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# Using Interactive Voice Response for PLHIV on Art: Patient Interaction with Mhealth

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## 1 Background and Purpose

The WHO recommends use of mobile phone health technologies (mHealth) to support adherence in HIV [1], [2]. Studies on text messages (SMS) show promise in limited rigorous evaluations[3]. Increasing use of mobile phones in Africa provides an opportunity to use mHealth tools to support resource limited health systems. We used Information-Motivation-Behavioural Skills model of Highly Active Antiretroviral Therapy (HAART or ART) adherence theory of change[4] to locally adapt, implement and evaluate an mHealth tool (Call for Life Uganda – C4LU). The tool is designed to support ART adherence in people living with HIV (PLHIV) in Uganda through interactive voice response (IVR) and SMS. We describe the evolution of the C4LU projects and the interaction of patients with the health tip function of the tool.

## 2 Methods

Connect for Life™ (CFL2015.01 or higher version) information technology software (Janssen, Global Public Health, Johnson & Johnson) is based on MOTECH open source software, and facilitates remote communication between health workers and patients through interactions of SMS/Interactive Voice Response (IVR). Connect for Life™ was adapted for use in PLHIV in Uganda by Infectious Diseases Institute (IDI). Three phases of the project were undertaken 1)A pilot project with "expert PLHIV" at IDI- TAMA 2) A randomized controlled trial (C4L-RCT) at one urban site (IDI) and one peri-urban government site (Kasangati HCIV-KSG) 3) Call for Life Uganda Lite (C4LL) a less intensive version at IDI, Kasangati and Kisenyi HCIV (KIS-urban, government). C4L was linked with the Ministry of Health Uganda Electronic Medical Records (EMR) and IDI's ICEA EMR[5]. C4L-RCT ran from 3rd August 2016 to 30th November 2018; C4LL is ongoing. Figure 1 shows the timeline for the C4L projects.

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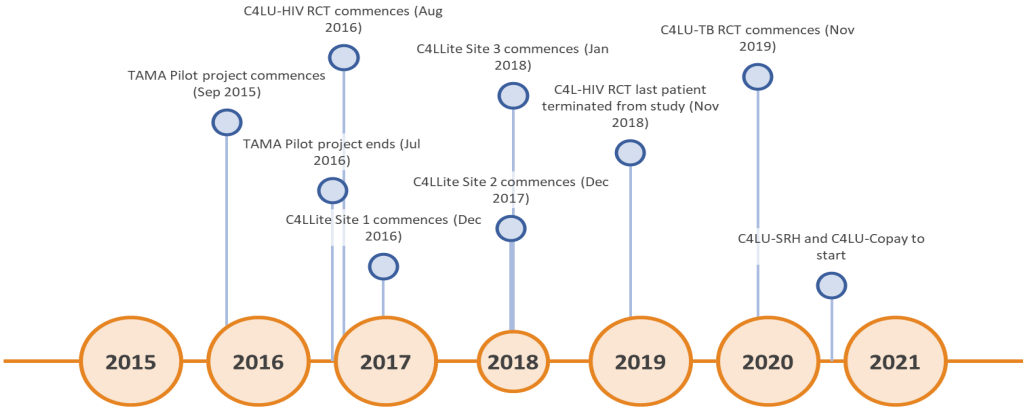



**Figure 1.** – Call for Life Projects timeline

C4LU offers adherence reminder calls or SMS (table 1), followed by options to report symptoms or access health information tips. In CFL-RCT, PLHIV were randomized 1:1 to receive either C4LU or standard of care (as stipulated in the national guidelines of the Ministry of Health). Those on intervention arm were offered daily calls if they had a viral load (VL) >1000c/ml, or weekly if they were stable (VL<1000). All on C4LL are stable, and so receive weekly calls only. There is also a 24-hour toll free line for PLHIV for symptom reporting or accessing health tips. Symptoms are responded to by a study doctor or nurse within 24 hours. All participants receive appointment visit reminders on a date convenient to them. Health tips are offered weekly in English or one of two local languages. Three hundred and thirty pre-recorded health tips provide information on HIV, ART and ART adherence, living positively with HIV, general health, sexuality, pregnancy and breast-feeding. The participants choose a preferred category of tips and can change category every project visit. Call flow is shown in Figure 2.

| | Daily adherence reminder calls/ SMS | Weekly adherence reminder calls/ SMS | Appointment reminders | Weekly health tip calls | Toll free line for symptom reporting or health tips |
|---|---|---|---|---|---|
| TAMA | √ | | √ | √ | √ |
| C4L-RCT | √ | √ | √ | √ | √ |
| C4LL | | √ | √ | √ | √ |

**Table 1.** – Call schedule by project

We used descriptive data from these interventions to generate frequency distributions of the participant demographics per project and within the C4L-RCT to describe the health tip utilization and generated gender and age differences by various health tip categories.

## 3 Results

TAMA enrolled 105 participants, all over 25 years, 50% of whom were females.
C4L-RCT enrolled 600 participants (IDI-300, KSG-300; 300 in intervention arm, 300 in control arm), majority females (69%) and median age 32 years (IQR25-40). At baseline, 97% chose IVR over SMS.
C4LL enrolled 2,506 participants (IDI-1,045, KSG–772, KIS–689). The majority (67.6%) were females and above 25 years (93.8%).

1,207,326 calls (daily and weekly adherence reminders, weekly health tips and appointment reminders, toll free inbound) were initiated between 3rd March 2016 to 21st October 2019. Of these, 463,267 (40.4%) have been successfully completed. Most common reasons for call not completed were patient not answering (44.6%), phone unreachable (26.2%), phone busy (19.1%), IVR provider errors (7.0%), call rejected by PLHIV (2.4%), other issues including network outages, server failures etc. (0.7%). Between 3rd August 2016 and 30th November 2018, 618,641 outbound adherence reminder calls were sent out

across C4LL and C4L-RCT, 240,979 (38.9%) successfully completed. This was higher for C4LL (46.2%) than C4L-RCT (35.1%) (p-value=0.000).

Overall, 85% (255/300) of the PLHIV enrolled on intervention arm of the C4L-RCT utilized at least one of the health tips categories. Particularly, participants utilized mostly general health information 70.0% (211/300); followed by ART and adherence 57.7% (173/300); pregnancy and breast-feeding 45.7% (137/300), HIV disease information 45.0% (135/300), sexuality 37.7% (113/300), and positive living 32.7% (98/300). Gender differences were noted regarding use of heath tip category. ART and adherence was more popular with females (60.5%) than males (51.1%). Males (42.2%) were more interested than females (35.7%) in sexuality information, however, the differences were not statistically significant ($p>0.05$). Age differences were noted with general health being more popular those over 25 years (73%) compared with those younger (63%). Younger people (<25years) preferred sexuality (39% vs 37%). Again, the differences were not statistically significant.

| | | **Gender** | | | **Age** | | |
|---|---|---|---|---|---|---|---|
| | | Female | Male | p-value | Adol-escen t | Adult | p-value |
| HIV information | Yes | 45.7 | 43.3 | 0.669 | 46.3 | 44.5 | 0.887 |
| ARVs and adherence | Yes | 60.5 | 51.1 | 0.154 | 56.1 | 58.3 | 0.775 |
| Positive living | Yes | 31.4 | 35.6 | 0.454 | 32.9 | 32.6 | 0.992 |
| General health | Yes | 70.5 | 70.0 | 0.877 | 63.4 | 72.9 | 0.130 |
| Pregnancy and breast feeding | Yes | 49.0 | 37.8 | 0.117 | 50.0 | 44.0 | 0.395 |
| Sexuality | Yes | 35.7 | 42.2 | 0.384 | 39.0 | 37.2 | 0.771 |

**Table 2.** – Health tip utilization by category

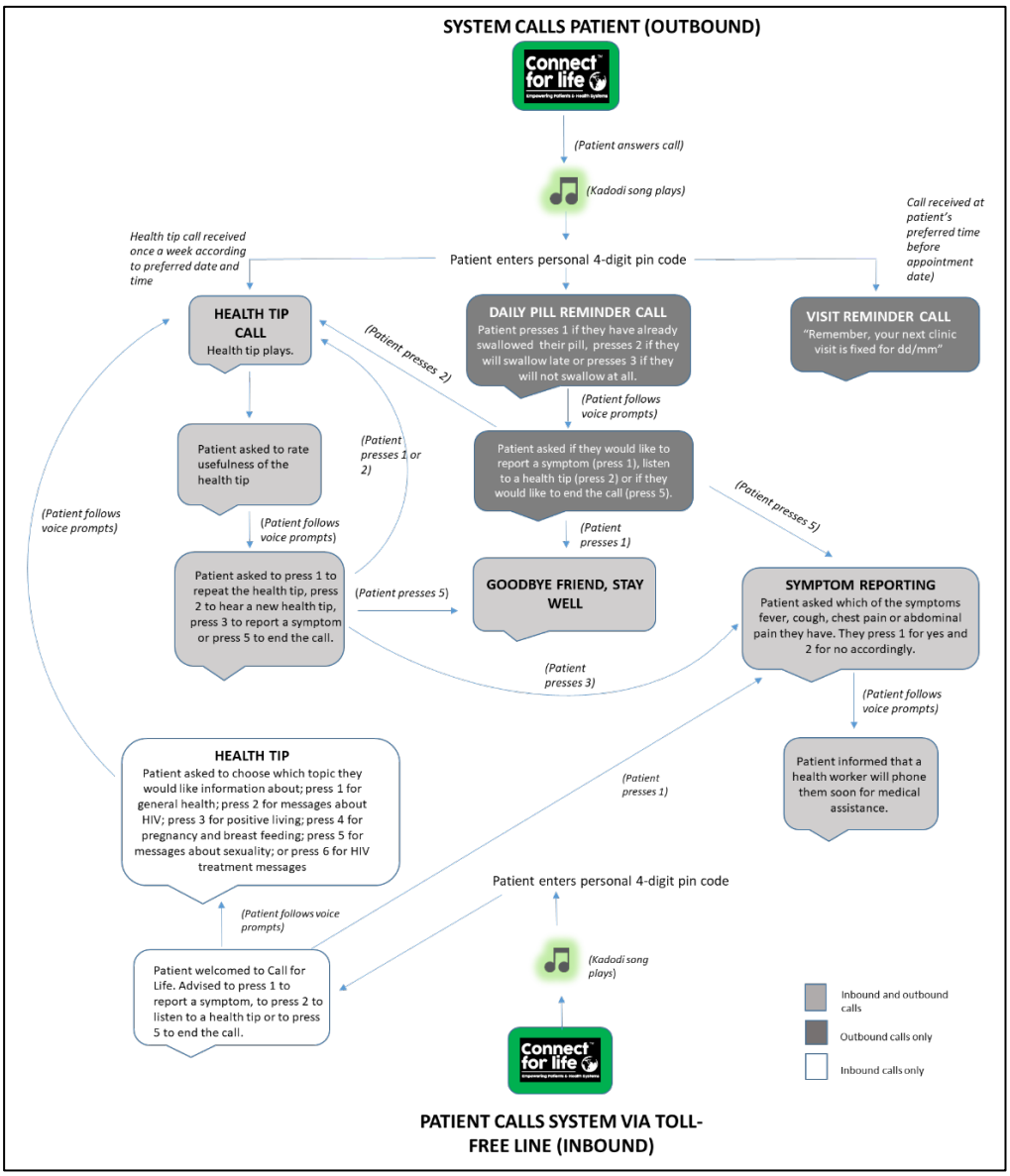
## 4 Conclusion

Since 2016 we have managed to send over 1.2 million IVR calls, of which 40% were completed successfully. This provides proof of principle that a regular IVR service in Uganda is feasible and PLHIV will engage with mHealth tools to support their HIV care. The higher rate of completed calls in C4LL than C4L-RCT is probably due weekly vs. daily calls leading to less participant technology fatigue. Qualitative work [6] revealed positive feedback from PLHIV about C4L.

Over eighty-five percent of PLHIV utilised health tips. These findings indicate that IVR services are a feasible and acceptable platform for delivery of health information. Preferences showed that PLHIV were interested in wider information and not just HIV specific. We are expanding C4L to other health conditions in the near future (TB and sexually transmitted diseases) and it could be used for non-communicable disease e.g. hypertension. Scale up of C4L for HIV and for other conditions relies on interoperability with other EMR/digital health systems in place. We have shown this is possible in Uganda through linkage to two EMR platforms and are confident it can be adapted to integrate in other countries that would benefit from low cost mHealth interventions.

**KeyWords:** Uganda, HIV, mHealth

**Figure 1.** Call flow diagram for Call for Life™ Project

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