Research Summary

1. Protocol Title:

A DIGITAL CASE MANAGEMENT SYSTEM FOR REDUCING PEDIATRIC CANCER TREATMENT ABANDONMENT IN TANZANIA (NCT03677128)

2. Purpose of the Study:

Digital case management systems can facilitate compliance with protocol-driven treatment and ultimately help to close the discrepancy between low- and middle-income countries (LMICs) and high-income countries (HICs) in survival outcomes among pediatric cancer patients. Unfortunately, few studies have implemented and evaluated such digital case management systems for pediatric oncology in LMICs, despite higher treatment abandonment rates reported in LMICs compared to HICs. In response to the urgent need for interventions to reduce treatment abandonment and improve survival rates for pediatric oncology patients in LMICs, including Tanzania, our proposal has the following specific aims:

Aim 1: To adapt an open-source digital case management platform to incorporate standardized pediatric oncology protocols.
Aim 2: To evaluate the efficacy of the digital case management application for improving provider compliance with standardized pediatric oncology protocols and reducing treatment abandonment.

A secondary objective of the study is to understand factors that facilitate or inhibit the implementation of mNavigator in tertiary care facilities for pediatric cancer.

3. Background & Significance:

Each year, approximately 220,000 children globally are newly diagnosed with cancer. Over 85% of these new diagnoses are made in low- and middle-income countries (LMICs) [1]. Survival rates in LMICs are 5-25% compared to 80% in high-income countries (HICs). One of the primary contributors to the discrepancy in survival outcomes between LMICs and HICs is a high rate of treatment abandonment in LMICs, defined as refusal to initiate or failure to complete curative treatment. Treatment abandonment rate in Tanzania is higher than in other LMICs (40% compared to 10-25%), directly impacting patient survival. In HICs, protocol-driven treatment for children with cancer has led to increased treatment compliance and large improvements in survival. However, it is often not feasible or appropriate to use protocol-driven treatment in LMICs without necessary supportive care, human resources and infrastructure. Not surprisingly, protocol-related compliance is lower in LMICs compared to HICs [2-9]. Mobile technologies for health (i.e., mHealth) can facilitate implementation of and compliance with standardized pediatric oncology protocols through step-by-step decision support algorithms, reminders and alerts related to patient visits, and timely data for health service coordination with allied health providers (e.g., nurses, pharmacists etc.) [10-12]. This multidisciplinary team from Duke University and Dimagi Inc. in USA, and Bugando Medical Centre (BMC) in Tanzania, proposes to adapt, implement, and evaluate an mHealth case management system, called mNavigator, for improving health provider compliance with standardized pediatric oncology protocols.

4. Design & Procedures:

Study location:
This study will be conducted at the Bugando Medical Centre (BMC) in Mwanza, Tanzania.

Describe the study, providing detail regarding the study intervention (drug, device, physical procedures, manipulation of the subject or the subject's environment, etc.):

Study intervention
There are approximately 150 pediatric oncology patients seen annually at BMC. Patients are currently registered (via paper file) by either pediatric patient navigator or clinic coordinator. Patients are seen by medical providers, and treatment plan is prescribed.

The proposed mHealth case management system, called mNavigator, will be developed by adapting Dimagi Inc.'s CommCare platform, an open source software for digital case management. Once mNavigator is implemented, routine pediatric oncology patient clinical data, part of standard of care, will be entered in

mNavigator. This will include clinical care information, case management, decision support, and behavior change communication.

The study intervention will include adding to routine clinical information by incorporating into mNavigator two nationally-approved treatment protocols, one for Burkitt lymphoma (BL) and the other for retinoblastoma (Rb), to facilitate protocol-driven treatment. Of the 150 BMC pediatric oncology patients entered annually into mNavigator, approximately 50 patients are expected to be diagnosed with either Burkitt lymphoma (BL) or retinoblastoma (Rb). In this study, mNavigator will be used for additional case management and decision support with these BL or Rb patients.

Patient navigators or clinical coordinators will perform activities in mNavigator such as:

- Register pediatric oncology patients.
- Enter pre-diagnostic labs and imaging tests.
- Assign patients to BL, Rb, or non-BL/Rb cohorts for further assessment.
- Complete and review pre-treatment staging and laboratory checklists for patients with preliminary Rb or BL diagnosis, to facilitate protocol adherence.
- Deliver cancer educational information, possibly in video format.
- Document parental knowledge of their child's disease.
- Review treatment guidelines with decision support algorithms to facilitate communication between care coordinators and prescribing physicians.
- Enter information on changes in treatment plan, including referrals to outside hospitals, second line treatment, or palliation.
- Follow-up with patients to record outcomes (healthy, relapse, lost to follow up, death, etc.).

mNavigator will be implemented at BMC. mNavigator users will be both those who will directly use mNavigator and/or those whose work will be impacted by mNavigator. Users will be BMC health professionals who provide routine clinical care for pediatric cancer patients including patient navigators, clinical coordinators, health providers and other clinical staff as well as non-clinical staff and other key stakeholders whose buy-in will be necessary for the successful implementation of mNavigator.

Identify procedures, tests and interventions performed exclusively for research purposes or more frequently than standard of care. Include alternative therapies, concurrent therapies discontinued per protocol, risk benefit ratio, and use of tissue/specimens.

Study procedures and activities:

Study procedures and activities for Aim 1:

Aim 1: To adapt an open-source digital case management platform to incorporate standardized pediatric oncology protocols.

For Aim 1, Duke and Tanzanian PIs and research staff, with support from Dimagi Inc. will develop the first iteration of mNavigator for digital management of BL and Rb patient care. This initial mNavigator prototype will be presented to users who will be both those directly using mNavigator and/or those whose work will be impacted by mNavigator. Users will be BMC health professionals who provide routine clinical care for pediatric cancer patients including patient navigators, clinical coordinators, health providers and other clinical staff as well as non-clinical staff and other key stakeholders whose buy-in will be necessary for the successful implementation of mNavigator.

We will elicit feedback from users to inform revisions, including edits to forms and displays in mNavigator, to have a functional system ready for implementation and pilot efficacy evaluation in Aim 2. To capture feedback on usability (perceived ease of use) and acceptability of the system we will:

- Conduct observations of users utilizing and testing mNavigator

- Guide users through a think-aloud process for providing feedback while using mNavigator. It will include filling out a brief survey and answering open-ended questions about their user experience. This will take approximately 45-60 minutes. Sessions may be audio-recorded using an encrypted digital device to help with documentation. These may be transcribed and, if conducted in Swahili, will be translated into English.

In addition, we will use (n=50) retrospective records to enter into mNavigator to test app content (skip patterns, calculations, hidden values etc.) prior to implementation.

The development of the mNavigator system and findings from the assessment of system usability and acceptability from aim 1 will be presented in peer-reviewed manuscripts.

Study activities and procedures for Aim 2 and the secondary objective:
Aim 2: To evaluate the efficacy of the digital case management application for improving provider compliance with standardized pediatric oncology protocols and reducing treatment abandonment.
Secondary objective: to understand factors that facilitate or inhibit the implementation of mNavigator in tertiary care facilities for pediatric cancer

For Aim 2, Duke and Tanzanian PIs, and research staff will train approximately 15 BMC personnel on mNavigator. Those trained will be mNavigator users who will be both those directly using mNavigator and/or those whose work will be impacted by mNavigator. Users will be BMC health professionals who provide routine clinical care for pediatric cancer patients including patient navigators, clinical coordinators, health providers and other clinical staff as well as non-clinical staff and other key stakeholders whose buy-in will be necessary for the successful implementation of mNavigator. BMC IT staff will be trained on how to further customize, deploy and manage the platform. Training will be followed by supported implementation.

mNavigator will be used as the standard of care for entering clinical data and managing care of pediatric cancer patients at BMC. All pediatric cancer patients at BMC will be registered and tracked in mNavigator. For research purposes, we will consent anyone who receives a clinical diagnosis of Rb or BL. Data for only those providing informed consent will be used in the research study (with the exception of historical data). Over the course of about one year, research staff will use mNavigator for treatment management of about 50 enrolled pediatric patients with pre-clinical diagnosis of BL or Rb (Typical treatment duration: 3 months for patient with BL and 4 months for patient with Rb).

To measure compliance with standardized pediatric oncology protocols and reduction in treatment abandonment (defined as missing four or more consecutive weeks of treatment or follow-up while still on therapy), we will use personal and clinical data points routinely collected as part of clinical visits along with the data entered into mNavigator for additional case management as described in the previous section.

Measurement of study outcomes is guided by the RE-AIM framework. In mNavigator, we will collect data points that will allow us to measure outcomes in the following domains:

- Reach – e.g., proportion of eligible patients for whom protocol was used.
- Efficacy – e.g., proportion of cases that abandoned care, with treatment completion and time from hospital presentation to confirmed diagnosis
- Adoption – e.g., proportion of providers who use the protocol, provider acceptability and satisfaction with mNavigator content, ease of delivery and credibility
- Implementation/Compliance? – e.g., proportion of protocol steps completed per patient
- Maintenance (measured in future studies)

We will compare treatment protocol compliance between BL/Rb retrospective patients (treated between 2015-2018 when standardized treatment protocols for BL and Rb were introduced at BMC, but before introduction of mNavigator) and BL/Rb prospective patients (treated using case management provided by mNavigator). To collect retrospective medical record data, trained research staff will abstract medical data into CommCare from paper records for up to 50 files per year (for a total of approximately 200) of patients diagnosed with BL and Rb between 2015-18. Items abstracted will include as many data points available in paper records that are included in mNavigator.

We will assess implementation factors that may facilitate or inhibit implementation of the system. This information will be used to inform scale-up and design of future studies.

We will periodically conduct observations, surveys and/or checklist with users to collect data related to the following areas:

- Technical functionality (such as content, time to complete forms)
- Technical stability (network connectivity, server downtime, failure and errors; issues with quality of data and system, device damage)
- Fidelity and quality of system implementation. These data will help us assess and describe the fidelity of the intervention (how mNavigator was used in practice and whether protocol steps were followed)

We will invite mNavigator users to complete a 30-45 min in-depth interviews to discuss system acceptance and usability, and satisfaction. Using Organizational Readiness for Implementing Change (ORIC), we may also revisit the degree of change in readiness and commitment over time to use mNavigator and change in efficacy, a belief in the capacity at BMC to implement mNavigator. All above study activities related to use of mNavigator will be conducted with mNavigator users who will be both those directly using mNavigator and/or those whose work will be impacted by mNavigator. Users will be BMC health professionals who provide routine clinical care for pediatric cancer patients including patient navigators, clinical coordinators, health providers and other clinical staff as well as non-clinical staff and other key stakeholders whose buy-in will be necessary for the successful implementation of mNavigator.

For the secondary objective, to document factors that may facilitate or inhibit implementation of mNavigator, we will use a process of Continuous feedback from users as documented above. User feedback will be documented in several ways including: mNavigator documentation regarding system errors or failures; in-depth interview to probe users to reflect on factors that facilitated or challenged their use of mNavigator; and through brief surveys regarding acceptability and implementation.

We will also reach out to parents or caregiver of pediatric oncology patients to conduct in-depth interviews to explore factors that may contribute to treatment abandonment (barriers to initiating or completing treatment). We will complete an interview with as many parents as can be reached, recognizing that follow-up will be difficult. The interview may be audio-recorded using an encrypted digital device to help with documentation. These will be transcribed and, if conducted in Swahili, will be translated into English.

Activities contributing to increased research capacity at BMC will also be documented. Examples of research capacity include: (a) technology transfer and research capacity for implementation of mHealth interventions among BMC investigators through collaborations With Dimagi Inc. on aims 1 and 2; (b) continued development of research management capacity through weekly conference calls between project coordinators regarding budget management, quality assurance oversight, and local staff leadership. Tanzania-based investigators are intellectual partners in the study, contributing to proposal writing and all aspects of study design, implementation, analyses, and manuscript development, thereby contributing to improved research capacity in the region.
We will document the process of training and ongoing support provided to mNavigator users. Results of protocol implementation and barriers to adoption, and of the feasibility and pilot efficacy evaluation of mNavigator will be presented in peer-reviewed manuscripts.

Study outcomes are summarized in table below.

Outcome	Measurement	Data Source	Description
Efficacy outcomes			
Protocol compliance with mNavigator	Calculated as proportion of protocol steps completed, based on a compliance checklist	mNavigator data from prospectively registered pediatric cancer patients from July 2019 – July 2020	
Historical protocol compliance	Calculated as proportion of protocol steps completed, based on a compliance checklist	Data from paper charts for patients registered at BMC from 2015 – 2018 entered into mNavigator	
Change in protocol compliance (primary outcome)	Continuous variable calculated as a difference in protocol compliance with mNavigator and historical compliance.	See above	
Treatment abandonment rate	Calculated as the proportion of patients registered in mNavigator who abandoned care. Treatment abandonment is defined as missing four or more consecutive weeks of	Data from mNavigator (outcome form)	

	treatment or follow-up while still on therapy.		
Treatment completion rate	Calculated as the proportion of patients registered in mNavigator who completed treatment	Data from mNavigator (outcome form)	
Time to diagnosis	Continuous variable expressed as number of days and calculated as the difference between the diagnosis date and the registration date.	Data from mNavigator (registration form; diagnosis form)	
System outcomes			
Usability	System usability scale score ranging from 0-100. A SUS score above a 68 is considered above average and anything below 68 is below average.	10-point validated system usability scale	
Acceptability			
Usage	Number of forms submitted, stratified, by users, per month of implementation	Data from mNavigator (Mobile users statistics)	
	Number of patients registered in mNavigator, per month of implementation	Data from mNavigator (Mobile users statistics)	
Stability	Number of instances of mNavigator failure per month Number of instances of CommCare failure per month Number of instances of device failure per month		
Implementation factors			
Training	Number of hours of initial training as well as hours of ongoing support provided during the first month of implementation		
User-proficiency	Number of users who are proficient in use of mNavigator within first month of implementation		
Time per form	Average time in minutes spent completing each form, stratified by form		
Time per patient	Average time in hours spent entering patient data in mNavigator, from time of registration		

	until an outcome is recorded.		

5. Selection of Subjects:

The following two groups of participants will be identified and screened for eligibility.

BMC health professionals and staff
We will approach approximately 15 BMC personnel, both who will directly use mNavigator and/or those whose work will be impacted by mNavigator, to offer enrollment in the study to help test usability of the mNavigator system prior to implementation and during implementation. BMC personnel will include health professionals who provide routine clinical care for pediatric cancer patients such as patient navigators, clinical coordinators, health providers and other clinical staff as well as non-clinical staff and other key stakeholders whose buy-in will be necessary for the successful implementation of mNavigator.

Health professionals and staff will be identified to participate in this study based on the following inclusion criteria:

- Must be a health provider or staff working at BMC who provide care or support clinical care for pediatric cancer patients at BMC (medical oncologists, radiation oncologists, nurses, patient navigators, clinical coordinators, among others).
- Must be 18 years or older.

Parents or caregivers and their child who is a BMC pediatric oncology patient with diagnosis of BL or Rb
As part of standard of care, mNavigator will be used to register approximately 150 new BMC pediatric oncology patients yearly. Over the course of one year, we will enroll about 50 parents, for treatment management for the duration of treatment (typically 3 months for BL and 4 months for Rb) using mNavigator.

Parents or caregivers and their children who are suspected or have known diagnosis of either BL or Rb will be identified to participate in this study based on the following inclusion criteria:

- Child with suspected or known pediatric cancer diagnosis of either BL and Rb
- Child younger than 18 years of age at enrollment

6. Subject Recruitment & Compensation:

This study does not include DUHS patients. Recruitment will be limited to oncology health providers and staff, and pediatric patients and their parent or caregiver at the BMC cancer center.

BMC health professionals and staff
Research staff, with guidance from the PI working at BMC, will approach eligible BMC health professionals to offer enrollment in the study and introduce the study. The screening process to evaluate for eligibility will be conducted in a private setting prior to consent and enrollment. For health providers and staff, no identifying information will be collected prior to consent. However, we will keep a record of the number of providers and staff approached and, if applicable, reasons for ineligibility or refusal.

Approximately 15 BMC health care providers and staff will be enrolled and consented into the study. Only those providing informed consent will be included in the study. Those who choose not to participate in the study will see no impact on their medical care and treatment, or their employment status or opportunities.

Parents or caregivers and their child who is a BMC pediatric oncology patient with diagnosis of BL or Rb
Research staff will reach out to parent/caregiver and pediatric patients who present with clinical diagnosis of pediatric cancer to the BMC Cancer Center. The screening process to evaluate for eligibility will be conducted in a private setting prior to consent and enrollment. No identifying information will be collected prior to consent. However, we will keep a record of the number of parents with a potentially eligible child are approached and, if applicable, reasons for ineligibility or refusal.

Over the course of approximately a year, about 150 pediatric patients who present to BMC with a clinical diagnosis of pediatric cancer will be registered in mNavigator. Of those registered patients, approximately 50 patients diagnosed with either Burkitt lymphoma (BL) or retinoblastoma (Rb) will be enrolled and consented

into the study. Only those providing informed consent will be included in the study. Those who choose not to participate in the study will see no impact on their medical care and treatment.

Neither patients nor providers will receive any direct compensation for participation in the study.

7. Consent Process

Who will conduct the consent process with prospective participants?
Various research staff including study coordinator, research assistant, patient navigators and clinical coordinators will be trained to conduct the consent process. A PI may also consent.

How much time will the prospective participant (or legally authorized representative) have between being approached about participating in the study and needing to decide whether or not to participate?

Potential participants will be given time as needed to consider joining the study. However, in practical terms, patient's parent or LAR will need to consent on the day of their BMC appointment. Patients will be asked to provide consent to have their patient information entered into mNavigator which will include patient registration information. Hence, the reason for requiring consent prior to registration.

Patients will receive a copy of the consent with phone numbers of local investigator and local ethics boards printed, in case of questions.

Where will the consent process occur?
The consent/assent process will occur at **Bugando Medical Centre**, in a room or area where participants feel comfortable discussing the study. The consent process is expected to take approximately 10-15 minutes. Participants will be encouraged to ask questions and will be given time needed to consider joining the study.

What steps will be taken in that location to protect the privacy of the prospective participant?
Patients will be consented as part of their normal clinic visit, after expressing interest to participate to their provider. The consent will be reviewed in an area of the health facility where the participant feel comfortable discussing the study.

How much time will be allocated for conducting the initial consent discussion, including presenting the information in the consent document and answering questions, with each prospective participant?
The informed consent process is expected to take approximately 15-20 minutes. During this time, participants will be encouraged to ask questions about the study. Before requesting participants' signature on the consent form, research staff will make every effort to ensure that the participants' questions have been answered.

The current study is limited to pediatric subjects under 18 years old and, therefore, consent will be obtained from a parent or LAR. Assent will be sought for children >12 years old. If still actively participating in this study, participants enrolled in this study as minors will be re-consented as adults when they turn 18 years old at the next available opportunity (i.e. next study visit, contact point, intervention). Re-consenting will occur at the next available opportunity (i.e. next study visit, contact point, intervention, etc.).

If a child is older than 6 years old, research staff will ensure that the parent has had sufficient time to discuss the study with their child. If the child is older than 12, staff will ask the child to sign the consent as well.

What arrangements will be in place for answering participant questions before and after the consent is signed?
Informed consents for this study are in Swahili, with an English translation available. The Swahili versions are back-translated for accuracy. The informed consent process with all study participants will be conducted in Swahili. Written consent will be obtained from all participants. Health providers, staff and pediatric patients/parent/caregivers will be enrolled in the study only if they provide informed consent.

Trained research staff will conduct the consent and assent process with participants to clearly explain study activities, and any risks and benefits associated with the study. Research staff will emphasize the voluntary nature of the study. They will inform participants that they may choose not to participate, or may stop participating at any time. They will also be instructed to look for signs of emotional distress or discomfort

during the consenting process, and to immediately stop if distress is noted. Research staff will also be advised to periodically pause for questions from participants.

Participants will receive a copy of the consent form and will be directed to the phone numbers printed on the consent form for the local PI (Dr. Masalu) as well as contact information for the director of the ethics board at NIMR should any questions or concerns arise in the future.

Describe the steps taken to minimize the possibility of coercion or undue influence.
To minimize the possibility of coercion or undue influence, participants will be informed of all aspects of the study and any questions will be answered. The voluntary nature of the study will be emphasized. Participants will also be told that their decision to accept or decline participation in the study will not impact their ability to receive medical care and treatment provided by BMC, or their employment status or opportunities. A copy of the consent form will be provided to participants with a contact phone number to call in case they have questions or concerns about the study.

What provisions will be in place to obtain consent from participants who do not read, are blind or who do not read/understand English?
The consent process will be conducted in the local language, Swahili. For participants who are unable to read, research staff will read the consent form to the patients/parents/guardians and request a fingerprint instead of a signature in the presence of a literate witness.

Swahili versions of the consent forms will be submitted to the Duke IRB once they have been approved by the NIMR IRB in Tanzania.

8. Subject's Capacity to Give Legally Effective Consent:

Since all patients enrolled in the study will be children younger than 18 years old, consent will be obtained from parent, guardian or caregiver. Assent will be sought for children who are 12 years old or older. After explaining the purpose of the study, as well as the process, consent will be obtained in writing or verbally (with thumbprint in the presence of a literate witness), depending on participant's literacy. Comprehension of the information provided will be ensured by asking potential participants if they completely understand the project aim and process. Research staff will also ask participants to repeat, in their own words, what they understand about the research study and how we are asking them to participate. These methods to ensure comprehension and avoid unintentional coercion will be taught to research staff prior to conducting any consents.

9. Study Interventions:

Described in study activity section.

10. Risk/Benefit Assessment:

<u>Risk</u>
BMC health professionals and staff
Risks in this study are minimal as there are no physical risks from participation. There is always risk associated will loss of confidentiality for participants. However, this risk of loss of confidentiality will be minimized through rigorous training of study personnel, use of study identifiers to make data de-identified unless linked, and restricting access to identifiable data.

Pediatric oncology patients and their parents or caregivers
Risks in this study are minimal as there are no physical risks from participation. There is always risk associated will loss of confidentiality for participants. However, this risk of loss of confidentiality will be minimized through rigorous training of study personnel, use of study identifiers to make data de-identified unless linked, and restricting access to identifiable data.

Receipt of treatment and any related risks for BL or Rb while participating in this study will be commensurate with receipt of standard of care treatment. Patient treatment will not be impacted if they choose to decline participation.

<u>Benefit</u>
BMC health professionals and staff

There are no direct benefits to to participants for taking part in the study. However, it is possible that by using mNavigator, providers will be able to better follow Tanzanian national guidelines related to pediatric cancer treatment. In addition, the information we get from observing and interviewing BMC health professionals and administrative staff may help us understand how mNavigator can work best in a setting like BMC to improve compliance with treatment protocols and increase treatment adherence thus improving survival outcomes in cancer patients. This may cause a sense of satisfaction in helping inform the better implementation of cancer treatment guidelines for better patient outcomes

Pediatric oncology patients and their parents or caregivers
A potential benefit of participation is that providers using mNavigator may follow national guidelines for treatment better, and so patients may receive treatment that is more consistent with national guidelines. Although this cannot be guaranteed, following national treatment guidelines are expected to improve the results of treatment. Additionally, we hope that in the future the information learned from this study will benefit other people with BL and Rb.

11. Costs to the Subject:

There are no costs to subject for participating in this study.

12. Data Analysis & Statistical Considerations:

Quantitative analysis plan:
Descriptive statistical measures (e.g., means, proportions etc) will be used to describe basic socio-demographic and clinical profiles of study participants.

A compliance score will be generated based on the number of protocol steps completed.

Difference-in-difference (DID) estimation will be used to track longitudinal differences in compliance from baseline to end line at BMC. For secondary outcomes, logistic regression will be used to assess provider characteristics associated with protocol compliance and completion of critical steps in the checklist. Patient characteristics at BMC will be compared using $\chi 2$ tests (binary variable) and t-tests (continuous variables).

Qualitative analysis plan:
For observations and in-depth interviews conducted with health providers and staff, we will use applied thematic analysis on the observation notes and interview transcripts. Electronic files may be uploaded into QSR NVivo--software that supports coding and finer level re-coding of text data that enables researchers to explore how concepts fit by developing and modifying a hierarchical coding index. Thematic analysis will be conducted via an iterative process of data collection and analysis that utilizes four interrelated steps: reading, coding, data display, and data reduction. The team will use a codebook of a priori, structural codes based on the observation and interview guides, and then a second round of coding, i.e. content coding, will be conducted to identify additional themes, ideas, or concepts. Twenty percent of transcripts will be coded by two team members to assess inter-rater reliability. Discussions will be held to resolve coding discrepancies. We may generate summaries of interviews and look across interviews for commonly named problems and solutions related to mNavigator. Data from the observations will be summarized as workflow diagrams, tables or other visual or narrative summaries to describe domains that help assess reach, efficacy, adoption, implementation, and technical functionality and stability.

13. Data & Safety Monitoring:

The current study does not alter standard of care therapy, but provides digital treatment algorithms to assist with following protocols. No additional adverse events are expected. Any unexpected adverse events from the digitalization of the treatment protocols will be reported by the mPIs, Drs. Vasudevan and Schroeder, to the DUMC and Tanzanian IRBs at BMC and the National Institute for Medical Research (NIMR).

Investigators will make all study related documents, including consent forms, readily available for inspection by the study's IRBs and authorized site monitors, including the Office for Human Research Protection (OHRP). On-site study monitoring will be performed by the principal investigators or their designees, to verify compliance with human subjects and other research regulations and guidelines; to assess adherence to the study protocol; and to confirm the quality and accuracy of information collected and entered into the study database.

The study will be conducted in full compliance with the protocol. With the exception of modifications required to eliminate immediate participant safety concerns, the protocol will not be amended without approval from the Duke principal investigators. Protocol amendments will be submitted to CUHAS, NIMR and Duke IRBs for approval prior to implementing amendments.

14. Privacy, Data Storage & Confidentiality

Explain how you will ensure that the subject's privacy will be protected:
All participants will be approached by research staff to participate and, if they agree, will be consented in private area. Research staff will be trained to emphasize that participants can stop their participation at any time, refuse to answer any questions, and refuse to participate at the onset or during follow-up.

Interviews, surveys and observations will be conducted in mutually agreed-upon locations, within the health facility. For group discussions/interviews or workshops such as during intervention development and pilot testing, participants will be reminded to keep proceedings confidential but also cautioned that anything that they say may be repeated by group members.

Describe how research data will be stored and secured to ensure confidentiality:
All enrolled participants will be assigned a study identification number (ID) to help protect their identity during data collection and analysis. Only study IDs will be used to identify participants' medical record data, survey and interview responses. Enrollment logs, paper consents and contact information documentation sheets will have linkage information between study IDs and participant identifiable data. These will be stored separately from study materials identified only by ID. At Duke, only authorized research staff will view and monitor study logs, including enrollment logs, to keep track of participant recruitment and study progress.

At both sites, locked filing cabinets will be used to keep paper study documents including informed consent forms, enrollment logs, paper data collection forms and other study documentation. At Duke, locked filing cabinets will be located in locked offices. Security staff members guard the BMC twenty-four hours a day.

Enrollment logs will be stored separately from other record forms containing collected research data. Contact information will be stored and shared Qualtrics and/or CommCare.

To enable the prospective tracking of participants, the study will collect identifying information such as names of patient (child and parent/caregiver) and provider/staff, dates of birth (only patients), home address and mobile phone numbers. Mobile phone numbers may be used to send reminders about upcoming appointments to parents, contact them about participation in follow-up survey/interview, and for other study-related communication. This information will be stored on secure systems.

All identifiable electronic data will reside in one or more of the HIPAA-compliant servers or devices and software used for this study at BMC and Duke, with appropriate network security measures in place. Secure applications and/or servers will be administered by BMC (in Tanzania), Dimagi, or Duke University (United States). **Data will be kept in compliance with state and federal privacy regulations, including HIPAA. Qualtrics, REDCap, Box.com and CommCare are all HIPAA-compliant.** REDCap (HIPAA-compliant and secure – data are stored on DHTS servers behind Duke firewall). Permissions for the Box folder are provided centrally by Duke OIT and approved by the study PIs(s). User accounts and access will be provided to key personnel only upon approval by the mPIs.

Electronic data may be transferred between BMC, and Duke via CommCare, Qualtrics, REDCap or Box.com and/or other secure software. A data transfer agreement (approved by NIMR) will govern the transfer of electronic data between BMC and Duke. Data transfer will occur via Qualtrics, REDCap, CommCare and/or a centrally administered Box account.

PHI will be shared with Duke PI and research staff. These will include the following:

- Names
- Geographic subdivisions smaller that a state
- Elements of dates directly related to the individual participant
- Telephone numbers
- Medical record data
- Account numbers
- Biometric identifiers such as voiceprints

Sociodemographic, laboratory values and clinical features will be collected and stored within CommCare, whose data will be stored on a secure server. Health providers and research personnel will have access to this database.

Due to the objectives of the study pertaining to pediatric cancer treatment care and compliance with treatment protocols as well as reduction in patient abandonment, we will collect the information on the year element of dates (birth dates, clinical care related dates etc.). In addition to the data listed in CommCare, we will also receive other data as described below:

- Survey data collected on paper surveys and electronic devices.
- Voice recordings and/or transcripts of group discussions/interviews and in-depth interviews
- Medical data for enrolled participants including clinical care dates, values, results, notes
- Recruitment, enrollment, patient tracking logbooks
- Administrative data from health facilities or district/regional administration

Research staff will sign a confidentiality agreement. Only information about groups of participants will be written and published, and it will not be possible to identify any one person when study results are published.

1. Ribeiro, R.C., et al., *Baseline status of paediatric oncology care in ten low-income or mid-income countries receiving My Child Matters support: a descriptive study.* Lancet Oncol, 2008. **9**(8): p. 721-9.
2. Chindo, L., *Mobile phone use in Cameroon: an increasingly useful tool for the follow-up of children with Burkitt lymphoma.* Pediatr Blood Cancer, 2013. **60**(3): p. 524.
3. Labrique, A.B., et al., *mHealth innovations as health system strengthening tools: 12 common applications and a visual framework.* Glob Health Sci Pract, 2013. **1**(2): p. 160-71.
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