Definition	Location	n
ZAZIC Consortium	Staff who support the design, implementation, scale-up, and/or maintenance of 2wT and are part of ZAZIC Consortium. ZAZIC consists of: - Zim-TTECH - ZiCHIRe - ZACH	Zimbabwe	9
Medic	Staff who support the design, implementation, scale-up, and/or maintenance of 2wT and work for Medic. Medic is the 2wT technology partner.	Outside of Zimbabwe (Ghana, Kenya, Nigeria, Uganda)	5
MoHCC Site Nurses	Staff who support the design, implementation, scale-up, and/or maintenance of 2wT and work as MoHCC site nurses or HCWs	Zimbabwe	2

Program Successes

Program partners who participated in this study largely reported that the successes of the 2wT program outweighed the challenges. In addition to decreased burden on clients and HCWs, partners identified successful collaboration, strong foundational training, supportive 2wT central staff, and a 2wT app that is easy to use and built upon human-centered design.

Multiple program partners reported that community buy-in of 2wT, within both client and HCW communities, had been a main driver of the success of the program. Community acceptance of 2wT, supported by HCW and program partner led demand creation, has helped amplify support of 2wT and contributed to good enrollment numbers. One partner stated that, "two-way texting is now a household name" as a result of 2wT promotion and community buy-in. Some partners also pointed to how demand creation could generate increased 2wT acceptance among guardians. This is an important consideration as program partners reported that the 2wT program began to enroll minors during the time of these interviews. While a few partners suggested that increased availability of 2wT promotional and educational materials would further bolster demand creation efforts, overall, partners reported program efforts to generate community buy-in have been successful, both for HCWs and clients.

> *"[Clients] have the motivation and are willing to respond…People are interested in their own health and are willing to communicate directly with the two-way texting nurse."* IDI: 01

The majority of program partners perceived the 2wT training to be a strength of the program. Partners stated that the training was easy to understand, accessible, and comprehensive in the

material it covered. HCWs who completed a 2wT training gained a strong foundational understanding of the program and had opportunities to troubleshoot and receive support during and after the training. The importance of the support received by the Zim-TTECH "Hub Nurse", who is an essential figure in both training and program support, was also emphasized. More than half of the program partners discussed the value of the continued support and mentorship provided by the Hub Nurse during training and beyond, highlighting the importance of a central support system for the 2wT program.

Partners highlighted the usability of the 2wT application (app) as an important success for the program. Most program partners stated the app was easy to use, not only for HCWs but for clients as well. The user-centered approach that Medic utilized to design the app likely contributed to the numerous partners who pointed to the 2wT app as a major program success. The app offers multiple languages, and by allowing clients to respond with the numbers "0" or "1", creates a usable interface even for clients who are not literate.

"We designed a system with our users, for our users, and it resonates with their needs." IDI: 15

Multiple program partners also highlighted the importance of providing 2wT devices to HCWs and how that enabled successful engagement and at times increased HCW interest in the program. In addition to the provision of devices, program partners stated that, similarly to any novel technology systems, initial training is needed for 2wT. However, with proper education, most partners felt that 2wT could be easily understood by users across all levels.

Constraints to Scale Up

While program partners emphasized the many successes of 2wT, all participants identified some factors that provided constraints to scale up. One larger structural challenge identified was the issue of poor cellular service. Of the 16 program partners interviewed, 13 discussed poor mobile network as a constraint to scale-up, impacting clients, HCWs, and program partners. Partners specifically cited the network challenges that come in rural areas, where 2wT is currently working to increase enrollment. Poor network coverage not only could prevent clients from successfully engaging in 2wT, but also impacts HCW efforts to enroll clients. Additionally, some 2wT trained HCWs may work at facilities or do outreach in rural areas, creating barriers to timely enrollment and communication.

> *"Some of the areas are very remote and network coverage is very poor. So that has been our main challenge. It's difficult to implement when there is no mobile network."* IDI: 07

Another systemic issue highlighted was that clients must purchase their own airtime for text messages in order to participate in the 2wT program. Some program partners felt that this was a barrier that could prevent successful engagement, especially for clients who are out of work or facing extreme poverty.

> *"[Clients] will tell you that 'yes, I have a phone, but I don't have money to buy the text message.'"* IDI: 05

However, not all partners saw this as a significant client challenge, reasoning that the cost of text messages is low, and, prior to 2wT, clients had to pay more in transport fares than the cost for 14 text messages. One program partner also pointed out a potential logistical barrier: the partner

believed providing airtime would be beneficial to clients but worried it may impact the cost effectiveness of the intervention.

A program specific challenge that multiple partners discussed was that some facilities do not always have enough HCWs who are 2wT trained. Shortages of 2wT trained HCWs was identified as a challenge to the system that affected client enrollment and could impact program sustainability long-term. Zimbabwe faces national HCW shortages which leads to increased attrition and turnover. Partners highlighted the challenge of when HCWs who went through the 2wT training leave the health facility.

> *"Once our trained nurses have gone away, we have no one enrolling our clients."* IDI: 04

Additionally, several partners mentioned the occurrence of 2wT trained HCWs who remain at site but are not actively engaging in the program, something partners associated with lack of enthusiasm or disinterest for 2wT. Multiple partners identified staff shortages, either due to attrition, not enough HCWs at sites who have gone through training, or HCW disinterest in the program, as a constraint to scale up.

Suggestions for Improvement

In addition to discussing what is and is not working well in 2wT, partners provided suggestions that could aid in improving and expanding the program. Exploring the optimal number of 2wT messages clients should receive was brought up by half of the partners. While the time and effort to respond to 2wT text messages results in less time and financial burden for clients than in-person follow-ups, program partners reported that some clients feel there are too many messages they

must respond to in the 2wT program. Partners suggested prioritizing text messages on key days for follow-up, including days two and seven, rather than the standard 14 daily post-operative messages, which may feel repetitive or tedious for clients.

> *"We can reduce the number of automated messages that reach the client…if we can stick to [messages on] day two and day seven, I'm sure it will be easy on the client side."* IDI: 10

While the 2wT training was positively perceived, partners suggested that cascading training could improve sustainability and scale up efforts. While the current aim of training is for trained 2wT HCWs to train their colleagues when they return to the healthcare facilities, this is not always the case. When 2wT trained HCWs are unable or unwilling to train others at their facility, 2wT could be hindered due to lack of capacity or trained staff. Program partners largely pointed to increasing the number of HCWs who go through training as a key strategy to improve implementation and scale-up.

Cascading training so that it is not only received by more HCWs but also further decentralized, could also help address issues related to 2wT trained HCW shortages according to partners. While the training is by and large deemed a success by program partners, increased access to training and more trainers could improve the sustainability of the program.

> *"If you are to expand, there is a need to cascade the training down, so that you can also have provincial-based trainers, or district, or even site-based trainers…the only way to expand is to have more trainers."* IDI: 07

Multiple partners discussed the need to update the 2wT system to allow enrollment of multiple clients on the same phone number. Partners reported that while most potential clients have access to a phone, not everyone owns their own individual phone. This is especially true in rural areas where phone sharing within families or households is more common.[11] The new addition of minors to the 2wT program further highlights the need to address this issue, as younger clients are more likely to share a phone.[11] Partners suggest that updating the 2wT system to allow multiple clients, especially youth, to be enrolled on the same phone number as others in their household could improve enrollment and reduce client barriers to 2wT engagement.

> *"The platform should allow a number to be entered twice, especially when the surname is the same, to show that these [clients] are related and they're using the same number."* IDI: 11

Another consideration that was highlighted specifically by technology program partners from Medic was that some clients have more than one phone number. Clients may switch service providers, and therefore phone numbers, based on if a certain provider has better cell service for the area they are currently in. However, the system does not accommodate multiple phone numbers for a client, creating another barrier for clients to engage in the system. Partners stated the importance of exploring ways to update the system to allow multiple clients per line as well as multiple numbers per client. Addressing these system enrollment limitations could improve enrollment and reduce barriers to 2wT scale up.

Expanding Beyond VMMC

Almost every program partner expressed optimism in 2wT being used in a variety of settings outside the VMMC context. Management for non-communicable diseases, maternal and child health, medication adherence, and follow-up for other low risk procedures were identified as other settings where 2wT would be successful. Program partners from Medic discussed emerging 2wT programs they are supporting in other settings, including 2wT to support antiretroviral and antitubercular medication adherence. Partners also mentioned the unexpected benefits 2wT brought during the COVID-19 pandemic. Through reducing in-person visits for VMMC follow-up, facilities have been able to reduce the risk of COVID transmission.

> *"Two-way texting has come at the right time, because we are able to review clients without physical reviews. So, we are reducing the contact between the health worker and the clients themselves. It's helping us during this outbreak of COVID."* IDI: 05

Overall, almost every program partner believed 2wT could be implemented or expanded and used in a variety of health conditions and settings.

Discussion

Partners identified several factors contributing to the 2wT program's success, including community buy-in, strong foundational training, and good usability of the 2wT app for both HCWs and clients. Factors that constrained scale up efforts also were highlighted and included poor mobile network coverage, clients needing to buy their own airtime, and shortages of 2wT trained HCWs at sites. Finally, partners discussed strategies to further improve and expand the program.

Specifically, partners pointed to exploring the optimal number of text messages sent, cascading the 2wT training, and updating the 2wT system to allow family members, especially youth, to register on the same phone as ways the program can be improved.

These findings provide additional support for WHO's positioning that digital health interventions are an innovative and efficient way to strengthen health systems.[15] Similarly to other mHealth programs, such as the P3 (Prepared, Protected, emPowered) intervention in the U.S., the 2wT VMMC follow-up system has successfully transitioned to the routine care context.[16] Moreover, similar to the Mobile for Reproductive Health service (m4RH) program, an SMS-based reproductive health information system that was first implemented in Tanzania, ZAZIC's 2wT program highlights the importance of a user-centered, community-driven approach that occurs throughout all stages of implementation.[17] Indeed, other mHealth studies found that partners who were able to provide numerous rounds of user-centered design feedback sessions may be more invested and engaged in health programs, an important consideration as 2wT continues to generate community buy-in.[18] Furthermore, this study emphasizes the importance of an iterative process for optimization, and the need to adjust and adapt 2wT systems to specific contexts for improved care.[19]

While most adults have access to a mobile phone in Zimbabwe, almost all program partners noted that poor mobile network remained a barrier to 2wT.[11] This structural barrier aligns with other mHealth and 2wT programs within low-income and middle-income countries (LMICs), including in other parts of Sub-Saharan Africa, where implementers have found that reliable cellular service is limited, particularly in rural areas.[17] While the program is not able to improve mobile network

infrastructure, partners identified other more feasible improvements and successes that still support existing literature. For example, similarly to the m4RH program, 2wT partners, including 2wT trained HCWs, took part in demand creation activities, that included promoting 2wT to incoming VMMC clients in this case, generating demand for 2wT.[17] Continued promotion of 2wT's advantages among HCWs could be a feasible way to improve the program and mitigate constraints to scale-up.

These findings also contributed to limited literature on differing perspectives of users on the technology design or development side, as opposed to users on the front-end, direct program implementation side. In the findings, different types of users in the system, specifically technology partners from Medic as opposed to local program partners, interacted with the 2wT system differently and therefore at times identified unique facilitators or barriers to the 2wT program. For instance, local program partners in Zimbabwe more often highlighted the inability to enroll multiple clients with the same number as a major system limitation. In contrast, those interviewed from the technology partner, Medic, more often cited the issue of clients having multiple phone numbers as a barrier to engagement. It may be beneficial to further explore how program perspectives vary by user type, with special attention paid to how this relates to system barriers.

After completion of these interviews, several recent program changes highlight the consistent push towards 2wT improvement. First, ZAZIC now enrolls minors aged 15-17 years, or their guardians, in the 2wT program. This age group had formerly been able to participate in VMMC, but could not take part in 2wT during the RCT. Second, in response to both patient and provider feedback, the number of text messages sent to clients was reduced, replacing some daily text messages with

educational messages about the healing process and reducing the number of SMS overall. Text messages are now sent on seven days throughout the two-week period, rather than 14 daily messages. Lastly, there is momentum to integrate 2wT with current and future MoHCC telehealth programs, a direction that enhances synergies with other existing national efforts.[13] It will be important to monitor the impact of this and other technology developments going forward.

Limitations

Study limitations include that sampling bias may be present, as participants who volunteered to be part of this study may have had more time, capacity, and interest in the program than their counterparts who chose not to participate. The sample size was small (n=16), but those interviewed were recruited by initial key informants and filled important roles within the 2wT program. The study is limited to program partners and does not include the client perspective. However, as previous studies related to this project collected data on client perspectives, this study is filling an important gap by focusing on the perspectives of program partners. Though these interviews occurred in English, which was not the first language for some participants, all interviewees were fluent in English. Interviews were conducted on Zoom which may have reduced some of the nuanced interactions that occur in-person. However, due to the constraints of the project and lack of budget, virtual interviews were necessary.

Positionality

The lead researcher, while not employed by Zim-TTECH or any partner organization, is affiliated with the University of Washington Department of Global Health, a funder of the 2wT project. This may have impacted participants' willingness to in respond honestly. Additionally, the lead

researcher is not from and has never worked in Zimbabwe or within the clinical VMMC context, which doubtless impacted data collection and interpretation.

Conclusion

As with all digital health innovations aimed at improving routine healthcare in low resource settings, community buy-in of 2wT by both providers and patients is essential. As well, the need for continued technical system improvements and support to better serve implementers and end-users alike in rural areas remains vital. Continuous monitoring to see the impact of program changes and system improvements will be key to better understanding 2wT. Additionally, this study emphasizes the need for continuous and constant collaboration between mHealth program implementers and technology partners to improve service delivery. Finally, across the board program partners felt that 2wT could be utilized in a variety of settings and health conditions, including for the COVID-19 pandemic. As one program partner from Zim-TTECH said, “the opportunities are really endless.”

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