HEALTH WORKERS PERCEPTIONS ON USE OF MOBILE PHONES IN INTEGRATED COMMUNITY CASE MANAGEMENT IN NYAGUDA SUB-LOCATION, WESTERN KENYA

BY

AGNETTA ADIEDO NYABUNDI

PhD/FA/00116/2014

A THESIS SUBMITTED IN FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN ANTHROPOLOGY

DEPARTMENT OF SOCIOLOGY AND ANTHROPOLOGY

SCHOOL OF ARTS AND SOCIAL SCIENCES

MASENO UNIVERSITY

@2019

DECLARATION

This thesis is my original work and has not been presented for a degree or any other award in any other University.

_____   _____

Agnetta Adiedo Nyabundi   DATE

This thesis has been submitted for examination with our approval as University Supervisors.

_____   _____

Prof. Erick Otieno Nyambedha   DATE

Department of Sociology and Anthropology, Maseno University

S. Muh

_____

Dr. Sonja Merten   DATE

Department of Epidemiology and Public Health (Swiss Tropical Institute)

ACKNOWLEDGEMENT

DEDICATION

To my parents, Mr. & Mrs. Joseph and Julia Oluoch, for your encouragement. You taught me to appreciate life's seasons and embrace hard work at all times. To Prof. Julius Nyabundi who always encouraged me to be the best and get the best. Melissa Okoth you are simply the best for standing with me always. To my brother Wilson you made work much easier every time you availed yourself and time to help me through this journey.

To my dear husband Jectone Tocho for teaching me persistence, courage, determination and encouraging me at all times to go for it and be the best. Thank you!

To Devane Austin Tocho and Kristen Amondi Tocho my cheer leaders in life, you keep me on toes to be a mum who leads by example at all times in all aspects of life through focusing on God who gives me the strength and wisdom.

ABSTRACT

Kenya is still lagging behind regional and global averages in child mortality rates despite the fact that substantial progress has been made in reducing child mortality since 1990. Furthermore, Kenya like other developing countries faces constraints in health system performance and access to services in hard-to-reach areas such as Nyaguda sub-location. Evidence shows that the integration of basic mobile phones in integrated Community Case Management (iCCM) could potentially address challenges of reducing under-five child morbidity and mortality due to common childhood illnesses. However, much evidence on mhealth is largely based on small-scale implementations which does not incorporate the experiences of stakeholders such as community health volunteers and others on the appropriateness of the mobile phones within different cultural settings. This study aims to assess the health workers' perceptions and use of mobile phones in community case management of childhood illnesses in Nyaguda sub-location, Kenya. Specifically, the study investigated; the uses, examine the views of health workers and the challenges associated with the use of mobile phones among health workers and how they influence integrated community case management of childhood illnesses. The study was guided by the theory of cultural ecology by Julian Steward (1955), which proposes that culture is shaped by the physical and biological properties of the area in which it is developed. Due to its criticism of environmental determinism it will be complemented by the concept of spaces of care in global ehealth by Vincent Duclos (2015). The concept of spaces reveals how technology has linked bodies, knowledge and care practices in new spatial and temporal configurations. The study design is ethnographic. The study population consisted of 25 CHVs trained and supervised in iCCM and having access to mobile phones, 20 Caregivers, 4 key informant interviews (KIIs) with Nyaguda dispensary in-charge, community health extension workers (CHEW) Nyaguda sub-location, a clinical officer and matron in-charge of maternal child health clinic (MCH) at Bondo sub-County hospital, 4 focus group discussions (FGDs) with the caregivers, CHVs, CHEWs within the intervention sites of iCCM and Bondo sub-county health management team. Data collection methods included; in-depth interviews, KIIs, FGDs, and direct observation. Data was analyzed through content analysis to examine the themes that emerge to explain specific objectives of the study. Ethical standards were followed by obtaining informed consent and respecting confidentiality. This study found out that the mobile phone is used within iCCM to further open up the existing and new spaces of care through improving the processes of child healthcare within the health system. The health workers viewed the mobile phone as an important tool that has helped to create new special and temporal configurations by breaking barriers in the overall stakeholder relations in healthcare. The informal integration process however, faced certain challenges which included physical challenges, integrity challenges such as lack of trust in the information given. Despite the few challenges, the integration of the mobile phone within iCCM will help to further strengthen the existing initiatives and practices in integrating mhealth in the Kenyan healthcare system and contribute to improving health policy.

Table of Contents

1.1 Introduction

This chapter presents the background information to the study; statement of the research problem; research questions and objectives; significance, scope and limitations of the study. It also presents the theoretical framework and its relevance to the study.

1.2 Background to the study

Ending preventable deaths of newborns and children under 5 years of age is one of the core agendas of the 2030 sustainable development goals. All countries are aiming to reduce mortality rates among children less than five years to at least as low as 25 per 1,000 live births (UN General Assembly, 2015). The other goal within sustainable development is to end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water borne diseases and other communicable diseases. Diseases such as pneumonia, diarrhoea and malaria continue to account for about one third of deaths among children under five. In low income countries, these deaths are often exacerbated by under nutrition among children who are under-five years of age (United Nations, 2015a; United Nations Children's Fund, 2013b). Progress has been achieved in child health over the past two decades with the global under-five mortality rate having dropped to 53 per cent since 1990 (UN Interagency Group for Child Mortality Estimation, 2015). A number of preventive and curative health policy interventions have contributed to this progress.

An important intervention to reducing child mortality is correct treatment of pneumonia, diarrhoea and malaria (Bryce et al. 2010). However, in most high-mortality countries, facility-

based services alone do not provide adequate access to treatment (Schellenberg, Victora, Mushi, de Savigny, Schellenberg, Mshinda, & Bryce 2003; Victoria, Wagstaff, Schellenberg, Gwaitkin, Claeson, Habicht, 2003) and most importantly, not within the crucial window of 24 hours after onset of symptoms. There is need to focus on the critical role of communities in helping extend coverage of key health-care services to hard-to-reach populations. integrated Community Case Management (iCCM)is an important extension of Integrated Management of Childhood Illness (IMCI) to community level, which was developed by the World Health Organization (WHO) in the 1990s (Gove 1997). It is a strategy to extend case management of childhood illness beyond health facilities so that more children have access to lifesaving treatments for the most common causes of mortality and morbidity. iCCM aims to augment health facility-based case management. In the iCCM model, community health volunteers (CHVs) are identified and trained in classification and treatment of key childhood illnesses, and also in identifying children in need of immediate referral. A "community health volunteer" (CHV) in this context is a health worker that provides health care in the community, with some training in the interventions they deliver (and who may or may not receive a stipend), but who does not have a formal health professional or paraprofessional certificate or tertiary education degree.

Programmatic experience shows that an integrated strategy can be effective in achieving high treatment coverage and delivering high-quality care to sick children in the community. In Nepal, which has more than 20 years of experience in community-based management of child illness, 69 per cent of the under-five population has access to treatment (Dawson et al., 2008), and both the case fatality rate for acute diarrhoea and the proportion of severe pneumonia among acute respiratory infection cases across the country have decreased significantly (Ghimire, Pradham & Maskey, 2010). In Ghana, 92 per cent of caregivers of sick children sought treatment from community-based agents trained to manage pneumonia and malaria.

Indeed, most sought care for their children within 24 hours of onset of fever (Gyapong & Garshong, 2007). In Zambia, a CCM study on pneumonia and malaria found that 68 per cent of children with pneumonia receive early and appropriate treatment from community health workers, and that overtreatment of malaria significantly declined (Yeboah-Antwi et al., 2010). In Ethiopia, workers deployed in remote communities delivered two and a half times as many treatments for the three diseases than all the facility-based providers in the same district (Degefie et al., 2009). A study conducted in Malawi similarly found out that, 68 per cent of classifications of common illnesses by Health Surveillance Assistants were in agreement with assessments done by physicians, and 63 per cent of children were prescribed appropriate medication (Institute for International Programs, 2010). Integrated community case management is, however, not without limits. For example, it is expensive to train health workers, coupled with challenges such as lack of sufficient supportive supervision, the tendency for health workers to follow protocols less rigorously overtime and insufficient resource and policy support (Shrivastava and Ramasamy, 2013). Another important limitation is poor infrastructure particularly in rural areas (Bhutta, Lassi, Pariyo & Huicho 2010).

The use of mobile phones in managing health-related issues is an emerging strategy that holds promise for improving quality of health care and reducing challenges associated with accessing quality health care (Zurovac, Talisuna & Snow, 2012, Noordam, Kuepper, Stekelenburg & Milen, 2011, Lester et al., 2010). Mobile health (mHealth) is defined as the use of portable electronic devices for mobile voice or data communication over a cellular or other wireless network to provide health information (Yang & Kahn, 2010). Across the globe, mobile phones are a means to engage patients in health promotion and disease management initiatives. However, sound health policies are required to determine the future direction of these types of health initiatives to ensure continued successes and expansion of health services within difficult

to reach communities (Malvey & Slovensky, 2014). In 2006, Kaplan explored studies primarily in developed countries (Kaplan, 2006). These studies looked at direct interventions in which mobile and fixed-line telephones phones were used to address health conditions such as diabetes (patient blood sugar level monitoring) conducted in Canada, In the United States (US) studies were conducted on breast cancer telephone counseling, tuberculosis (adherence to medication), treatment compliance for a variety of conditions, attendance at health facility appointments, depression outcomes, immunization rates, asthma management, and smoking 20 cessation (Kaplan, 2006). The studies conducted in Canada and the United States, specifically explored the use of mobile phones for the "express purpose of supporting or altering one or more health outcomes" (Kaplan, 2006). These studies in the US and Canada have been documented in the literature on the use of text messaging for health, mobile diagnostic and decision support, disease surveillance and control, and mobile phones to address emergencies and chronic illness. However, within the context of such documentation, there is very little evidence on the health outcomes related to the direct application of mobile phones to support health objectives (Kaplan, 2006; Vodafone, 2006). According to a Vodafone Policy Paper, mobile phone and health studies have been recent and largely focused on the "potential" benefits of the technology within the health sector and on their use in developed, rather than developing countries (Vodafone, 2006).

According to Mechael (2009), individuals around the world are using mobile technologies to access health services and information, however, this is often done informally. The informal use of mobile phones for health-related purposes poses the challenge of ascertaining its benefits (Mechael, 2009). In sub-Saharan Africa the mobile phone is also often used informally, despite its potential to assist in addressing challenges experienced in hard-to reach areas. The

inadequate documentation of mobile phone informal use within the context of iCCM makes it difficult to ascertain its benefits within the context of iCCM.

Mhealth has potential in the developing and underdeveloped countries where cost of hospital visit among other challenges such as long queues before getting treatment, affects the health seeking behavior of population. Pilot mhealth projects in developing countries such as Uganda, Tanzania, Rwanda and Kenya have shown the mobile phones potential to revolutionize health care (Tamrat & Kachnoski, 2012). Majority of projects on the use of mobile phones in health care in Africa reported successes and positive outcomes (Aranda, 2014). For example, mobile phones were used to provide support to patients in requesting for services such as generating appointments in Zanzibar, rural Uganda and Kenya respectively (Lund et al., 2012; Siedner, Haberer, Bwana, Ware & Bangsberg, 2012; Zurovac, Talisuma & Snow, 2012). Furthermore, studies in rural Ghana (Andreatta, Debpuur, Danquah & Perosky, 2011), in Cape Town South Africa (Rotheram-Borus et al., 2012), in Kenya (Githinji et al., 2013), revealed that mobile phones offered reduction in communication delays and improvement on data collection and reporting. Mobile phones also reduced patient burden in terms of transportation costs and time wastage (Asiimwe et al., 2011; Gitonga et al., 2010; Zurovac, Talisuma & Snow, 2012). They have also helped improve health workers' compliance to treatment guidelines (Hoffman et al., 2010; Lester et al., 2010; Siedner, Haberer, Bwana, Ware & Bangsberg, 2012). Despite these positive benefits experienced within the African context, it has been noted that the mHealth projects are still at the small-scale levels and the success of similar large-scale projects may not be guaranteed due to limited information on how the health workers perceive the use of mobile phones and the challenges they experience (Aranda-Jan et al., 2014). The current study has focused on the uses of mobile phones informally within the context of iCCM which focuses on management childhood illnesses such as malaria, pneumonia, diarrhea and malnutrition.

The current study will explore the use of basic phone services which are owned by the various stakeholders in health and used in an unstructured manner. This is especially made possible by the continued growth in coverage of mobile cellular networks (International Telecommunication Union (ITU), 2013). Most studies (Hoffman et al., 2010; Vital Wave Consulting, 2009; Lester et al., 2010) that have indicated successes focused on HIV and AIDs and T.B. This study will however, explore the informal use of mobile phones within the context of iCCM which covers illnesses such as pneumonia identification and referral, testing and treatment of malaria, diarrhea and malnutrition.

Technologies such as mobile phones, are constructed by social judgements hence they contribute to shaping human action (Hess & Layne, 1992). They shape human actions as socially significant objects whose positioning in society endows them with trappings of human agency. They can gain agency through the various ways that they are put to use by members of society (Hess & Layne, 1992). This prompts the need to explore the use of mobile phones within the context of iCCM and examining how the mobile phones shape human actions in terms of health seeking behaviour. According to (Car et al., 2012, Guy et al., 2012) evidence shows that most pilot projects and randomized trials of mhealth interventions have employed text message reminder systems, for example, in improving attendance at health care appointments. It is however, important to note that limited number of the studies included in the reviews were conducted in resource limited settings. For example, in rural Malawi, short message service (SMS) based communication and professional networking to support CHVs were studied. The CHVs in rural Malawi used SMS to report supply shortages, sent texts to obtain or communicate general information and information about patients with emergencies (Lemay et al., 2012). It remains yet to be documented whether the use of SMS actually reduced the incidence of supply stock outs or patient referrals within the context of iCCM. Apart from

text messaging, little evidence exists on the other functions of the mobile phones such as use of voice calls that can be put to use within the context of integrated community case management of children. This therefore, prompts the need to answer adequately the question on aspects that impede or pose a challenge to the use of the other mobile services in health care management.

Technology has the potential to help human beings exist in the social relations that they have created (Geertz, 1972) including those relations among various stakeholders in the health system. According to Pfaffenberger (1992), technology unifies almost every aspect of human endeavor including that of health seeking behavior and the various relations within the health system. A review by Agarwal et al. (2015) identifies the potential role of mobile phones in providing a channel for training of CHVs and supporting CHVs in the provision of care. Several studies (Chib, 2010, Lee, Chib & Kim, 2011, Lori, Munro, Boyd & Andreatta, 2012, Jennings, Ong, Simiyu, Sirengo & Kassaye, 2013, Jimoh, Pate, Lin & Schulman, 2012, Medhi et al., 2012) conducted in developing countries suggested that the use of mobile phones is also perceived as an opportunity for self-improvement hence can improve CHV motivation, self-efficacy and enthusiasm to continue their work. These are critical non-financial incentives that contribute to CHV retention (Weinberg, Kaddu, Gabler & Kovarik, 2009; Asiimwe et al, 2011; Kamanga, Moono, Stresman, Mharakurwa & Shiff, 2010). However, such strategies were yet to establish how they may improve health outcomes, health system, efficiencies and cost-effectiveness of service delivery. A further examination on the perceptions of health workers within their context of iCCM would help establish the role of mobile phones towards improving the health system.

Reviews on mhealth in sub-Saharan Africa reveal that most of the pilot projects have not focused on local cultural adaptations, for example, language (Tomlinson et al., 2013). However, Tomlinson et al. (2013) notes that mHealth interventions would be more helpful if the results were organized according to foundational functions in the areas of informing, training, monitoring, shaping, supporting, and linking to care; providing content-specific targets for example, providing information for Millennium Development Goal developmentally related tasks and challenges; and last but not least addressing the local cultural adaptations such as language. According to Källander et al. (2013), mhealth interventions often used SMS to provide information, motivate individuals and encourage self-management or promote disease prevention. However, illiteracy is an issue for text-based prevention interventions (Mechael et al., 2010). This barrier calls for the need to provide culturally specific health information to prevent poorly designed campaigns which can have negative and unintended effects. The successful integration of innovations is as a result of many skills and develop over a long period of time within a given socio-cultural context (Pfaffenberger, 1992). Context matters in understanding ways in which social relations evolve and influence wellbeing across time and space (Ajrouch, Fuller, Akiyama & Antonucci, 2017). It is important to win the hearts and minds of CHVs by taking into account their cultural issues such as language and illustrations as well as the ecological settings within which the mobile phone is being used (Tariq & Akter, 2011). The current study further explores the area of health workers' social and cultural views and challenges in the informal integration of mobile phones in relation to their ecological setting within the context of iCCM.

Despite the achievements made towards reduction of under-five child mortality rates, Kenya is still lagging behind. For example, one in every 19 children born die before their first birthday, and one in every 14 do not survive to age five (Demographic Health Survey (DHS), 2009). In

2011, the World Health Organization (WHO) estimated that a total of 188,928 children under-five died in Kenya—out of this, 38,892 deaths were caused by diarrhea, 20,666 by malaria and 30,406 by pneumonia (WHO, 2011; and MOH, 2013). There are many factors driving this trend, including low access to lifesaving treatments. For example, it is estimated that only 50 percent of children in malaria-endemic regions of Nyanza and Western seek treatment from health facilities within 48 hours of developing a fever, with 11 percent taking the recommended antimalarial artemisinin combination therapy (ACT) (Kenya MOH, 2013). Similarly, the Kenya Demographic and Health Survey (KDHS) 2008–2009 shows that only 56 percent of children with symptoms of pneumonia were taken to a health facility. Of these, 50 percent received antibiotic treatment.

As a strategy, iCCM is important for reducing mortality, especially among marginalized children who otherwise have limited or no access to lifesaving treatments. The community health platform exists to help reach children within their communities. The iCCM strategy extends case management of childhood illness to populations underserved by health facilities so that more children have access to lifesaving treatments for the most common causes of mortality and morbidity. iCCM pilots have been implemented in Kenya since 2011. The iCCM strategy in Kenya includes training and supplying the community health volunteers (CHVs) to treat diarrhea with zinc and oral rehydration solution (ORS); conduct malaria rapid diagnostic tests (RDTs) and, after a positive RDT, provide artemisinin-based combination therapies (ACTs), along with assessment and referral for suspected pneumonia; referral for malnutrition and newborn illness; and health promotion (Kabue et al. (2016). UNICEF conducted an operational research study on the use of antibiotics (specifically oral amoxicillin) by CHVs in Homa Bay, whereas, Maternal Child Survival Programme conducted a feasibility of implementing iCCM using the Kenya health system in Bondo District, which included assessment and referral of suspected pneumonia Kabue et al. (2016). In Kenya, the national

iCCM policy builds on the iCCM Implementation Framework and Plan of Action (MOH, 2013a) and the iCCM Monitoring and Evaluation Plan (MOH, 2013b), both of which are anchored in the Community Health Strategy (MOPHS, 2006) and Kenya's National Health Sector Strategic Plan II (NHSSP II). The NHSSP II highlights the limitations of focusing on formal, facility-based interventions to improve health outcomes and emphasizes promotion of individual and community health. The community health strategy supports development and expansion of the community health structure, which is made operational through a community unit, each of which serve a population of 5,000 and consist of 50 CHVs and one government-salaried community health extension worker (CHEW) to supervise the CHVs.

 iCCM in Kenya, however, faces challenges in five key areas which include; the deployment, motivation, supervision and retention of adequate numbers of community health workers as the backbone of iCCM; secondly, maintaining reliable supply chains; thirdly, barriers to utilization among the clients; fourthly, weak monitoring and evaluation systems, and lastly, the need for supportive government policies and engagement to achieve sustainable progress. The challenges within iCCM provide further need for research and interventions to ensure that childhood illnesses receive quality healthcare management. The mobile phones can help to overcome barriers within iCCM through providing further access to care by enhancing spacial and temporal configurations.

Kenya is viewed as an mhealth hub in East Africa, for instance, all reported SMS trials have to-date been undertaken in Kenya (Lester et al., 2010, Pop-Eleches et al., 2011, Zurovac et al., 2011, Odeny, et al., 2012, Zurovac et al., 2012). A study conducted in Western and Coastal parts of Kenya by Jones, Wasunna, Sudoi, Githinji, Snow & Zurovac (2012) revealed that health workers willingly received SMS text-messaging on malaria messages. Some of the health workers in the study by Jones et. al. (2012) were however, concerned with the number

of messages they received per week. The study by Jones et al. (2012), prompted this study to further assess the uses of mobile phones within the context of iCCM which is concerned with the diagnosis and treatment of malaria, diarrhea, assessment and referral of pneumonia and malnutrition in addition to providing health messages for preventive care. Most of the studies (Barrington, Wereko-Brobby, Ward, Mwafongo & Kungulwe, 2010; Treatman & Lesh, 2012; DeRenzi et al., 2012) that focused on health workers' perceptions were only addressed the use of SMS. The current study further explored how the health workers within the iCCM context put to use informally the all interactive aspects of the mobile phone such as use of voice calls. This information would provide further contributions on the views of health workers on the overall integration of mobile phones within iCCM.

In 2013, the Kenya Ministry of Health (MOH) and the Maternal and Child Health Integrated Program (MCHIP), a program supported by the U.S. Agency for International Development (USAID), initiated an implementation research study to inform the MOH and its partners about the feasibility, success factors, and challenges of implementing iCCM in Bondo. The study was completed under MCHIP's successor, the Maternal and Child Survival Program (MCSP), together with the MOH. Successful iCCM implementation in Bondo was built on health and community system support by the Sub-county Health Management Team (SHMT), Community Health Extentsion Workers (CHEWs), Community Health Volunteers (CHVs) and the community leaders (Kabue et al., 2016). This support was established under the community strategy. iCCM implementation had a positive impact on the health of children in their community and reported that iCCM had resulted in a reduction of child deaths, as evidenced by a drop in requests for burial permits and funeral services. However, challenges arose which included: lack of money from the county sufficient to ensure regular supervision; lack of drugs procured and supplied from national medical stores sufficient to meet orders from the health facilities that supplied CHVs; and a dearth of monitoring and reporting tools (Kabue et al.,

2016). Inadequate resources for SHMTs and CHEWs to carry out regular supportive supervision of CHVs can severely undermine iCCM implementation.

Most CHVs enjoyed the status that providing iCCM gave them in their communities, however, the small size of the stipend forced them into other activities to generate income, activities that diminished the time available to provide health care services (Kabue et al., 2016). It was noted that guarding investments of training by sustaining a workforce of CHVs calls for more innovative approaches to incentives (Kabue et al., 2016). CHEWs were too few to support iCCM, and some lacked the clinical background to mentor and supervise CHVs without close supervision. Scaling up iCCM will require a review of needed CHEW competencies. Nyaguda sub-location is located within Bondo sub-county which has one of the highest under-five mortality rates of 208/1000 live births which is thrice the national under-five mortality rate of 74/1000 (KNBS, 2010). Nyaguda has been used as one of the intervention sites for feasibility study of the implementation of iCCM. It was selected on the basis of being a hard-to-reach area. Within the context of iCCM a hard to reach areas were defined as those parts of the county that have physical, communication, social and economic conditions that make them receive health care services that are relatively inequitable.

Nyaguda sub-location is located the furthest compared to the other sub-locations within Bondo sub-county from the Bondo sub-County hospital which is the main referral hospital. It was at the referral hospital where commodities were stored and where the key supervisors in iCCM were located (Kabue et al., 2016). This therefore posed the challenges of supervision, commodity stock outs and referral of severe cases of illnesses among children under five years. This prompted this study to provide a detailed and in-depth examination into the potential of integrating mobile phones in iCCM. However, iCCM did not embrace the use of mobile phones

during the implementation period. The perceptions and the challenges of the use of mobile phones are also yet to be documented within Nyaguda sub-location. The background has therefore exposed some of the aspects within this study that have been problematized in the next section.

1.3 Statement of the Problem

Kenya is still lagging behind regional and global averages in under-five child mortality rates, despite the fact that there are several programs and interventions to address childhood illnesses. One intervention with potential to address delays in treating childhood illness in hard to reach areas in Kenya is ICCM. Despite its potential to lower childhood mortality rates, however, iCCM is faced with various challenges, including difficulties in transmitting health messages and lack of optimal strategies for supervision and retention of CHVs. Mobile phones have the potential to address the challenges of client accessibility, enhancement of supervision and reduction of workload. That said, available evidence on mhealth in the developing countries such as Kenya is largely based on pilot studies and small-scale interventions. This calls for a study of the informal use of basic mobile phone within the context of iCCM in Nyaguda sub-location exist. It has not been possible to formally integrate mobile phone use within iCCM due to lack of adequate information. The informal use of mobile phones within the context of iCCM poses a challenge in ascertaining its benefits due to lack of data on its potential benefits and demerits. In addition, lack of longitudinal data obtained through ethnographic studies further compounds the ability of mobile phones to be integrated in iCCM. There is therefore need to provide data based on observed realities from the current informal users in order to promote the involvement of end users in the design of iCCM. The informal use of mobile phones in iCCM has only been limited to less interactive methods of communication. This prompts the need to introduce more interactive approaches in an endeavor towards scaling up

the existing informal use of mobile phones within hard-to-reach areas such as Nyaguda sub-location. The views of the health workers are not isolated from their social and cultural contexts of work, yet, there is little documented information regarding the health workers' perceptions on the use and appropriateness of the of such mobile phones. The available evidence on health workers efforts in integration of mobile phones in iCCM are yet to be explained. This is especially with regard to their views concerning the benefits and incentives for use and their compliance to procedures for work. This study therefore endeavored to answer the following research questions:

1.4   Research Questions

This study sought to answer the following questions:

1. How are mobile phones being used in the management of illnesses among children less than five years in Nyaguda sub-location, Western Kenya?

2. How do the health workers view the integration of mobile phone use in the management of illnesses among children less than five years in Nyaguda sub-location, Western Kenya?

3. How do the challenges associated with the use of mobile phones among health workers influence the management of illnesses among children less than five years in Nyaguda sub-location, Western Kenya?

1.5 Research objectives

The general research objective was to explore the health workers' perceptions and use of mobile phones in integrated community case management of illnesses among children less than five years in Nyaguda sub-location, Western Kenya. Specifically, the study aimed to:

1. Investigate the uses of mobile phones in the management of illnesses among children

less than five years in Nyaguda sub-location, Western Kenya.

2. Examine the views of health workers on the integration of mobile phones in the management of illnesses among children less than five years in Nyaguda sub-location, Western Kenya.

3. Investigate the challenges associated with the use of mobile phones among health workers and how these challenges influence the management of illnesses among children less than five years in Nyaguda sub-location, Western Kenya.

1.6   Justification of the Study

This study has contributed to the existing knowledge on how mobile phones can be adopted for use in the hard-to-reach context and help in the management of common childhood illnesses. The use of the ethnographic method provided a deeper insight into the use of mobile phones in health. The use of mobile phones may also change the user-provider interaction, the identity of the health worker, the representation of the job and the involvement of other stakeholders in the communication chain.

The study may influence the government and policy-makers as the field of mobile health matures to enhance efficiency and reduce cost. This could contribute towards the Government's efforts in meeting the SDGs which is aimed at ensuring healthy lives and promoting well-being for all at every age. It includes ending preventable deaths of newborns and children under-five. It could be achieved by examining how mobile phones can make the process of communication and social mobilization cost-effective, since these are the key benchmarks for the implementation of integrated community case management. This is important because at the

community level, community members and caregivers would constantly keep in touch with the community health workers who are supervised by the district health management team.

The findings of this study may be useful in enhancing practices and interventions at the community level. This is achieved through understanding the current context of the use of mobile phones by health workers. Information on the use and perception of effectiveness of the use of mobile phones in the management of common childhood illnesses is geared towards improving the health workers' understanding on the appropriate health action to take, thus positively influencing health seeking behaviour. It will also ensure that appropriate and effective interventions are put in place by the health workers. This is achieved through the process of disseminating the findings of this study to the community members and health workers.

1.7   Scope of the Study

This study was carried out in Nyaguda Sub-location. It mainly focused on health workers who have been trained and supervised in iCCM in Nyaguda sub-location and at the Bondo sub-County hospital where the main supervisors were based. The current study can therefore not advise in totality recommendations for application in areas that are not hard-to-reach and having the cultural background like that of Nyaguda sub-location. The study only focused on the use of the mobile phones utilized by the health workers in their day-to-day activities. In addressing the aspect of perceptions, the study only focused on the views of the health workers. In addressing the challenges, the study focused on the challenges related to the management of the health of children under five years. The findings of this study are limited to application in areas where iCCM has been implemented.

1.8   Theoretical Framework

This study was guided by the theory of cultural ecology. The main proponent of this theory is Julian Steward (1955). He describes cultural ecology as a school of thought which views the development of a cultural group as the result of an interaction with the surrounding environment and resources. According to Steward (1955), this theory postulates that culture is shaped by the physical and biological properties of the area or region in which it is developed. Steward further notes that cultural groups shape these ecological properties through exploitation of resources and use of technology. Cultural ecological theory states that these interactions are perpetual and central to a culture's evolution (Steward, 1955). Human cultures have adapted their technologies to suit their environment, and these culture's use of resources have led to changes in the physical and biological characteristics of their surroundings as well as modifying behavior on a range of issues that affect human lives (Steward, 1955).

Cultural ecology represents ways in which culture change is induced by adaptation to the environment through use of material culture. This environment constitutes both the physical and social environment. According to cultural ecologists, the social environment is constituted of relationships that are constructed with different groups overtime including the use of technology to construct such relationships. Thus, cultural ecology theory recognizes that the ecological locale plays a significant role in shaping the cultures of a region. Steward was concerned with the documentation of technologies and methods used to exploit the environment in order to get a living out of it. He looked at patterns of human behavior or the culture associated with using the environment. He also assessed how much these patterns of behavior influenced other aspects of culture. The primary mechanism by which human beings adapt to their environment is culture, including the application of material culture based on existing technology at a given time period to address human problems. According to

Dobzhansky (1972); Cohen, (1974) & Kirch, (1980), culture is the most potent method of adaptation. They Dobzhansky (1972); Cohen, (1974) and Kirch, (1980) further argue that cultural responses include technological advances and how such technology influences human organization in a given ecological context.

Steward (1955) argued that technology was the window between the natural world, human society and culture. Culture is a huge mass of socially transmitted preferences, attitudes, knowledge and concepts among others. According to Steward, technology is the most important aspect of material culture. This is because it is the way that we make our living in the world that links us directly to the rest of nature. It is mostly through technology, rather than biology, that humans have adapted to virtually every ecosystem on earth (Sutton & Anderson, 2010). They (Sutton and Anderson, 2010) further noted that technology can be very general for example, a hammer can be used for many tasks or designed and used for very specific tasks. Through an analysis of technology, one can gain insights into the functions of the tools and the relationship between the user (the culture) and the environment. The more we know about technology, the more we can learn about how a culture adapts to its environment.

The mobile phone has become a central cultural technology. It is associated with qualities of mobility, portability and customization thus, fitting into new ways of accessing services including health. It is used to construct relationships among different groups of people in different social environments. Its use within the health system especially in the hard-to-reach contexts is however, still nascent though growing. Limited studies have used the theory of cultural ecology to explain the use of mobile phones, views of health workers and the challenges the health workers may face in any given environment which in turn may influence the management of common childhood illnesses.

Cultural ecology theory has drawn a great deal of criticism, primarily for its strong emphasis on environmental determinism. While some of the critiques lodged against cultural ecology theory are important to keep in mind and are valid, the value of the theory and its impact on this study cannot be denied and today is still being used very effectively. According to Sutton and Anderson (2010) All human cultures have technology. They Sutton and Anderson (2010), further noted that, technology is the result of need, available materials, innovation, and influence from other cultures. Mobile phones are not only innovative but also available as a means of communication among different groups of people. It is further put to use in the context of iCCM which is a strategy that was implemented in a hard-to reach area. Therefore, exploring its use within the context of iCCM would be important. Mobile phones influence peoples' mode of interaction in different environmental settings where it plays an important role in addressing human communication problems. This is especially so within the context of iCCM within Nyaguda sub-location because diseases exist and are managed within a particular ecological setting. This theory has helped to explain how within the ecological settings the mobile phone technology can be applied to address the challenges of access to health care and the challenges that have been experienced in iCCM within Nyaguda sub-location which is a hard-to reach area. This theory also focused on how culture in particular the mobile phones as part of the material culture helps human populations adapt to their environments and live within the means of their ecosystem given that iCCM was implemented in order to reach undeserved populations located within hard-to reach areas. The various aspects of culture are interrelated hence ensure sustainability of a certain material culture like the mobile phone within the healthcare system for as long as it is useful. For example, given the context of Nyaguda sub-location in terms of the ecological properties (hard-to-reach area), cultural and social context in which the population are busy with fishing activities being located along the shores of Lake Victoria and the rural location hence a strong adherence to traditional culture in relation to

health care. All these aspects of culture are interrelated and therefore affect the use and views of health workers and the challenges they experience in the integration of mobile phones informally within iCCM. According to Goggin (2006), the value of any new technology is a function of the society's cultural level as well as environmental potentials.

The limitations of cultural ecology theory are addressed by the concept of spaces of care in global ehealth by Vincent Duclos (2015). Duclos (2015), reveals how technology has linked bodies, knowledge and care practices in new spatial and temporal configurations. Digital connectivity is mostly correlated with access to care and protection against health-related risk. It is therefore expected to break down barriers to the provision of health care (Mort, May & Williams, 2003). The use of mobile phones is a contemporary arrangement that creates new spaces in which lives are cared for. This concept has therefore guided this study by mapping out how mobile phones shape, generate and distribute knowledge in ways that encode and enforce existing relations within the context of iCCM within Nyaguda sub-location. It also helped this study to document how these relations are enmeshed in a multitude of force relations, mobilities and strategies aimed at addressing common illnesses among children less than five years within the context of iCCM within Nyaguda sub-location. This therefore brings forth a connection among patients, medical practitioners, hospitals and lay people affecting the circulation of knowledge, expertise and data. For example, within iCCM the CHVs use the mobile phones to connect with the caregivers; the CHEWs also contact the CHVs and the Sub-county health management team towards ensuring that the goals within iCCM are met which eventually help to reduce morbidity and mortality rates among children less than five years. This concept blends with the theory of cultural ecology by noting that the use of various sociotechnical tools such as the use of mobile phones should be based on particular contexts where they are being put to use. Given the hard-to-reach ecological and socio-cultural context

of Nyaguda sub-location, mobile phones have been put to use to help address further the challenges experienced within the context of iCCM. The challenges include motivation, supervision and retention of adequate numbers of community health workers as the backbone of iCCM. According to Duclos (2015), there are differences between how these networks are envisioned and the processes through which networked spaces are rendered operational. The concept of spaces provides a further view on how the various stakeholders in health care for children less than five years have used the mobile phone within the ecological and socio-cultural context of iCCM within Nyaguda sub-location to create further spaces for care. This is through exploring how the mobile phones are being put to use, the views of health workers and challenges as they relate with each other within the context of iCCM towards addressing common childhood illnesses among children less than five years. Studies on relations within a healthcare system are critical for enhancing knowledge on the performance of a given healthcare delivery system. The informal use of mobile phones within the context of iCCM helps to create and establish relations for health care for children less than five years hence the need to establish how they are being used, the views of health workers and challenges to enhance performance within the health care system.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of literature by other scholars in the area of use and distribution of mobile phones in the health system, health workers' views and challenges on the integration of mobile phones in the management of childhood illnesses. The aim of this chapter is to expose knowledge gaps which have informed this study. Literature has been reviewed by first and foremost providing an overview of the distribution and use of mobile phones in the health system; secondly in the area of health workers' views on the integration of mobile phones in the management of childhood illnesses and lastly addressing the challenges facing the integration of mobile phones in the management of childhood illnesses.

2.2 Background of Integrated Community Case Management (iCCM)

The correct treatment of childhood pneumonia, diarrhoea and malaria is one of the most powerful interventions to reduce mortality (Bryce et al. 2010). However, in most high-mortality countries, facility-based services alone do not provide adequate access to treatment, (Schellenberg et al., 2003; Victora et al., 2003) and most importantly, not within the crucial window of 24 hours after onset of symptoms. There is need to focus on the critical role of communities in helping extend coverage of key health-care services to hard-to-reach populations. iCCM is an important extension of Integrated Management of Childhood Illness (IMCI) to community level, which was developed by the World Health Organization (WHO) in the 1990s (Gove 1997). It is a strategy to extend case management of childhood illness beyond health facilities so that more children have access to lifesaving treatments for the most

common causes of mortality and morbidity. iCCM aims to augment health facility-based case management. In the iCCM model, community health volunteers (CHVs) are identified and trained in classification and treatment of key childhood illnesses, and also in identifying children in need of immediate referral. A "community health volunteer" (CHV) in this context is a health worker that provides health care in the community, with some training in the interventions they deliver (and who may or may not receive a stipend), but who does not have a formal health professional or paraprofessional certificate or tertiary education degree.

Programmatic experience shows that an integrated strategy can be effective in achieving high treatment coverage and delivering high-quality care to sick children in the community. In Nepal, which has more than 20 years of experience in community-based management of child illness, 69 per cent of the under-five population has access to treatment (Dawson et al., 2008), and both the case fatality rate for acute diarrhoea and the proportion of severe pneumonia among acute respiratory infection cases across the country have decreased significantly (Ghimire, Pradham & Maskey, 2010). In Ghana, 92 per cent of caregivers of sick children sought treatment from community-based agents trained to manage pneumonia and malaria. Indeed, most sought care for their children within 24 hours of onset of fever (Gyapong & Garshong, 2007). In Zambia, a CCM study on pneumonia and malaria found that 68 per cent of children with pneumonia receive dearly and appropriate treatment from community health workers, and that overtreatment of malaria significantly declined (Yeboah-Antwi et al., 2010). In Ethiopia, workers deployed in remote communities delivered two and a half times as many treatments for the three diseases than all the facility-based providers in the same district (Degefie et al., 2009). In Malawi, 68 per cent of classifications of common illnesses by Health Surveillance Assistants were in agreement with assessments done by physicians, and 63 per cent of children were prescribed appropriate medication (Institute for International Programs, 2010). Integrated community case management is however, limited. This is due to the expense

of training, lack of sufficient supportive supervision, the tendency for health workers to follow protocols less rigorously overtime and insufficient resource and policy support (Shrivastava & Ramasamy, 2013). There are also limitations in the health care system and poor transportation or infrastructure particularly in rural areas (WHO/Global Health Workforce Alliance, 2010).

In 2013, the Kenya Ministry of Health (MOH) and the Maternal and Child Health Integrated Program (MCHIP), a program supported by the U.S. Agency for International Development (USAID), initiated an implementation research study to inform the MOH and its partners about the feasibility, success factors, and challenges of implementing iCCM in Bondo. The study was completed under MCHIP's successor, the Maternal and Child Survival Program (MCSP), together with the MOH. Successful iCCM implementation in Bondo was built on health and community system support by the SHMT, CHEWs, and the community leaders, support that was established under the community strategy. iCCM implementation had a positive impact on the health of children in their community and reported that iCCM had resulted in a reduction of child deaths, as evidenced by a drop in requests for burial permits and funeral services. However, challenges arose which included: lack of money from the county sufficient to ensure regular supervision; lack of drugs procured and supplied from national medical stores sufficient to meet orders from the health facilities that supplied CHVs; and a dearth of monitoring and reporting tools. Inadequate resources for SHMTs and CHEWs to carry out regular supportive supervision of CHVs can severely undermine iCCM implementation.

Most CHVs enjoyed the status that providing iCCM gave them in their communities, however, the small size of the stipend forced them into other activities to generate income, activities that diminished the time available to provide health care services. It was noted that guarding investments of training by sustaining a workforce of CHVs calls for more innovative approaches to incentives. CHEWs were too few to support iCCM, and some lacked the clinical

background to mentor and supervise CHVs without close supervision. Scaling up iCCM will require a review of needed CHEW competencies. Nyaguda sub-location is located within Bondo sub-county which has one of the highest under-five mortality rates of 208/1000 live births which is thrice the national under-five mortality rate of 74/1000 (KNBS, 2010). Nyaguda has been used as one of the intervention sites for feasibility study of the implementation of iCCM. It was selected on the basis of being a hard-to-reach area. Within the context of iCCM a hard to reach areas were defined as those parts of the county that have physical, communication, social and economic conditions that make them receive health care services that are relatively inequitable.

2.3   An overview of the distribution and use of mobile phones in the health system

Technology signifies social relationships and values and not just the making and use of objects (Dobres, 1999). This is because within the various social relations and contexts is where culture is produced, reproduced and transformed by the individuals who are a product of the particular society. It is these individuals who eventually ensure that the materials produced have meaning in society and provide a holistic experience to the users (Dobres, 1999; Ingold, 1990). This has been echoed in the works of Steward (1955) when he notes that human beings within different cultural contexts adapt to technologies that suit their environment. The adaptation of certain cultural resources such as technology also modifies individual behavior on a range of issues that affect human lives. Mobile phones are therefore used to intensify social relationships and allow for greater coordination of activities. They therefore present the arena where social relationships are negotiated and experienced through communicating and networking (Axel, 2006). According to Horst and Miller (2014), mobile phones are used to link up and provide intensive social networking among kin and friends within a given socio-cultural setting. They

can therefore be used to educate community health workers on proper treatment procedures and correct treatment practices. Networking is normally the main goal of using mobile phones, however, the resulting relationships can be used for economic aid, sexual liaisons, business contacts, psychological support and even provide better health access to the members of any society (Horst & Miller, 2014). The concept of spaces of care also reveals that technology has indeed helped to bridge the gap in knowledge, interaction between health professionals and their clients and has indeed brought health care even closer to the clients in different contexts (Duclos, 2015). According to Kahn et al. (2010), mobile phones offer a great promise for improving the quality of life because it is the anchorage point for mobile health which can support the removal of physical barriers to care and service delivery. Kahn et al. (2010) thus argues that this will help to improve the weak health system management, unreliable supply systems and poor communication in developing countries with different socio-cultural contexts. The study by Kahn et al, (2010) however, focused on the integration of mobile phones in addressing non-communicable diseases and the economic outcomes of this integration. The current study on the contrary, focuses on communicable childhood illnesses such as malaria, diarrhea, pneumonia and malnutrition within the social and cultural context of hard-to-reach areas such as Nyaguda sub-location.

Technologies are socially significant objects whose positioning in society endows them with the trappings of agency (Hess & Layne, 1992). Mobile phones are put to use through a process of acceptability and their ability to help individuals to address certain challenges that they are made to address. They form part of material culture which needs to be culture specific and also address the ecological contexts of their different areas of application. This assertion has further been made by Sutton and Anderson, (2010) who state that, it is mostly through technology, rather than biology, that humans have adapted to virtually every ecosystem on earth. Individuals around the world are using mobile technologies to access health services and

information (Mechael, 2009). It is being used formally and informally by health professionals in public health and clinical activities. According to Mechael (2009), mobile phone uses range from mobilizing emergency support to scheduling a doctor's appointment, remotely monitoring one's health among others. A further study by Mechael (2013), has categorized into two the formalized uses of mobile phones for health purposes. These include; mhealth as an extension of e-health and m-health as a subset of m-services. Mhealth as an extension of e-health encompasses the formal integration of mobile devices within the health sector which includes text-message appointment reminders, data collection systems, remote patient-monitoring devises and mobile medical records. These services often begin with small pilot projects which may be replicated and scaled-up if successful and well-funded. This progression has however been slow as noted by Mechael (2010). M-services on the other hand, include health-related call center and hotlines, mass mobilization campaigns and mobile phone-based games (Mechael, 2010). These services are often provided through mobile phone operators in partnership with non-governmental organizations and soft-ware development firms. The study current study focuses on the informal uses of mobile phones within the health system in the context of iCCM. This study further addresses the interactive use of mobile phones within health care such as the use of voice calls which is also important in providing real time communication between the different players in health especially in the hard-to reach area of Nyaguda Sub-location.

According to Vital Wave Consulting (2009), examples of mhealth innovations around the world include; India-Asia media labs project in Asia where there is developing and deploying of data collection and support tools for community health workers and gaming systems to promote behavior change. In Peru, Universidad Peruana Cayetano Heredia is conducting research and training in biomedical and health informatics. In Cambodia, the Mekong collaboration programme has begun using a messaging system developed by innovative

support to emergencies, diseases and disasters (in-STEDD). In Philippines, mobile health technologies are being used to help rural health workers. In South Africa, project Masiluleke is using the mobile phone to educate South Africans about HIV and T.B prevention. In Ghana, program m-pedigree is using mobile phones to identify and reduce the use of counterfeit drugs. In Rwanda, a mobile phone-based technology called Trac Net is helping follow patients and their treatment. According to Mechael (2009), the functional and structural properties of mobile phones make them attractive to the health sector in low-and middle income countries. All these attempts to use mobile phones have however, not been subjected to rigorous academic studies to advance theories and knowledge on their use. The present study aims to provide an academic contribution to advance knowledge by generating qualitative data on the use of mobile phones. This study through an ethnographic approach uses the theory of cultural ecology to explain, provide a better understanding and be able to predict the future of the use and views of health workers within the hard-to-reach context. This use of the theory and the concept of spaces of care will help provide an understanding that will enable scale-up and sustainability in the integration of mobile phone in iCCM.

The most notable feature of the phone is its capacity to communicate and transfer information within both literate and illiterate populations (Mechael, 2009). The relatively low start-up costs and flexible payment plans have put the technology into the hands of significantly large proportions of the general public. Mechael (2006) further noted that subscribers even share their mobile phones with others extending even further the health and emergency benefits of mobile phones. Despite this availability of mobile phones in the hands of large proportions of people of the general public and its diverse positive benefits, it has been noted that the mHealth projects are still at the small-scale levels and the success of similar large-scale projects may not be guaranteed. In addition, most of these studies (Hoffman et al., 2010; Vital Wave Consulting, 2009; Lester et al., 2010) have indicated successes focused on HIV and AIDs and

T.B. However, the current study provides information on childhood illnesses especially those focused on by iCCM which include malaria, pneumonia, diarrhea and malnutrition.

Mobile phones are used to establish extensive networks and can therefore change the way health care is delivered in the most rural and underserved parts of the world (UNICEF, 2013). For example, community health workers in remote areas are largely unsupported by the formal health system. This makes them unable to make timely and accurate diagnosis. The mobile phone is deemed to be a solution to the disconnectedness problems of distance, time and access to information (Frog & UNICEF, 2013). This report (Frog & UNICEF, 2013) further notes that with the use of the mobile phone, the community health workers receive information, ask advice, re-order life-saving drugs and receive feed-back from the otherwise distant formal health system. This asserts that, technology and material culture form the primary means by which people establish their viability given the constraints imposed upon them by their environment and the demands of social integration (Axel, 2006). Every artifact the mobile phone included has two dimensions; the instrumental dimension related to the artifact's function and the secondary dimension related to its social meaning and symbolism (Binford, 1962).

The mobile phone has several benefits especially in the hard-to-reach areas due to the constraints of accessibility imposed by the environment. According to Lacal (2003), the development of health-related applications within the mobile communication technologies can provide real-time feedback, pre-programmed automated services and support to increasingly decentralized health systems. However, Källander et al., (2013) noted that few projects were implementing real-time communication. This is whereby information would be sent and a response received immediately for example through the use of voice calls. These studies

focused on the use of automated text messaging reminders whereas the present study focusses on the interactive use of voice calls and the informal use of mobile phones for health-related purposes within the context of iCCM. The studies within developing countries are yet to provide evidence showing that studies in mhealth have assessed the impact of mobile phones on community health workers in terms of the quality of care provided (Källander et al., 2013). This has prompted the present study to investigate the uses of mobile phones in the management of childhood illnesses in Nyaguda sub-location. Most people in Nyaguda sub-location have embraced the use of mobile phones informally. They use the mobile phones as a means of communication in their day-to-day activities and have also ended up using it informally in their health matters. These uses and the views of health workers within the context of the study area have however, not been documented.

2.4 Health workers' views on the integration of mobile phones in the management of common childhood illnesses

Shrivastava and Ramasamy (2013) have argued that the delivery of health services is often weakest where the needs are greatest. They argued for universal health coverage stating that, in the modern era, where the costs of availing health care are increasing day-by-day, and if people only have to pay for most of the expenses through their own pockets, the poor will never be able to avail the health-care services they need and even the rich have to face financial debt, especially for serious/chronic ailments. Bryce et al. (2010) concurs by noting that low coverage of the most needed interventions results in a significant unmet need for treatment of the major diseases contributing to childhood mortality. According to Rowe et al., (2007), appropriately trained, supervised and supported with an uninterrupted supply of medicines, community health workers can identify and correctly treat most of the children with pneumonia, diarrhea

and malaria. Community health workers are therefore an effective option for investment as part of a comprehensive primary health care system. Community case management should however, not be viewed as an inexpensive or low-cost measure (Rowe et al., 2007). Effective implementation requires policy support, training, supervision, performance maintenance and regular supplies. This study explores the various informal uses of mobile phones within iCCM due to their potential in providing effective implementation of iCCM.

Communication and social mobilization is one of the key benchmarks for the implementation of integrated case management of common childhood illnesses (WHO/UNICEF, 2012). The joint statement by WHO/UNICEF (2012) further notes that at the lowest level, the community members or caregivers will constantly keep in touch with the community health workers who are supervised by the health management team members. Accessing, affording and the achievement of quality health care are problems experienced around the world (West, 2013). West (2013) further states that, there are disparities based on income and geography. The high costs of health care present affordability challenges for many different people making the achievement of quality care a challenge. Health care delivery can be improved through the use of mobile health applications, sensors, medical devices and remote patient monitoring products. According to West (2013), these products can help lower costs by facilitating the delivery of care and connecting people to their health care providers. The increasingly ubiquitous access to mobile phone provides one of the solutions to the problems of disconnectedness, distance, time and access to information.

Mobile phones provide communication which is an essential ingredient to reach out remote and isolated tribal and rural communities. They therefore make proper healthcare accessible to the rural population. The perception of value offered by mobile phones eventually influences acceptance (Chib, Lwin & Jung, 2009). Acceptance according to Kim, Chan and Gupta (2007)

refs to the general benefits of technology. The perception of value and for example, self-efficacy according to Chib et al., (2009) also influences perceived use, for example, if an individual has a positive view towards the use of mobile phone in healthcare, they may use it than if they have a negative perception. Therefore, the introduction of a new technology and in this case the formal use of mobile phones can also be enhanced by educational assistance which enhances user confidence. The theory of Cultural ecology notes that material culture such as the mobile phone helps human populations adapt to their environments and live within the means of their ecosystem (Steward 1955). This is because they help the members of a particular society to navigate certain challenges such as the challenge of accessibility. Therefore, to ensure sustainability of the integration of mobile phones into healthcare, it is necessary to acknowledge the views of various stakeholders within a given ecological and cultural context. A study by Jones et al., (2013) in Kenya revealed that SMS text messaging was enthusiastically received by the participants, the content on malaria was also perceived to be useful active reminder of best practice. The current study further examines the use of mobile phones on the other common childhood illnesses such as diarrhea, pneumonia and malnutrition.

The acceptability of the intervention to health workers in the study by Jones et al. (2013) concurs with findings of other projects conducted in India where MMS was used to support CHV practice. In this study which was conducted in India messages were viewed by health workers as important since they came from an expert (Treatman & Lesh, 2012). A study conducted in Tanzania focused on reinforcing timely home visits by CHVs. The study also revealed that CHVs had considerable enthusiasm with the use of mobile phones within the health care system (DeRenzi et al., 2012). The current study provides a further exploration on the frequency of message delivery, duration of messaging and SMS interaction with participants. These views on the frequency and duration of sending messages are important within each specific context. This is because they will eventually determine the sustainability

of the integration of mobile phones especially within iCCM. The present study therefore aimed at understanding health workers calling preferences and patterns and their views about the use of mobile phones in health care which have not been adequately addressed by studies on perception of mobile phone use among health workers. This endeavor has been guided by concept of spaces of care by Duclos (2015) which discusses the importance of mapping out how mobile phones shape, generate and distribute knowledge in ways that encode and enforce existing relations among the various stakeholders. This is necessary because the achievement of acceptance and promotion of the formal use of mobile phones in health care requires overcoming social and cultural barriers.

According to Tariq and Akter (2011), overcoming the barriers to use of mobile phones may be achieved through winning the hearts and minds of CHVs, taking into account their cultural issues such as use of language and illustrations as well as the ecological settings within which the application of the mobile phone is being used. There is therefore need to align the use of mobile phones to the processes and tasks of CHVs. This concurs with a revelation by Pfaffenberger (1992) who averred that technology expresses an embedded social vision and engages human beings in what Marx refers to as a form of life (Pfaffenberger, 1992). Mobile phones when put to use provide a total social phenomenon which Mauss (1967) noted that it marries the material, social and symbolic into a complex web of associations. It is culture and not only nature that defines necessity (Pfaffenberger, 1992). He further states the need for a special environment or a cultural preadaptation in order to achieve the earliest steps of an invention. Hughes (1983) concurs that those seeking to develop new technologies must concern themselves not only with techniques and artifacts but also with the social, economic, legal, scientific and the political context of the technology. In exploring the integration of mobile phones within iCCM the current study will examine the views of health workers in an endeavor to address the cultural views in relation to the ecological settings of the CHVs. The current

study goes further than just acknowledging the challenges addressed by Tariq and Akter (2011) by exploring how the problem of health workers social and cultural views in relation to their ecological settings can be addressed. This study therefore obtained views of the CHVs with the aim of overcoming the social and cultural barriers while integrating the mobile phones in iCCM within their ecological settings. This is in order to understand the natural role of mobile phones within the CHVs work settings and also to gain the desired benefits of the technology. Studies (Chaiyachati, 2013; Chang, 2013; Grimsbø, 2012; Medhanyie, 2015) reveal that the focus on health workers' perceptions will complement reviews of mobile health effectiveness and help improve our understanding of the barriers to and facilitators of its successful implementation.

2.5 The challenges facing the integration of mobile phones in the management of childhood illnesses

Many factors constrain health system performance in developing countries (Kahn et al., 2010; Arah et al., 2008; Mullan, 2005; Lopez & Mathers, 2006). These include limited infrastructure, hospital resources concentrated in urban areas (Kahn et al., 2010), a shortage of health care workers and difficulty in recruiting and retaining health workers especially in rural areas (Arah et al., 2008; Mullan, 2005). Other factors include, disease burden-incidence and impact on people's livelihoods and economic productivity being great (Lopez & Mathers, 2006). The supervisory and management systems are often lacking or weak (Kahn et al., 2010). This means that there is a discrepancy in the number of supervisory and management health workers in relation to the amount of work that needs they need to do. Therefore, mobile phones put in context might help by removing physical barriers to care and service delivery due to their mobile nature. This will help improve health system management, unreliable supply systems and poor communication. The challenge however, is that the value for m-health remains scarce especially for the developing countries (Kahn et al., 2010). Kahn et al. (2010) further notes that

challenges to the implementation of mobile phone in integrated community case management have influenced the scaling up on the use of mobile phones in health. They however, do not address the specific challenges. This makes it necessary to further explore these challenges within specific contexts such as in hard to reach places such as the current study area.

There is a further need to assess m-health on the aspects of awareness of practical issues such as sustainability within certain cultural contexts. This is more so because real-world challenges greatly influence the ability of programs to survive and grow (Iluyemi, 2009). New technologies also need to be examined within their economic, social and political contexts. This is because as Basalla (1988) noted, there are material manifestation of the various ways men and women throughout time have chosen to define and pursue existence. This thesis provides an in-depth analysis of the challenges experienced in the implementation and sustainability of mobile phones in community case management of children basing its arguement in the context of rural and hard-to-reach areas.

A socio-technical system is not static and mobile phones and their use will keep on changing hence to keep the system functioning requires constant vigilance (Pfaffenberger, 1992). This may require additional technical or social modification which may have economic implications. This brings forth the challenge that m-health needs to demonstrate economic outcomes. For example, there is a need for the local communities and the general health systems in the governments to experience lowered costs. If m-health is to compete with other health interventions, it will need to be measured in terms of cost per disability-adjusted life year (DALY) averted. This is increasingly the accepted measure of health intervention for performance (Jamison, 2006). According to Kahn et al., (2010), an evaluation framework for m-health would characterize the interventions, their costs and their intended clinical outcomes and potential adverse effects. The qualitative nature of this study will help provide an in-depth

analysis of the challenges within the hard-to reach and rural context. This in-depth and qualitative approach adopted in this thesis has attempted to provide a culturally specific understanding of these challenges and culture specific mechanisms to promote sustainability of these programmes.

A study on m-health in developed countries explored how people used mobile phones for the express purpose of supporting or altering one or more health outcomes (Kaplan, 2006). Kaplan (2006), further avers that such studies were primarily small pilot projects. They offered mixed results in terms of demonstrating the potential of landlines and mobile phones to serve as a support for more effective delivery of health care services. It was however, noted that the main feature of mobile phones that has significantly been documented in the context of health is text messaging. This puts forth the challenge of finding out about the use of other services in health care. This is because technology is a most decidedly cultural and human phenomenon that encompasses far more than the physical transformation of the material world from one state to another (Schiffer, 2001). It therefore encompasses more than text messaging hence its application in the health systems should strongly endeavor to move beyond text messaging. Therefore, the question that is yet to be answered adequately is on the aspects that impede or pose a challenge to the use of the other mobile services in health care management and how such challenges can be addressed to enable the use of mobile phones expand spaces of care for under-five children in resource limited settings.

The greatest barrier to m-health adoption by countries is the competing health system priorities (WHO, 2011). It is further noted that, health systems worldwide are under increasing pressure to perform under multiple health challenges. These challenges include chronic staff shortages and limited budgets. This makes the choice of interventions difficult. According to Pfaffenberger (1992), socio-technical systems are heterogeneous constructs that are as a result

of successful modification of social and non-social actors in order to work harmoniously. Hughes (1990), concurs with Pfaffenberger and states that the introduction and sustainability of a technology does not only depend on its benefits but must also examine the social, economic, legal, scientific and political context of the technology. This thesis has analyzed contextual challenges that may interfere with the implementation and sustainability of the use of mobile phones in integrated community case management of childhood illnesses.

The other challenge is lack of education for the public about the benefits of m-health. This has hindered the establishment of m-health into government policy (Källander et al., 2013). There is however, need for an effective policy as the field of m-health matures because it would enhance efficiency and reduce cost (WHO, 2011). It is important as noted by Pfaffenberger (2011), that construction of technology is more than merely deploying materials and techniques. It is also the act of constructing social, political and economic alliances. This makes it necessary to have the role of the mobile phone to be seen in its totality which embraces not only the tool but the main role it was intended for which is communication, the social relations and political myths that guide the choices to adapt the technology. Källander et al., (2013), states the need for sufficient qualitative data to explain these challenges. The methodology used in this study is intended to provide sufficient qualitative data that will explain challenges and provide knowledge relevant for the implementation and sustainability of the use of mobile technology in iCCM.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Introduction

This chapter describes the methodology used in this study. It outlines the data collection methods, data analysis procedures and key ethical issues. It entails the description of the research design, study area, study population, sampling procedure and sample size, data collection methods, reliability and validity, data analysis and presentation and the ethical considerations.

3.2 Research Design

An ethnographic study design was used. This study design aids in looking at the interactive strategies in human life. This design provided analytical descriptions of social scenes, individuals and groups that recreate their shared feelings, beliefs, practices, artifacts, folk knowledge and actions influencing the integration of mobile phones in health care within a given context. It is both a process and product of describing and interpreting cultural behaviours such as the integration of mobile phones within the health system. It also uses rigorous research methods and data collection techniques to avoid bias and ensure accuracy and triangulation of data (LeCompte & Schensul, 2010). LeCompte and Schensul (2010), further mention that ethnographic research reveals a greater and deeper insight into the matter being studied. By going out into the world and observing things as they occur, ethnographers are better able to obtain a more accurate picture.

The entry point for this ethnographic study was a health center within the study area. It is at the health center that the health workers concerned with the management of childhood illnesses

were selected. The selection was based on the health workers who have been trained on integrated community case management for children less than five years old and who are consulted by caregivers who reside in hard-to-reach areas. The second phase entailed following-up the health workers within their natural setting of work. This is where the researcher carefully observed and participated in the lives of the individuals being studied. For purposes of triangulation other data collection methods were also put to use such as conducting interviews (in-depth interviews, key informant interviews) and focus group discussions. The participants were followed for one year having done preliminary preparations of booking appointments for other interviews for 2 months.

3.3 The Study Area

This study was conducted in Nyaguda Sub-location, Siaya County in Western Kenya. Nyaguda sub-location is located near Lake Victoria and in a malaria-endemic area. It is situated in a rural area 112.4 kilometers from Kisumu Town. It is located in Siaya County and Bondo sub-County which has one of the highest infant mortality rates in Kenya, at 110 infants per 1,000 live births, and an under-five mortality rate of 208 per 1,000 live births (KNBS & ICF Macro, 2010). KNBS & ICF Macro further note that this is thrice the national under-five mortality rate of 74/1,000. High burden of disease, high levels of poverty, and underdevelopment have led to the declining health status of the population in Bondo (KNBS & ICF Macro 2010). Nyaguda sub-location comprises of seven villages namely; Minya, Nyaguda, Orengo, Otuoma, Uhendo, Wichlum and Wichlum Uhendo.

Nyaguda sub-location has approximately 1552 households (Kenya Bureau of Statistics, 2010). The main health care facility in Nyaguda sub-location is Nyaguda health Center. According to the health facility's records, approximately 10 – 12 sick children visit the local health facility (Nyaguda dispensary) per day. The sub-location has 25 community health workers trained and

supervised in iCCM (Kabue et al., 2016). The economic activities in the area are mainly fishing and subsistence farming. The location of the area at the shores of Lake Victoria coupled with high levels of poverty, and underdevelopment which makes the place more susceptible to common childhood illnesses. Despite several strategies and policy initiatives—such as the MOH's Reproductive Health Policy (2007); Ahmed, Mitchell, and Hedt's (2010) "National Implementation of Integrated Management of Childhood Illness (IMCI): Policy Constraints and Strategies"; and the MOH's Kenya Health Policy 2014–2030 (2014)—all of which are aimed at improving health indicators especially for children under-five, there is still limited access to and use of health services in this study area. These challenges within the health system prompted the current study to examine how the integration of mobile phone as a popular form of material culture may be used to address these challenges of access to and use of health services.

Map of the study area.
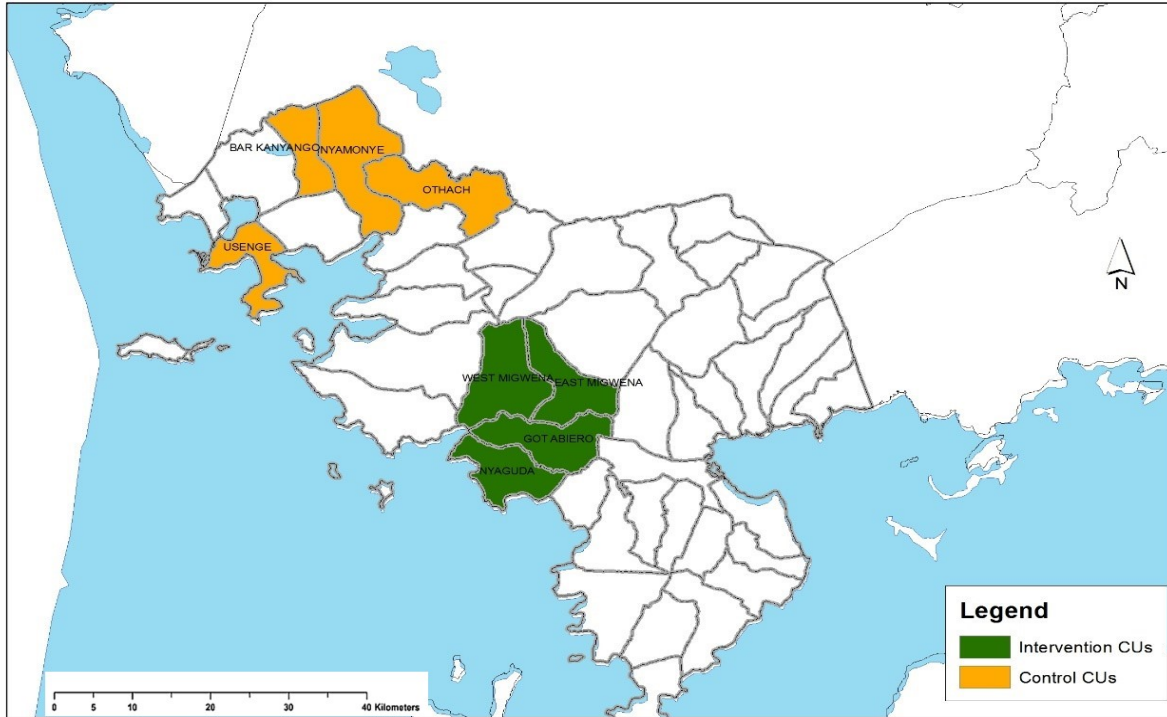
Source: USAID/mcsp.

3.4 Study Population

The study population comprised of 25 health workers in Nyaguda sub-location trained and supervised in integrated community case management of childhood illnesses and have access to mobile phones. The study also targeted 20 caregivers who are involved in the decision making process of where to seek health care during the illness of a child less than five years old. In addition, information was received from 4 key informants who included community health and extension workers, key hospital workers both in Nyaguda health center and Bondo-sub district hospital where most of the children are referred to when the illness is severe. These included the in-charge of Nyaguda health center, the matron and a clinical officer in the maternal child health unit at the Bondo sub-district hospital. The unit of analysis was the health workers concerned with the management of childhood illnesses among children under five and who used mobile phones informally to manage childhood illnesses.

Table 3.1: Socio-demographic characteristics of CHVs			Table 3.2: Socio-demographic characteristics of Caregivers	
Variable	**Number**		**Variable**	**Number**
Sex			**Sex**	
Male	3		Male	2
Female	22		Female	18
Age			**Age**	
$\geq$ 50 years	3		$\geq$ 50 years	2
40-50 years	15		40-50 years	3
35-39 years	5		35-39 years	3
25-30 years	2		25-30 years	12
Education			**Education**	
Secondary level	10		Secondary Level	4
Primary level	15		Primary Level	16

3.5   Sampling Selection Procedures

The target population was the health workers tasked with the management of childhood illnesses. Twenty-five community health workers concerned with the management of childhood illnesses were all selected and interviewed in each of the seven villages in Nyaguda sub-location (Minya, Nyaguda, Orengo, Otuoma, Uhendo, Wichlum and Wichlum Uhendo). The caregivers were selected purposively based on the first 20 who had had contact with the CHVs within the first six months of the study. The CHVs referred them to me after the contacts and I would then book appointments and follow them up for the interviews. The need for thick description makes it necessary that samples are small (Hammersley & Atkinson, 2007). Small samples do not permit generalization to a larger population. The aim of this study is not to generalize but rather to have an in-depth understanding of the situation without losing sight of the whole (Hammersley & Atkinson, 2007). It provides the researcher with a much more comprehensive holistic perspective than other forms of research. According to LeCompte and

Schensul, (2010) qualitative research is also appropriate to behaviours that are best understood by observing them within their natural environment (dynamics). The main focus was on generating themes and categories and perhaps even theories from the data about the people being studied.

3.6   Data Collection Methods

Several data collection methods were employed to obtain qualitative data. The information was sought through key informant interviews, in-depth interviews and focus group discussions.

3.6.1   In-depth Interviews

In-depth interviews were conducted with 20 community health workers concerned with the management of children under the age of five with common childhood illnesses (Appendix 1) and 20 caregivers who had children under five with common childhood illnesses and had interacted with the CHVs through phone (Appendix 2). The participants were sampled purposively. These interviews provided a detailed inquiry into how mobile phones are being used in the management of childhood illnesses, the health workers social and cultural views on the integration of mobile phones in addressing common childhood illnesses within the ecological locale of Nyaguda. It also provided an in-depth explanation into the challenges associated with the use of mobile phones and how the challenges influenced the management of common childhood illnesses within that context. Data gathered during these interviews were audio recorded and also noted in the field note-books.

3.6.2   Key Informant Interviews

Key informant interviews were conducted with the Nyaguda dispensary in-charge, community health and extension worker, a clinical officer and the matron in-charge of the maternal child

health clinic at Bondo sub-county hospital and the assistant chief of Nyaguda sub-location. The key informants were identified through purposive sampling. Interviews were guided by the key informant interview guide (Appendix 3) which was developed based on the study objectives. They provided information on how the mobile phone is being used in the management of common childhood illnesses and the perception of health workers towards the integration of mobile phones in the management of common childhood illnesses within the cultural and ecological context of the study area. In addition, they informed the study on the challenges faced when mobile phones are integrated in the management of common childhood illnesses. Data gathered during these interviews was audio recorded and noted in the field note-books.

3.6.3 Focus Group Discussions (FGDs)

Five FGDs were conducted with until a level of saturation was achieved that is, when additional interviews done were not yielding additional insights. These groups included; female caregivers, community health workers, Community Health and Extension workers of areas within Bondo sub-county where integrated community case management has been implemented, members of Bondo sub-county health management team who are often involved in iCCM supervision process. The FGDs each comprised of eight participants. During the Focus Group Discussions, a field assistant assisted with the note-taking. The discussions were also audio-recorded and later transcribed. The focus group discussions aimed at eliciting data on how mobile phones are used in the management of common childhood illnesses. These discussions also informed the study on the health workers' perceptions on the integration of the mobile phone in the management of common childhood illnesses. Information on the challenges that affect the use of mobile phones in managing childhood illnesses was also obtained using these discussions, and how those challenges influence the management of childhood illnesses within the context of Nyaguda. The discussions were guided by a focus

group discussion schedule for caregivers (Appendix 4) and health workers (Appendix 5- CHVs, Appendix 6- CHEWs, Appendix 7- facility workers) which had been developed based on the study objectives bearing in mind the theoretical framework of the study to provide room for triangulation of data obtained from the earlier instruments.

3.6.4 Reliability and Validity

Reliability which also means consistency in data collection tools is to find out the stability in terms of how far they can give the same results on separate occasions (Watson & Bannigan, 2009). The reliability of the tools in this study was achieved through pre-testing of the tools by taking a sample of 10% of the various data collection tools and administering them in Migwena village a setting similar to Nyaguda where iCCM has been conducted before though not within the study area. This aided in finding out if there are any errors to be addressed in the data collection tools before conducting the actual study.

Validity on the other hand is concerned with the meaning and interpretation of data collection tools which will be achieved through triangulation. Triangulation entails putting to use varied methods of data collection to ensure the information being obtained is valid.

3.7 Data Analysis and Presentation Techniques

The study employed qualitative data analysis techniques. The interviews were recorded having obtained consent. Information from the qualitative data was and analyzed using latent content analysis whereby patterns and themes were identified. The latent level of thematic analysis looked beyond what had been said by looking at the underlying ideas, assumptions and conceptualizations which are theorized as shaping the content of the data. The data was coded and themes presented through descriptive texts, analyzed reports and narratives. This was done by theoretically relating the emerging themes from the texts and examining the specific objectives of the study.

3.8 Ethical Considerations

Studies that conduct research in the aspects of life that affect the medical issues of a population are usually sensitive. Ethical clearance was sought from Maseno University Ethics Review Committee (MUERC), permission was also sought from the Assistant chief of the area, the In-Charge of Nyaguda health facility and District Management Officer in charge of Health in Bondo Sub-County to conduct the research. The participants were informed about the study through the assistant chief's baraza. An oral and written informed consent was obtained from the participants and they were assured of confidentiality. This was achieved by not using names in any instance while collecting data. The participants were further assured of anonymity and confidentiality for the recorded interviews. They were informed that the information would be kept safe and accessed only by the researcher. The main aim of the study was to provide benefit to the community members through the dissemination of the results which will be done at a later date.

CHAPTER FOUR

Furthering health care management for children less than five years old through the use of mobile phones within iCCM.

4.0 Introduction

This chapter presents and discusses the results of this study on the benefits of using iCCM as a strategy for health care management of illnesses among children less than five years. It further presents and discusses the results on the uses of informally integrating mobile phones in improving accessibility of healthcare, treatment and referral process, follow-up and adherence, supervision of CHVs and in enhancing monitoring of the movement of commodities within iCCM. This chapter is therefore divided into the following sections; Towards integration of mobile phones: A background of iCCM benefits and challenges; Further accessibility: Use of mobile phones in accessing health care; Networked spaces: Use of mobile phones in the treatment and referral process within iCCM; Improved efficacy levels: Use of mobile phones in the process of adherence and follow-up within iCCM; Circulation of data, knowledge and expertise: Use of mobile phones in the process of supervision and health promotion in iCCM and last but not least, enhancing accountability in commodity movement through the integration of mobile phones in iCCM.

4.1 Towards integration of mobile phones: A background of iCCM benefits and challenges

> Being located near the lake has made most women to be careless when it comes to taking care of the health of their children. They do not value taking their children to hospital but will instead state that "let me go first and look for money because when I go to the health facility to seek health care for my child they will ask me for money to buy the book, for the lab and I would still buy medicine because I would be told that there are no drugs." But now through the implementation of iCCM, health care has been brought near the clients. The caregivers just walk to our homesteads to seek care for their sick children. However, when they are busy, they send the older siblings to the

child or relatives to bring the sick child to me for care as they go about their daily businesses along the shores of Lake Victoria. Some parents despite proximity to care, they still never bother to bring their children to me but during my routine rounds I find the sick children at their homes and attend to their health needs (40-year-old, Female Community Health Volunteer).

The narrative above shows the peoples' views on how iCCM has improved access to health care for children less than five years. It brings out the interaction between seeking health care for children and the varied priorities in their daily lives. The narrative reveals the great benefit of iCCM within the context of Nyaguda. Nyaguda sub-location is a hard-to-reach area. This is especially in relation to health accessibility. The distance from most of the villages to the health facility is far and the terrain is also poor. Even with the implementation of iCCM whereby CHVs are being used to help the community members' access health care, they are still in-charge of 100 households which is still a large number. However, through the implementation of iCCM, the community members have ease of access to health care for their children. This is more so because through iCCM, the CHVs have been trained on how to identify and treat common childhood illnesses. The CHVs are located within the community and hence the community members need not to travel long distances within the poor terrain of Nyaguda to seek health care for their children less than five years. The above except reveals that this proximity to health care for children less than five years old has given caregivers a better opportunity to attend to their daily work routines and still have the health of their children less than five years well taken care of. According to the CHVs, caregivers would often just visit the CHVs' homesteads which are located in the vicinity and seek care for their sick children. In addition to accessibility to care, the narrative by the CHV also reveals that iCCM has also made health care for children less than five years affordable. During an informal discussion with one of the caregivers she narrated how iCCM has been helpful to them as a community.

Life has become so demanding and hence there is no time to waste. Therefore, with the implementation of iCCM in our village healthcare has been brought closer. It has made our work easier when I have to go and conduct my business early in the morning yet

the child is unwell, all I do is to send the older sibling with the child to the CHV who provides healthcare for the child and the sibling brings the child back home. The sickness of the child does not stop my day-to-day activities unless the child is in a critical condition (29-year-old, female caregiver)

In the event that a caregiver is too busy to take the child to the CHV due to other commitments, they would just ask other close family members to help them with task of taking the child to the CHV for care. Caregivers would quite often task the older siblings or relatives with that responsibility of taking the sick child to the CHV for health care management.

The above narrative by the CHV, at the same time further reveals certain challenges that the CHVs encounter during their work. For example, the CHV mentioned that despite the proximity to care, some caregivers would still not seek care for their sick children from the CHVs. This was mainly attributed to their proximity to the fish landing beaches of Lake Victoria. The caregivers would be busy going about their daily chores at the fish landing beaches instead of seeking care from the CHV for their sick child. The sick children whose caregivers did not seek heath care for the common childhood illnesses would further benefit from the routine rounds that the CHVs are mandated to make within the various households allocated to them. Therefore, the implementation of iCCM has made health care management for common childhood illnesses more accessible to the people living in the hard-to-reach area of Nyaguda sub-location. Levesque et al., (2013) defines accessibility as the identification of health care needs and seeking of health care services. Health care within iCCM is made accessible when the caregivers identify health needs and seek health care services. This accessibility to health care is also achieved when sick children less than five years old are able to obtain health care services through the routine rounds made by the CHVs.

Within the strategy of iCCM no money is needed for the healthcare needs of children less than five years. This is because the CHVs provide the caregivers with the record books, the distance to the CHVs place is near and when medications are out of stock, the CHVs refer the caregivers

to the next CHV who has the medicines or to the nearest health facility with a referral note which enhances access. However, within iCCM all these are provided for free. Therefore, other than the hospital charges being made free, transport costs due to the long distance from the health facility for most caregivers has also been addressed through the implementation of iCCM. According to Levesque et al. (2013), access to health care is the opportunity to identify health care needs, to seek health care services, to reach, to obtain or use health care services and to have the need for services fulfilled. A study carried out in Eastern Uganda demonstrated that iCCM for malaria and pneumonia increased prompt and appropriate treatment for self-reported pneumonia symptoms (Kalyango et al., 2013). iCCM in the area was therefore deemed to improve access to care. The study by Kalyango et al., (2013) focused on symptoms and treatment of malaria and pneumonia. This is despite WHO recommendations (WHO/UNICEF, 2012), that iCCM should integrate diarrhoea and identification of acute malnutrition together with the identification and treatment malaria and pneumonia which was also implemented in Nyaguda sub-location.

Integrated Community Case Management (iCCM) is credited for removing most barriers to health care access. For example, the narrative below achieved through an informal discussion with the caregiver reveals one of the ways through which iCCM has addressed the barrier of accessibility to care and increased timeliness to care.

> First of all, the health facility is far from my home and the road is also bad even if I am in a position to take a motorbike especially with a very sick child. The road to the hospital is so uncomfortable. The queues at the health facilities used to be so long and the doctor would take his sweet time with each client making the wait even longer to be seen by the doctor. I would end up wasting a lot of time which I would have used to do my other chores some of which are geared towards giving me money. Sometimes instead of going to hospital for the fear of the long queues, I would instead visit the chemist and buy medications for my child (Cases of self-care reduced and their implications). The introduction and implementation of iCCM has however now made it easier for me because when my child gets unwell, I just walk to the CHVs home which is near my homestead. The CHV attends to me as fast as possible then I can comfortably go back to my daily chores (35-year-old female caregiver).

This narrative reveals that the distance to the health facility is no longer a barrier to accessing health services for the people of Nyaguda sub-location. Health care management for children less than five years old has now been rolled out within the villages. The CHVs who are residents of the villages within the iCCM area are identified, trained and supervised and given the mandate of testing and treating children less than five years with common childhood illnesses such as malaria, malnutrition, diarrhea and pneumonia. This widens the care spaces within the community for efficient and effective management of their sick children. The health care services are efficient and effective due to their accessibility and timeliness. This is because the CHVs are located within the villages and any time of the day or night they can be visited to provide health care services for children less than five years with common childhood illnesses. Community members also get to save a lot of time which they use to go about their businesses. This is especially so if the child has not been referred to the health facility within Nyaguda sub-location. The implementation of iCCM has also ensured that children are given the appropriate care needed through the professional attention provided by the CHVs. The caregivers have the great option of choosing to see the CHVs who are even visited for care free of charge than to go to the chemists whereby they may get the child misdiagnosed and still spend money.

The study further found out that iCCM has contributed to the reduction of the previously reported high child mortality rates in the study area. This was one of the overarching themes revealed by the study during the several interviews conducted by all the stakeholders in the healthcare of children less than five years. One of the CHVs narrated during an in-depth interview that;

> Malaria used to kill children in this village. This is because most caregivers would not seek health care for their sick children and some would just buy medications from the chemists for the sick children. However, since the implementation of iCCM, the number of deaths have reduced. The number of funerals we now attend for children have greatly reduced unlike those days before iCCM when we would attend funerals for children who had died of common childhood illnesses every other day. The decline in child

deaths is evident even in our monthly reporting to the sub-county hospital (45-year-old female CHV).

Previously, as narrated by the CHV, malaria used to contribute to high child mortality rates in the area. However, with the empowerment of CHVs to test and treat malaria, a decline in death incidences has been reported. It has also been noted that the number of caregivers who would seek care from other sources of health care other than the health facility such as those who bought medications from the chemists without prescriptions had reduced. The narrative therefore reveals change in health seeking behaviours among caregivers. In one voice, the FGD conducted among the Bondo Sub-county health management team concluded that the implementation of iCCM has helped to reduce mortality rates within Nyaguda sub-location. This is due to the accessibility of quality care for their children less than five years with common childhood illnesses. The World Health Organization (WHO) and UNICEF recommended iCCM as a strategy geared towards the achievement of equity in child health care provision (UNICEF, 2012). They UNICEF (2012), further stated that iCCM as a strategy is also expected to contribute towards a sustained reduction in child mortality (UNICEF, 2012). The World Health Organization (WHO) and UNICEF (2012) further note that the implementation of iCCM is expected to improve access to health care for the underserved populations, for example, those living in hard-to-reach areas such as Nyaguda sub-location.

According to the findings of this study, it can be deduced that the implementation of iCCM has made health care for children less than five years more accessible by reducing barriers to care. These findings concur with that of Kisia et al., (2012) who found out that care provided by CHVs has the potential to reduce barriers of accessibility through the interactions with fellow community members who understand the family's situation. They further mentioned that care provided by CHVs was also available to caregivers outside normal "business hours" and more frequent follow-up also provided (Kisia et al., 2012). This study has found out that factors

noted by Chuma et al., (2010) relating to affordability, accessibility and availability that interact to influence level of access to prompt and effective malaria treatment were being addressed by the implementation of iCCM. This access to prompt and effective health care has worked towards helping to reduce morbidity and mortality rates among children less than five years.

Despite its benefits, implementation of the feasibility study of iCCM, the study revealed that the strategy is facing certain challenges which included; the need to align iCCM with a functioning health system which entails addressing the problem of stock-outs of medicines and supplies, including RDTs at primary health facilities which affected CHVs' ability to deliver services. There was also the problem of a lack of strong linkage of sick children referred to health facilities. The view of CHV-referred children as "new visits," as health facility nurses initiated the consultation process afresh resulted in a missed opportunity to underscore CHVs' role and build caregiver confidence in their skills and value. According to the implementation study findings, caregiver noncompliance with CHV referrals raises questions about the current policy of referring suspected pneumonia cases to a health facility rather than allowing trained, supervised CHVs to themselves administer antibiotics. Referral compliance was affected by health facilities' reputation for drug stock-outs, perceived lack of severity of the child's illness, and easy access to recommended (or alternative) drugs from shops in the community.

The challenges within iCCM also included, inadequate resources for SHMTs and CHEWs to carry out regular supportive supervision of CHVs can severely undermine iCCM implementation; although most CHVs enjoyed the status that providing iCCM gave them in their communities, the small size of the stipend forced them into other activities to generate income, activities that diminished the time available to provide health care services. The implementation study of iCCM also noted that guarding investments of training by sustaining

a workforce of CHVs calls for more innovative approaches to incentives; CHEWs were too few to support iCCM, and some lacked the clinical background to mentor and supervise CHVs without close supervision.

Mobile phones are being used informally within the strategy of iCCM. The integration of mobile phones though informally within iCCM has further narrowed the distance in relation to healthcare access within Nyaguda sub-location. This study revealed that within the context of Nyaguda sub-location, mobile phones are used by caregivers to call the CHV and inform him or her of the child's illness. CHVs also reported that some caregivers called them for advice on what to do when a child for instance has fever at night. This was also affirmed by most of the caregivers who reported that they would call the CHV for advice when the child was sick. One of the caregivers stated during an in-depth interview that;

> When my child is unwell, I first call the CHV to ask her for advice on what to do as I explain the problem to her. The CHV would advise me to take the child to her for check-up and this would really help me at the same time not waste time by knowing the location of the CHV and also getting good healthcare for my child (30-year-old female caregiver).

The theory of cultural ecology by Steward (1955) states that, human beings adapt to their environment through the primary mechanism of culture. The mobile phone is part of material culture that the residents of Nyaguda sub-location which is a hard-to-reach area have adopted to use to further enhance accessibility to health care. Networking being the main goal of mobile phones has improved health care access for the people of Nyaguda sub-location. This has been achieved through the resulting relationships developed while using the mobile phones. Use of mobile phones for health purposes has also been noted by Horst and Miller (2014). According to Horst and Miller (2014), mobile phones are used to link up and provide intensive social networking among kin and friends within a given socio-cultural setting. They can therefore be used to educate community health workers on proper treatment procedures and correct

treatment practices. The main goal of using mobile phones is networking, however, the resulting relationships can be used for economic aid, sexual liaisons, business contacts, psychological support and even provide better health access to the members of any society. The use of mobile phone in Nyaguda sub-location as revealed from the above narrative shows that mobile phones are key tools for acquiring real time knowledge of what needs to be done in various health situations. According to Duclos (2015), technology helps bridge the gap in knowledge through the various interactions between health professionals and their clients. This function of the mobile phone of improving interactions within the community members has brought health care even closer to the clients within the context of Nyaguda sub-location. This concurs with the assertion by Axel (2006) that, technology and material culture form the primary means by which people establish their viability given the constraints imposed upon them by their environment and the demands of social integration.

4.2 Networked spaces: Uses of mobile phones in the treatment and referral process within iCCM

Mobile phones have improved communication and coordination within iCCM though being used informally in Nyaguda sub-location. This study established their use during the process of diagnosing and the treatment of children less than five years with common childhood illnesses. The narrative below by a 40-year-old female CHV conducted during an informal discussion, revealed the use of mobile phones in the process of diagnosis and treatment within iCCM.

> Sometimes back I tested a child for malaria and found that the child had no malaria but was convulsing. I therefore called the doctor immediately notifying him of the case. The doctor asked me to refer the child to the health facility. The phone call and conversation that I made with the doctor gave the caregiver hope. This is because she knew that on arrival to the health facility she would not take long before her child is attended to. (40-year-old CHV)

The qualitative data above provides evidence that the mobile phone provides connectivity among the various stakeholders within the health sector. In this case, the mobile phone is used to show a lot of concern towards the life of the sick child through the initiative that the CHV takes to call the doctor at the nearest health facility, to explain the matter to the doctor and assure the caregiver that the doctor at the facility is aware of the case. This gives caregivers a lot of encouragement knowing that since the doctor has been informed about the child's problem they will be attended to immediately. The CHV also goes a step further in line with the iCCM rules to write a referral note that the caregiver gives to the doctor on arrival.

The mobile phone is therefore seen not only as an instrument of networking but as a motivating tool to caregivers to seek proper health care for their sick children. This in turn makes seeking care more efficient and effective. It is important to note that most of the time when the CHVs seek advice concerning the difficult scenarios from the clinical officer at the health facility they are requested to refer the patient to the health facility. However, the CHVs may also advise caregivers on the first aid to give the child which is mostly paracetamol in case of high fevers even as they refer the sick child. During an in-depth interview, one of the caregivers narrated how the CHV advised her through a phone call on what to do to the child as she prepares to take the child to hospital.

> When my child's body was so hot and the child had started convulsing, I called the CHV who advised me to give the child paracetamol and keep wiping the child with a warm damp cloth as she came to assess the child before referring us to Nyaguda health facility (33-year-old, female caregiver).

The mobile phone when used in providing healthcare advise provides protection against health-related risks. Therefore, as noted by Duclos (2015), use of mobile phones which is part of digital connectivity is closely related with access to care and protection against health–related risks. Through the use of the connectivity nature of the mobile phones among the various

stakeholders in health care and this is especially important in the hard-to-reach areas. Other studies (Aysha Z et al., 2016; Asimwe C. et al., 2011; Ngabo F. et al., 2012) have shown that simple text messages delivered through mobile phones have the potential to improve coordination and communication between health workers resulting in early case identification and timely feedback from CHVs and CHEWs. There is however, a clear indication within the context of iCCM in Nyaguda sub-location that over and above the use of text messages, the more interactive use of voice calls is key within the communication process.

The CHVs not only identify and treat children with common childhood illnesses but as earlier stated, a child may present with a sickness that needs the CHV to refer the child to the nearest health facility. This process is made easier through the use of the mobile phone especially given the ecological context and the distance to the health facility for some of the caregivers. One of the CHVs narrated through an informal discussion, an incidence where the phone was put to use informally during a referral process.

> A child had been brought to me suffering from fever and fast breathing. I tested the child for malaria but there was no malaria. I therefore had to refer the child to the health facility. Before sending the caregiver to the health facility, I called the health facility in-charge to find out if he was available. Through the use of mobile phone, the in-charge confirmed to me that he was not available at that time. I went with the caregiver to hospital and found that the in-charge was not back yet hence had to ensure that with the referral note written and handed to the caregiver she went to the nearest private health facility where the child was admitted given the severity of the illness (49-year-old female CHV).

The facility in-charge who was one of the key informants confirmed the use of the mobile phone in notifying him of a referral case and advising the CHV on the way forward.

> The CHV called me to alert me of a referral case when I was attending a meeting at the Bondo sub-county hospital. I asked the CHV to bring the child to the health facility thinking that by the time they arrive I will have come back from Bondo. However, when they arrived at the facility I had not come back and requested the CHV to ask the caregiver if she was ok with having the child referred to the nearest private facility

which the caregiver accepted and the child got treatment (Nyaguda health facility in-charge).

This study reveals the importance of the use of mobile phones in the referral process. The distance from the village of this particular CHV to the health facility is not near and the terrain is also poor, yet through the use of mobile phone they were able to get the best solution. For example, as noted from the narrative, the mobile phone was used to establish that the viable option for the caregiver to go to the nearest private health facility.

The mobile phone therefore has further enhanced spaces of care within the context of iCCM in Nyaguda sub-location. Accessing health care information to the establishment of the most appropriate action of care has been made easier through the integration of mobile phones. The people of Nyaguda sub-location have embraced the use of mobile phone to address their ecological challenges of poor terrain and long distances to health facilities. Material culture such as mobile phones is one of the mechanism by which human beings adapt to their environment. According to Dobzhansky (1972); Cohen, (1974); Kirch, (1980), culture which includes material culture is the most potent method of adaptation.

Therefore, through the use of mobile phones, networks are created, care is sought and negotiated through those networked spaces within Nyaguda from both the public and the nearest private health facility. This shows that the mobile phone helps to create new spaces of care other than the usual ways of seeking care for sick children less than five years. These new spaces of care for children less than five years provide greater access to effective and efficient health care services. According to Duclos (2015), technology such as the use of mobile phones has created new ways to show that indeed human beings matter and need timely and accessible care.

4.3 Improved Efficacy levels: Uses of mobile phones in the process of adherence and follow-up within iCCM.

Mobile phones are useful in improving treatment adherence and follow-up particularly in referral cases through the wider spaces of communication for healthcare it offers. During an in-depth interview one of the CHVs ascertained the use of mobile phone during the referral process.

> Having referred a patient to the hospital, I would call the facility in-charge to ascertain that the patient reached the hospital as opposed to walking to the health facility which is far from my community unit and I would also use that time to attend to other cases in the community (40-year-old female CHV)

This study also found out that the mobile phone was useful ascertaining that the mother or caregiver took the child to hospital for referral. This is because through the mobile phone the CHVs are able to communicate with the hospital in-charge and the caregiver in an endeavor to ensure that the child has received proper health care. Through the mobile phone, a CHV can find out from the caregiver where they went to seek treatment in case they did not find the facility in-charge at the health facility. This was noted by the CHEWs as a key aspect because incase the caregiver did not go to the recommended health facility and go to another facility, the health worker in that particular facility can also be contacted through the use of mobile phone and furnished with the necessary information. During an informal discussion one of the key informants narrated the need for communication in the whole process of referral and follow-up as an important step in iCCM.

> Some of our caregivers when referred to the main health facility which is Nyaguda health center, they find the place far from where they stay and resort to visiting a private health center near them which at times is not even within the sub-location. When they get at the hospital they give the referral form which gives the health worker attending to the child knowledge on what has been done to the child and in case they need any further clarifications they call the CHV who attended to the child (36-year-old, CHEW)

Accessibility to the health facility for referral cases is still a problem within Nyaguda sub-location. This makes the caregivers to opt for treatment from the private hospitals near them where they present the referral form that has details of the illness of the child. However, the CHVs are tasked with the follow-up of the patients they refer to the hospitals as revealed in the following narrative obtained through an informal discussion with a CHV.

> After referring a patient, I need to keep track of the sick child. I therefore, follow them up from the hospital to their homes. We establish the care they have been given and what they need to do to ensure that the child gets well completely. For example, the child I referred to the nearest private facility went back home and I had to find out the kind of care given and keep reminding the caregiver to give the medications as required until the child gets completely healed (49-year-old, female CHV).

When the caregiver has seen the doctor at the facility during a referral incidence, the doctor may call the CHV in charge of that caregiver's particular village and give the CHV instructions on how to follow-up. The doctor at the health facility may explain to the CHV what the problem was and how to better handle the case during follow-up. The CHV may also just call the caregiver and find out how they are faring on and if the child is indeed taking medications and if there is any improvement. This information concurred with that of the caregivers as narrated by one of them during an in-depth interview.

> I thank the CHVs who always check on me and find out how the child is faring on. The CHV establishes if the child has taken the correct medications through reminding me via mobile phone calls. She later comes in person to see how the child is doing
> (35 year old, female caregiver)

The above narrative reveals that the CHVs would check on caregivers with sick children once in a while physically during their normal rounds but would constantly call to remind them of giving the right dosage to the child and to find out the progress that the child is making. The mobile phone has therefore been used within the context of Nyaguda sub-location to improve the quality of health among children less than five years. During the FGDs with the caregivers and also with the CHVs this study revealed that the health system has been able to improve population health outcomes. During the FGD with the caregivers all of them concurred that;

> Through frequent reminders on when to give medications to our children especially Atermether Lumefantrine (AL) has helped relieve our children from frequent attacks of malaria (Caregivers FGD).

The CHVs FGD also revealed that

> The reminders through mobile phones among the caregivers with sick children has helped the to give the correct drug dosage at the right times and therefore addressing to a large extent the problem of reoccurrence of malaria (CHVs FGD).

Caregivers and CHVs reported that through the use of mobile phones, caregivers receive reminders on the various times to give the child medication. This was especially important with the issuing of antimalarial medications Atermether Lumefantrine (AL) which was to be given to the child eight hours after the first dose. Previously within the context of Nyaguda, caregivers failed to follow instructions but with the help of the mobile phones, the CHVs would easily contact them and remind them to give the medication at the right time. This improved the efficacy levels of the medication and helped reduce the frequent reoccurrence of malaria among children less than five years. It is noted by Steward (1955) that the primary mechanism by which human beings adapt to their environment is culture, including the application of material culture based on existing and appropriate technology at a given time period to address human problems. The CHVs have adapted to the use of mobile phones as timers to make their work easier. This is especially because the terrain within Nyaguda sub-location is poor and the distances between households are also long. Given a scenario whereby a CHV has more than one client, it is an impossible task to go to each of the households at every eight hourly timings given to ensure that medications are given. However, reaching such clients has been made possible through the use of mobile phones.

According to Horst and Miller (2014), mobile phones are used to link up and provide intensive social networking among kin and friends within a given socio-cultural setting. This study has revealed their use to educate community health workers on proper treatment procedures and

correct treatment practices. The mobile phone is being put to use within the context of Nyaguda sub-location as a networking tool in ensuring real-time communication among the different stakeholders in iCCM. This has also been noted by Duclos (2015), who discusses how technology has linked bodies, knowledge and care practices in new spatial and temporal configurations.

A study by DeSouza et al. (2014), showed that majority of respondents expressed interest in receiving medication adherence reminders for chronic illnesses. The use of reminders sent via mobile phones minimized forgetfulness which is considered a barrier to medication adherence (Vervloet et al., 2012). Such reminders have been found effective in improving medication adherence, in chronic non-communicable disease and communicable diseases such as tuberculosis and HIV infection (Horvath et al., 2012; Vervloet et al., 2011; Park et al., 2013; Nglazi et al., 2013; Rodrigues et al., 2012; Lester et al., 2010). All these studies emphasize the need of using SMS reminders to enhance adherence to medications, however, during this study it was established that the use of voice calls was more appropriate to the achievement of real time communication.

During informal discussions within the context of Nyaguda sub-location, this study revealed that, CHVs thought of using the SMS as a process that would end up taking long especially when the person being sent the message to is too busy and does not get to see the SMS until a later time. The CHVs explained that with a call, the phone mostly rings loudly and alerts the person being called immediately. Some health workers also acknowledged that there was some level of illiteracy hence calling was the best preferred method of communication. One of the CHVs during an in-depth discussion reported that;

> Writing an SMS is not easy and it does not bring out the clear picture of the matter unlike when I call and give a clear explanation and receive a clear explanation on my side. During the call, I can easily ask for clarifications where I do not understand. This makes it easier to handle cases at the community level (35-year-old, male CHV).

An exploratory study conducted in rural India revealed the preference for voice calls due to the low literacy levels among the people and among the literates with difficulty in articulating test messages (DeSouza et al., 2014). This is contrary to the second global survey on eHealth report that SMS reminders were preferred to voice calls globally (WHO, 2011). This study found out that voice calls were preferred in order to achieve real-time communication as compared to SMS which may not be read immediately and hence not responded to in time. This study has revealed how the mobile phone has been used as a means by which people in Nyaguda sub-location address certain environmental constraints such as, the rugged terrain and long distances to the health facility through use of voice calls. According to Axel (2006), technology and material culture form the primary means by which people establish their viability given the constraints imposed upon them by their environment and the demands of social integration. Every artifact the mobile phone included has two dimensions; the instrumental dimension related to the artifact's function and the secondary dimension related to its social meaning and symbolism (Binford, 1962). Therefore, other than just improving access to care, the mobile phone is also useful in establishing social relationships even as healthcare is achieved. The voice calls most of the times are not geared only to find out if adherence has been achieved but in the process the CHV is also able to find out how the caregiver and the members of the caregiver's household are faring on. During an in-depth interview, one of the caregivers stated that;

> The CHV would not just call to find out about the health of the sick child but would find out the welfare of each member of my household (35-year-old, female caregiver).

Finding out the welfare of all the household members by the CHV gives the caregivers and the community members the sense that CHVs have a genuine concern for their health and enhances

trust between the different stakeholders in iCCM. Literature shows that patients have to trust their health care professionals to work in their best interest and outcome (Hall et al., 2001). Trust in the health care professional has been suggested to be the foundation for effective treatments (Calnan & Rowe 2006; Croker et al., 2013) and fundamental for patient-centered care (Sakallaris et al., 2016).

4.4 Circulation of Data, Knowledge and Expertise: Benefits of Phone mobile use in the process of supervision and health promotion in iCCM

The study revealed that during supervision, the community health extension worker (CHEW) would call the CHV to find out and confirm on treatments that they have done and referrals that have been made. During an informal discussion on matters supervision with one of the CHVs, she narrated that;

> Through the use of mobile phones, the CHEW would just call me and most of us as the CHVs and find out how many cases of malaria or any other common childhood ailments we have treated or referred in a certain period of time. Sometimes weekly or in two weeks. This record she would use to even ask for more commodities or just to update her records ready for the Bondo sub-county health management team (45-year-old, male CHV).

The CHEWs attested to this during an FGD and stated the use of mobile phones to conduct spot-checks for instance on the number of clients who have been seen to also keep track of their work. They noted that the information was helpful in making projections for the CHEWs, and the sub-County health management team (SHMT).

> The mobile phone helps us to achieve spot-check information that is needed by the sub-county hospital. We get information on the ailments that affecting the children more and we can also track the use of commodities through the frequency of certain ailments (FGD among the CHEWs)

This study found out that through the use of mobile phones, the ailments among the children less than five years could be tracked. The CHEW also calls some of the caregivers to find out their level of satisfaction with the treatment procedures they are receiving from the CHVs. This

was confirmed by the caregivers who were very delighted when they were called by the CHEW to find out about the health of their sick children. It improves the relationships between the caregivers and the healthcare system through the actions and follow-up concerns of the Community health extension worker (CHEWs). One of the caregivers during an in-depth interview revealed this aspect of use of mobile phones.

> It really excites me when I receive a call from the CHEW just to find out how my child is doing. This encourages me that the CHEW also cares (29-year-old, caregiver).

The CHEW after having talked to the CHV and found out the children who have been treated by the particular CHV, follows the caregiver up to find out their level of satisfaction. This is usually part of supervision whereby the CHEW gets to interact with the caregivers who have previously visited the CHVs. This process helps to establish how the caregivers relate to the CHVs and vice versa in ensuring that the health needs of the children less than five years old are addressed. This shows that mobile phones have improved the interactions between the patients and health services delivery system by removing the interactive and communicative barriers to proper healthcare. This is exemplified when the CHEW is committed to physically serving the health care needs of people in a different area he or she can also address needs of other people who are far away from through the mobile phone given the vastness of the area. This interactive mode of health service delivery finds its relevance and appropriateness within such ecological settings such as Nyaguda where the vastness and topographical difficulties have posed challenges to the access and utilization of health services for under five years old children. This observation concurs with the works of Kahn et al. (2010), who noted that mobile health might help by removing physical barriers to care and service delivery. This would help to improve the weak health system management, unreliable supply systems and poor communication (Kahn et al, 2010). The study by Kahn et al. (2010), focused on the non-communicable diseases and the economic outcomes of mobile health. This study on the other

hand, provides an understanding on the context of iCCM which addresses communicable childhood illnesses such as malaria, diarrhea, pneumonia and malnutrition within the social and cultural context of populations leaving in resource limited settings with topographical challenges as is the case of Nyaguda sub-location. My study is therefore, geared towards establishing the benefits of mobile phones as material culture which has been adopted for use in the hard-to-reach area of Nyaguda sub-location. This confirms the assertion by Duclos (2015), that the use of mobile phones as a contemporary arrangement creates new spaces in which lives are cared for within contexts such as Nyaguda sub-location in Bondo sub-county, Siaya county.

The process of supervision in iCCM is also connected with the provision of health messages to community members. This was revealed during an informal discussion with one of the CHVs;

> Other than treatment and follow-up of cases, we also provide health messages. Through the use of mobile phones, we are able to remind the caregivers to ensure that their families sleep under treated mosquito nets and that they have pit latrines and dish racks among other kinds of health communication (36-year-old, female CHV).

The health messages are geared towards helping to further avert child morbidity and mortality among members in Nyaguda sub-location. This study found out that the CHVs not only offer treatment for the sick child but also engaged in health promotion activities as part of iCCM. These activities included the CHVs mandate to inspect the surrounding of the caregiver in terms of cleanliness and accessibility to common sanitary facilities. The CHV after inspecting the caregivers' surrounding advises the caregiver accordingly with frequent follow-ups to ensure that what is required to ensure the proper health of children less than five years is achieved. Such health messages include, the need for households to have toilets and structures for drying the utensils after being washed outside the house known as a "rack". They also provided advice on the use of mosquito nets, the need to drink treated or boiled water, the need

to ensure children go through the whole process of immunization among other health messages. For example, the CHVs noted reduced incidences of malaria as a result of use of mosquito nets, reduced incidences of diarrhea resulting from the members' adherence to building toilets and having the drinking water treated. This is proof of the saying that 'prevention is better than cure.' The caregivers concurred with the CHVs that indeed the health messages helped to address the preventable illnesses to some level. This was revealed during an in-depth interview by a caregiver;

> The CHVs would consistently call to confirm if I dug the pit latrine as agreed and also to find out if I built a dish rack. Eventually I did so because the pressure was so much and ever since the reoccurrence levels of diarrhea among my children have reduced (36-year-old, male caregiver)

Mobile phones have been used in creating health awareness and bringing about behavioral change (DeSouza et al., 2014). A study conducted in India by Ramachandran et al. (2013), showed that SMS has been successfully used to receive information on lifestyle modification. This has helped in lowering the incidence of diabetes in men (30-35 years of age). In a study conducted in rural India, health information is passed through passive means of text and automated voice calls. They may also use a system where people call a phone number, select the type of information they want by keying in codes for a particular topic and listen to pre-recorded information regarding that topic (DeSouza et al., 2014). In Nyaguda sub-location, the use of voice calls to pass health information was highly embraced due to the levels of illiteracy and the interactive nature of voice calls. Given the cultural context of Nyaguda sub-location, the people still believe in having a one on one touch with each other and given the terrain and the distances from one home to another the use of voice calls would be deemed appropriate for reaching out to neighbours and other networks, thus serving as an adaptive mechanism to enhance networking and in the process enhance interactive mode of health services delivery in

settings where infrastructural and topographical features pose challenges to health services delivery.

One of the key informants during an informal discussion narrated that;

> The CHVs provide healthcare to the sick children and once in a while we also check out the quality of care provided and incase the CHVs have cases of defaulters and those who refuse to adhere to the treatment regimen we also communicate and see how to visit these families and help (44-year-old, female CHEW).

Through the CHV, the CHEW can organize to meet several caregivers who have been attended to by the CHVs and find out how the children are doing since they received treatment. During supervision, the CHV may inform the CHEW when she is having a sick child to attend to and the CHEW would go along with her to see if the treatment procedures are being followed to the later to ensure that high standards of procedures are followed. The CHV may use the mobile phone to ask for assistance from the CHEW on the defaulting clients who have been having recurrent cases of for example, malaria because of not completing the set dosage of drugs. The CHEW would then find a way of helping the CHV and the client to ensure that the health of the child is not put at risk. This is mainly because supervision entails finding out even the adherence rates and therefore the necessary actions to be taken.

The mobile phone is also useful to the CHVs in finding out what to do when facing certain challenges such as when an RDT kit has no buffer or pricker. One of the CHVs narrated this experience during an informal discussion;

> When we are picking commodities from the health facility, we do not open the RDT kits packets to ascertain whether all the necessary items are in the kit. But during our work we find that some kits have either no buffer or pricker and this we can easily alert the CHEW for her knowledge and for the records. This has happened to me and the mobile phone really assisted me. I was able to call the CHEW and explain to her the issue well in advance before the next time of picking commodities (30-year-old, CHV).

The findings of this study concur with the report by Frog and UNICEF (2013), noting that with the use of the mobile phone, the community health workers receive information, ask advice, re-order life-saving drugs and receive feed-back from the otherwise distant formal health system. These findings also assert that, technology and material culture form the primary means by which people establish their viability given the constraints imposed upon them by their environment and the demands of social integration as documented by Axel (2006).

During a key informant interview one of the facility CHEW revealed that;

> There are sometimes we get impromptu need to have meeting with the CHVs especially when a certain donor has come on the ground and would like to meet them and have a discussion on the interventions they want to bring to the community. During such instances, we call the CHVs and inform them of the meeting (Facility CHEW).

The mobile phone can also be used to communicate meetings that the CHVs are supposed to have with the CHEWs or even at the sub-County offices in relation to health issues. The use of mobile phones within iCCM has therefore helped break the barriers of supervision, accessibility to information and also the health care of the children less than five years. The concept of spaces by Duclos (2015), also notes that mobile phones bring forth a connection among patients, medical practitioners, hospitals and lay people affecting the circulation of knowledge, expertise and data. This blends well with the theory of cultural ecology which argues that the use of various sociotechnical tools should be based on particular contexts where they are being put to use. For example, within the hard-to-reach area of Nyaguda sub-location the mobile phone is being put to use to help in accessibility issues especially within health care. The referral and supervision process within iCCM reveals the vital need for networking and communication for childhood illnesses. The caregivers also noted that the use of mobile phones ensured the efficiency of services through breaking the barriers of accessibility given the vastness and the rugged terrain. This usefulness of mobile phones has also been noted by Axel (2006), in his assertion that mobile phones are helpful in communicating and networking. This

kind of communication in ensuring good health for the child as envisaged in the context of

Nyaguda sub-location reveals the interactive nature in the informal use of the mobile phone.

This is in contrast to the study by Mechael (2009), which advocated for the need to further

identify the informal uses of mobile phones within the health system. The study by Mechael

(2009) informed this study, however, the current study provides a deeper insight into the

interactive use of mobile phones within the context of iCCM.

4.5   Enhancing accountability in the movement of commodities through the integration of mobile phones in iCCM

Findings from this study have shown how the use of mobile phones has improved

accountability in the movement of commodities for health services. This is exemplified by the

quotation below achieved through an informal discussion, in which the CHV described how

the mobile phone is used to monitor commodities and therefore aid in their day-to-day planning

of work.

> The CHEW can call to find out from the last time I went to pick commodities, how many
> children I have seen and how much of the commodities I have used as I mention the
> various cases I have encountered within my rounds of work (37-year-old CHV).

The CHEW uses the mobile phone to establish how commodities are being used even before

the official meeting when the CHVs come with their data on use of commodities. During a key

informant interview, one of the CHEWs also confirmed the benefits of using mobile phone to

get information on the commodity.

> The use of mobile phones has come in handy for us given the vastness of the area under
> my care as a CHEW. There are at times when the sub-county team would want to know
> which commodities are available and those not available. They may also inquire about
> the number of commodities that have expired. All these inquiries are to ensure that
> lobbying of commodities at the Government level is done in good time to help avert
> commodity stock-outs (42-year-old, Community CHEW).

The prior information helps not only the CHEW but also the sub-county team to plan and even

foresee how much commodities need to be sought for different facilities. There is usually a

70

problem with stock out of commodities from the facilities hence need to source for some commodities such as RDT kits from various facilities within the sub-county hospitals and health centers to help in the implementation of iCCM. In Nyaguda sub-location, there are two CHEWs, one in-charge of the community and the other in-charge of the facility. This puts the bulk of the community work, iCCM included to the community CHEW. Given the vastness of the area, the process of supply and monitoring commodities has been made much easier through the use of mobile phones as explained by one of the CHVs below through an in-depth interview;

> Before going to the facility to pick commodities, I usually call the CHEW to inquire if the commodities are available instead of just going before calling. This is because, there are times when I have gone to pick commodities only to be told that they are out of stock. This is after having spent resources like money for transport and time which I would have otherwise used to attend to other personal or community chores (36-year old, male CHV).

Given the hard-to-reach context of Nyaguda sub-location, it is evident that mobile phones are being used to save on resources such as time and money for transport when it comes to supply and monitoring of commodities. Mobile phones are therefore used to bridge the gap in the process of providing care. The CHVs are to plan their work and achieve their various goals which is made easier through the use of mobile phone given the ecological context of Nyaguda sub-location. The CHV having ascertained that the commodities and the CHEW they can plan to visit the facility at a particular time that has been agreed upon and pick the commodities.

The strategy within Nyaguda sub-location is to integrate iCCM into the national health system. This is to ensure sustainability if the programme. According to Rasanathan K et al (2014), without such integration of iCCM with the national health system there will be persistent obstacles. These obstacles include; supply of commodities, sustaining funding, providing adequate supervision, scaling up implementation and monitoring outcomes. However, with the integration of iCCM within the national health system, there are incidences of commodity stock

outs which affect the smooth flow of iCCM as a strategy. The ecological context of Nyaguda sub-location prompts the need to use mobile phones to contact the CHEW and establish the availability of commodities by the CHVs before they go to the facility. During a key informant interview one of the CHEWs narrated that;

> There are times when a CHV has called and alerted us that she is running out of some commodities like AL (malaria medications). This information at times finds when at the facility we are also waiting for the supply of the medications. The mobile phone comes in handy in informing the CHV to go ask for some stock from the neighbouring CHV given that we can call the neighbouring CHV and establish the availability of the commodity. This has really worked to ensure that the clients do not suffer even as we keep working on ensuring that supplies are availed to us (40-year-old, male CHEW).

The borrowing of commodities or sending the client to the next CHV with commodities was also confirmed by a caregiver during an in-depth interview.

> There is a time when my child was unwell and needed AL but the CHV did not have stock of the AL. The CHV therefore contacted the CHEW who contacted the nearby CHV and told her to lend the CHV who was treating my child some AL to be given to my child (24-year-old female, caregiver).

Enhanced mobility of medical supplies is one of the significant features of the use of mobile phones in iCCM. The above incidence reveals that caregivers received satisfying attention from the CHVs. This is because the CHVs ensure that they do whatever they can to ensure that care is provided to the sick child. The above verbatim quotations indicate that the application of material culture based on technology at a given time period helps to address human problems. Given the hard-to-reach context of Nyaguda sub-location, the mobile phone is being used to ensure proper flow of information regarding the availability, supply and monitoring of iCCM commodities. Therefore, the mobile phone has offered more spaces for care through the interactions of care via use of mobile phones to address the aspects of commodity supply. When there is frequent flow of commodity, the members of the community do not suffer but receive real-time care.

The mobile phone can also be used to provide a report to the CHEW on the usage of commodities especially data for the invalid commodities. This was revealed during an informal discussion by one of CHVs.

> There are certain times that after picking commodities and having started to use them, I realize that some RDT kits are missing certain components such as buffer or the needle which makes the commodity invalid or some medications that we may receive are usually about to expire. This makes it necessary to advise that CHEW so that she may advise further on how such commodities can be replaced.
>
> <div align="right">(46-year-old female CHV).</div>

The mobile phone comes in handy to the CHV especially when they receive commodities and realize that some invalid while putting them to use. Invalid commodities may eventually affect the activities of the CHVs if not accounted for immediately. Therefore, the CHVs can quickly contact the CHEW and give that information in real time so that even during the time of accounting for the commodities they can remind the CHEW that they had earlier communicated. This works in ensuring transparency and accounting for the commodities. Another CHV also narrated during an in-depth interviews an incident whereby she had received an invalid commodity;

> There is one time I received a set of RDTs and during one of my testing for malaria, I realized that the RDT kit had no buffer making the kit invalid. I immediately called the CHEW and notified her of the problem which she noted and during returns she remembered not to count it among the RDT kits that had been given to me. The notification through the mobile phone helped me avoid making questions among my colleagues when we went to pick commodities which can be shameful and hard to explain at the moment for me but it also saves a lot of time (49-year-old, male CHV).

The CHV can also use the phone to notify the CHEW or facility in-charge when they have many drugs in stock that are about to expire and receive the appropriate advice of what needs to be done. This was confirmed through an in-depth interview with one of the CHEWs.

> The mobile phone has been helpful in the monitoring of commodities. For example, a CHV would be having stocks that are nearly expiring. Since we have advised them to report such cases, they do not wait until the time of picking commodities but they use the mobile phone to alert us earlier. This helps us to pick the commodities in time and take them back to the sub-county hospital for use where there is greater need and faster use before the commodities expire (42-year-old, Female community CHEW).

The importance of reporting and surrendering commodities that are nearly expiring or have expired was also emphasized by the SHMT in charge of commodities at the sub-county during a key informant interview.

> It is important that we receive the commodities that are about to expire or expired so that we take the necessary steps to ensure the safety of the community members.
>   (Sub-county Health Management Team member in-charge of commodities).

A study conducted in rural Malawi reported that CHVs used SMS to report supply shortages, sent texts to obtain or communicate general information and information about patients with emergencies (Lemay et al., 2012). However, this study conducted in Malawi only embraced the use of SMS. The informal use of mobile phone in this study has therefore been of great benefit in the monitoring of commodities and especially not only through text messaging but also through use of voice calls. The use of voice calls provides real time information whereby there is no delay in getting feedback to any information relayed. This is unlike when it is only the use of SMS being employed. The study conducted in Rural Malawi by Lemay et al. (2012), remained yet to document whether SMS actually reduced the incidence of supply stock outs or patient referrals. This thesis on the other hand, discusses how the health workers applied both the use of SMS and voice calls to report shortage or any other issues affecting them in terms of commodities. Thus, the findings of this study reveal that commodities were availed by the Government to the CHVs in good time and only failed to do so in the event of commodity stock-out.

Information presented in this chapter has shown that iCCM has benefits as well as challenges. Some of the benefits within iCCM include, accessibility to basic health care for children less than five years and reduced workload at the facility level. However, the challenge of accessibility at some level still remained and is being addressed through the informal use of mobile phones. The informal use of mobile phones within the hard-to-reach area of Nyaguda

sub-location has helped improve and open up new spaces for care. Health care for children less than five years in Nyaguda sub-location has been made not only accessible but prompt through the use of mobile phones. For example, when a caregiver calls the CHV to inform him or her of a child's illness. This prompts quick response from the CHV. The mobile phone has been put to use during follow-up of the patient after care before getting time to physically visit the patient. The mobile phones are also used to seek the way forward in cases that prove confusing to the CHVs during testing and treatment of the sick children. The mobile phone within this context has been proved to be effective in finding out and alerting the doctor at the health facility about a referral case to ensure proper preparation for emergencies. The mobile phone also comes in handy in the aspect of monitoring commodities and assisting to ensure that reports are prepared in good time. Timely reporting and sourcing of commodities will ensure accessibility, efficiency and effective management of children less than five with common childhood illnesses. The discussions in this chapter has therefore shown that the use of mobile phones within iCCM will greatly enhance proper and timely care for children less than five years old with common childhood illnesses.

CHAPTER FIVE

Envisaging new spaces for Care: A health workers' perception

5.0 Introduction

This chapter presents and discusses the views of health workers regarding the informal integration of mobile phones within the health intervention of iCCM. It explains the views of health workers within the aspects of iCCM and include; referral and follow-up of patients, supervision of health workers, monitoring of commodities and passing on of health information. The chapter further discusses the health workers' perceptions on the best functions of mobile phones within the context of Nyaguda and the number of times to be contacted through mobile phones. It also explores health workers' views on the motivating aspect of mobile phones and the role of mobile phones in expanding the options for health care management of children less than five years. This chapter will therefore be divided into the following sections; establishing relations, prompt health care, connectivity in monitoring commodities, a better community through provision of health information, calling or texting: Which way for integration of mobile phone in iCCM, information real-time supervision, the mobile phone as an incentive to work.

5.1 Establishing Relations: Health workers' views on integration of mobile phones during follow-up

Community Health Volunteers (CHVs) perceived the use of mobile phone to be a beneficial tool for their work. They stated that mobile phones are of great benefit during follow-ups not only to find out about the health of the sick under-five child but to also establish the health status of the other family members. One of the Community health volunteers during an informal discussion stated that;

During my consultations with the caregiver of the sick child I will first and foremost establish and find out how the caregiver is faring on and the health of her family members before I embark to finding out how the child who is under treatment is faring on with the medications and if there is any improvement or any concern in the health of the child (42-year-old, female CHV).

The cultural context of Nyaguda sub-location is geared towards ensuring community unity and solidarity. This is because the rural setting of Nyaguda sub-location still fosters oneness and togetherness where members are concerned about the welfare of each other. Therefore, when a CHV calls the caregiver to find out how the sick child who received healthcare management is doing, the CHV will go ahead and ask about the health of the other family members. This culture has helped the CHVs to establish the health of all the family members and not the health of the sick child alone. This opens us more spaces of care for all family members because if another member is unwell, the CHV can still give guidance and encouragement to the member to seek health care. Human cultures have adapted their technologies to suit their environment, and these culture's use of resources have led to changes in the physical and biological characteristics of their surroundings as well as modifying behavior on a range of issues that affect human lives (Steward, 1955). The CHVs use the mobile phone as an important tool used to establish relations despite the physical environment of Nyaguda sub-location which is a hard-to-reach-area. This is because it is used to extend care even to the other members of the household who may not be feeling well yet have not sought for health care. The conversation between the CHV and the caregiver will help the CHV know if there is a health problem that needs to be addressed. The above narration shows how the mobile phone helps to navigate the aspects of care to the entire household members and not just to the sick child who had received healthcare. These interactions between the CHV and the family members help to open up spaces of care for the family members. This is through the CHV having received the message that there is a sick person in the family, the CHV will take the next important step and visit the

family to ascertain problem and provide that appropriate care needed. The mobile phone is used to help provide information yet at the same time still reinforcing the existing relations.

The mobile phones are viewed as important tools because when the caregiver had seen the doctor and received treatment. The CHVs would get feed-back from the doctor on what the child was suffering from and the steps that have been taken and what needs to be done when the caregiver gets back to the community. This strategy therefore forms different layers of health care management within the expanded spaces of care and enhances the effectiveness of the existing healthcare system. In the event that the doctor does not call, the CHV would call either the doctor at the facility or the caregiver and establish the way forward in helping the child towards achieving proper care and eventually good health. This is exemplified through a narration achieved through an in-depth interview by one of the CHVs;

> It helps me to confirm whether the caregiver whom I referred arrived at the health facility before the caregiver even returns the referral form with specific instructions from the facility in-charge on how follow-up is to be done (35-year-old, female CHV).

During a key informant interview the facility in-charge also confirmed the importance of the mobile phone during the various processes of care among the sick children who had been referred to him.

> In cases of referral after treating the sick child other than filling in the referral form to explain to the CHV on the steps of care given we also give the CHVs a call to follow-up on the cases given the different attentions to be given for different cases. This makes them understand better the role that they need to play during follow-up of different cases (Nyaguda Health facility in-charge)

The mobile phone has created new spaces in which lives are cared for through providing the necessary connections among the various stakeholders in the healthcare of children less than five years. For example, the above narratives show that it is through the use of mobile phones that the patients get connected with the CHV. The CHV then connects the clients with the facility in-charge especially for cases that she cannot handle and hence has to refer. The patient

after receiving treatment most of the time communicates via the mobile phone with the CHV explaining the directions given by the facility in-charge. This is unlike the physical follow-up whereby the CHV would at times be needed to accompany the caregiver with the sick child to hospital then follow-up the client all through the treatment process physically. The integration of mobile phones within iCCM has met the expectations of rendering distance meaningless and breaking down barriers to the provision of health care as also noted by Mort, May and Williams (2003); Bashshur and Shannon (2009). The mobile phone is put to use within iCCM to ensure the CHV receives feedback from the facility in-charge concerning the health care that has been given to the patient. It is viewed as an important tool used to further ensure that the CHV is well furnished with guidelines on how to follow-up on the patient. The networking function of the mobile phones, therefore, helps in distributing knowledge towards ensuring that the relations between various stakeholders in healthcare are reinforced. This is in ensuring that the health care of children less than five years is well managed. Studies assessed the use of mHealth tools to reach geographically dispersed CHVs with accurate and timely clinical information, shared through multimedia formats Florez-Arango et al. (2011); Lemay et al (2011). These studies however, focused on the use of multimedia formats yet this study focused on the use of basic phones that are accessible to the CHVs.

Through communication via the mobile phone, the CHV knows which commodities to carry for treatment. During the FGD conducted among the CHVs they all concurred that the mobile phone is very beneficial to them in terms of knowing which commodities to carry in their field work for each day.

> The mobile phone has indeed made our work easier in terms of knowing which commodities to carry to the field. We would receive calls from the various caregivers alerting us on the various ailments that their children are suffering from and hence making it easier for us to know which areas within the community unit to start visiting and which drugs and equipment to carry (Focus Group Discussion among the CHVs).

The mobile phone allows the CHVs to know in advance the symptoms that the child is suffering from and take with them only the needed equipment instead of carrying too much that is not necessary. The mobile phone has made work more convenient for the CHVs. For example, the CHVs would select the necessary commodities for a particular problem mentioned by the caregiver, instead of carrying all the commodities which can be very heavy. This is especially given that the distances between one household to another are usually long. For example, a caregiver may call and inform the CHV that the child has been having fever and no coughs prompting the CHV to just carry the Rapid Diagnostic Kit (RDT) for malaria, Artemether Lumefantrine (AL) and paracetamol. This was explained by one of the CHVs;

> The process of going out to offer treatment to the community members has made work easier for the CHVs through the use of mobile phone. This is because the caregivers with sick children would call the CHVs first and explain the illness of the child which guides the CHV on which equipment to carry to that particular household instead of carrying all the commodities which are usually heavy for all their visits (48-year-old, female CHV).

Connectivity through the use of mobile phones has lessened the burden of healthcare management for the CHV. The mobile phones have reshaped and reordered the lives of the CHV and generally the lives of the people of Nyaguda sub-location. This view concurs with the notion by Schillmeier and Domènech (2010), who state that technological and scientific innovations associated with solving the 'problem of care' are expected to produce societal transformations. Schillmeier and Domènech (2010), further mention that technological and scientific innovations question and alter common social relationships. They also evoke and stabilize, a new ordering of everyday life. Therefore, the use of mobile phone though still at the informal level in Nyaguda sub-location has induced considerable reconfiguration and intermingling of the community members' private and public spatial arrangements. New care and care systems technologies, such as telecare (Percival and Hanson, 2006), shape and reshape the practices and spatialities of care (Milligan 2001; Poland, Lehoux, Holmes and Andrews,

2005). The informal use of mobile technology within Nyaguda sub-location has indeed shaped and reshaped practices and opened spaces of care due to the open communication among all the stakeholders of healthcare.

Evidence from this study also shows that through the interactive nature of calling, the health workers and especially the CHEWs and the hospital personnel would immediately confirm cases and episodes of illnesses. For example, in case of new cases of illnesses, there can be a quick consultation on how best to address the issue before it gets out of hand. One of the CHV during an informal discussion reported that;

> There was a period when diarrhea cases were too many in my area. Having the mobile phone, I just called the CHEW who came immediately with the facility health officer to help identify and deal with the problem. The problem was solved in good time and health information passed on to the community members on the importance of having pit latrines in their homes, need to boil or treat drinking water and the benefits of hand washing before eating and after visiting the toilet (52-year-old, male CHV).

The use of mobile phones has been beneficial in addressing emergent cases of illnesses among children less than five years old. The key health stakeholders would interact through the use of mobile phones and ensure that despite the emergent illnesses compliance to guidelines and standards are still followed. This is to ensure that healthcare is provided efficiently and effectively. This concurs with a study conducted by Jones et al. (2012), who noted that mHealth tools have been used to ensure CHV compliance to standards and guidelines for health services in the field, most prominently through decision support, and alert and reminder tools. For example, a study using text messaging to improve outpatient malaria care in 107 government health facilities in Kenya led to improvements in drug management both immediately after the intervention, and six months post-intervention (Jones, 2012). In the next section, I further at the views of the health workers in ensuring the promptness in health care management for children less than five years.

5.2 Prompt Health Care: Health workers' views on the use of mobile phones during the referral process

Evidence in this study has shown that the mobile phone been beneficial since it has expanded the options of the health workers especially through the use of voice calls which help address an issue immediately. For example, during an informal discussion, one of the caregivers mentioned that the mobile phone has made it easier to know exactly where the CHV is and even explain the problem through the phone and are advised on the first aid to give the child as they rush to seek care from the caregiver. A caregiver stated that;

> The mobile phone has brought healthcare for our children even closer after the introduction of iCCM. There is a time when my child had fever at night and the CHV advised me to wipe the child with a cloth put in warm water to help reduce the fever as she was on her way coming to attend to my child. This really helped me to relax and know that my child is going to be ok (21-year-old female caregiver).

The mobile phone acts in such a way to reassure the caregivers whenever they have a sick child. This is due to the quick and easy communication that they have with the CHV when a child is unwell. The guidance they receive even before the CHV arrives to examine and manage the illness is very important because it helps the caregiver calm down knowing that following that direction the child will be well. The mobile phone therefore provided real-time information through the function of voice calls. Mobile tools can enable real-time quality review and analysis for decision-making (Phillips et al., 2010), as well as rapid response to cited health issues (Jennings et al., 2013). This study concurs with the findings of the study by Phillips et al., (2010) and Jennings et al., (2013), however, the focus of this study was mainly on the integration of the basic mobile phone as compared to the mobile technologies that was the focus of the studies by Phillips et al, 2010 and Jennings et al. (2013).

The CHVs treasured the use of phones during the referral process. This is because they would ascertain whether the doctor was available before sending the caregiver to the health facility. In case the doctor was not available physically at the facility, he would advise through the phone which facility they would refer the caregiver to go to and receive treatment. An informal discussion was conducted with a CHV who narrated her experience during the referral process as follows;

> When a mother comes to me with a severely sick child and I tell her that she needs to go for a referral to the health facility, the first reaction is that of shock because she imagines the hurdles that come with it. For example, some of them think of the queues, the possibility of not finding the in-charge of the facility due to him having to attend to other duties. However, at that moment of shock and despair, I take and use my mobile phone to contact the in-charge of the facility alerting him of the case at hand even as I write a referral form that will further make it easier for the caregiver to be attended to with urgency. This gesture really makes the caregiver get alive again in terms of her child receiving proper and prompt care (45-year-old female CHV).

The nature of connectedness provided for by the mobile phone helps to ensure that caregivers get the most appropriate treatment in good time. The phone calls made by the various health stakeholders help reassure the client that the best healthcare will be accorded to the sick child. Therefore, the kind of networking that goes on among stakeholders help to create new spaces of care even before the client gets to see the doctor that they have been referred to. A systematic review conducted by Agarwal et al. (2015), also noted that the mobile phone facilitated referrals through two-way communication and calls made prior to transfer.

This was confirmed by a caregiver who narrated during an in-depth interview that;

> There was a time when my child was severely ill and needed a higher level of care at the Bondo sub-county hospital. The CHV having observed the child immediately notified the CHEW who called the sub-county hospital casualty section and told them about my case. When I arrived at the sub-county hospital, I was amazed at how fast I was received and my child was given prompt health care and in no time I was settled in my heart that my child's wellbeing is in the hands of the doctors who treated him and within a few days we were discharged. The mobile phone helped ensure the connections were made faster (32-year-old female caregiver).

The mobile phone ensures connectedness and creation of new spaces of care; given the distance from the village to the health facility the mobile phone as a material culture has been used to make healthcare communication and access easier and prompt.

The mobile phones have also been helpful in ensuring adherence to drug regimen. For example, the CHV would ensure that they reminded caregivers to give medication on time to the sick child especially in the case of malaria medications which needed to be taken 8hours after the start doze. The CHV would also remind the caregiver to discard the oral rehydration salts solution after a certain number of hours so that the child receives only that which is effective for their quick recovery and good health. The mobile phone according to the CHVs will help ensure that they know at every point in time what exactly is happening to the child. It therefore helps the CHVs establish whether the child is improving or not. A CHV during an informal discussion narrated her experience with a caregiver whose child had been diagnosed with malaria;

> Within my community unit (CU), there was a child who had malaria so often even after treatment. This made me be concerned about how the medication was being given after having advised her to get the child a mosquito net which she also did. After the start doze, I called her after eight hours to remind her to give the child the second doze and I continued like that until the last doze was given. In between the making of calls for follow-up, I also visited her on the second day of treatment just to confirm that she was giving the medication. From that time, the child has not been unwell with malaria for the last 4 months and even as we speak now the child is well (39-year-old, male CHV).

Another CHV during an in-depth interview narrated that;

> The first follow-up of a client I would do it physically and when I establish that the child is faring on well, I would now conduct the subsequent follow-ups through the phone unless the caregiver alerts me of a problem. However, after the child has completed treatment, I would mostly again visit the caregiver physically to establish that the child is well and out of any health danger (43-year-old female CHV).

During the fieldwork, I also interacted with a CHV who narrated during an in-depth interview how the mobile phone helped her ensure that the correct dosage of ORS was given to a child

with diarrhea and that the ORS was discarded at the right time and a new solution made for the sick child to take. The CHV narrated thus;

> I once had a client with whom the phone helped me out during follow-up and i just visited her once during the 3 treatment days of taking the ORS. I gave her instructions on how to constitute the ORS and made for her the first solution. She was to make the subsequent solutions for the child to take which she did. This I confirmed by calling her and reminding her to discard the first solution and make a fresh solution. When I visited her one of the days in the morning, I found her preparing the solution the way I had directed her. This gave me confidence that the child was receiving the correct dosage and treatment (33-year-old female CHV).

The mobile phone helps in ensuring that there is communication among the various healthcare stakeholders to ensure prompt and effective healthcare provision for children less than five years in Nyaguda sub-location. A number of descriptive studies have suggested that mHealth tools aid in improving communication between different levels of the healthcare system (DeRenzi et al., 2012; Chib et al., 2008; Barrington et al., 2010; Chaiyachati et al., 2013; Githinji et al., 2013; Lemay et al., 2012) and improve emergency health referrals (Ngabo et al., 2012; Lund et al., 2012; Macleod et al., 2012; Manda and Herstad, 2010; Cole-Ceesay et al., 2010). A study in Gambia connected CHVs and TBAs to a hospital by providing them with mobile phones. In case of an emergency involving a pregnant woman or a young child, the Female Health Worker (FHW) can contact the ambulance driver and the maternity ward at the hospital (Cole-Ceesay et al., 2010). Cole-Ceesay et al. (2010), further note that the use of mobile phones to create this 'emergency chain of care' ranges from simply providing the FHW with a mobile phone so that she is able to arrange emergency services, to a far more sophisticated system where the FHW-generated community-data are linked with the facility-level data, and any patient alerts are automated. The current study focused on children less than five years old with common childhood illnesses within an area where there has been the implementation of iCCM and how the informal use of basic mobile phones has helped improve prompt care.

The mobile phone is also deemed helpful in contacting each other for help in case of an emergency or when a CHV is held up with other duties. This was exemplified through an informal discussion held with one of the CHVs;

> The mobile phone has really helped me in cases of emergency especially on my side. I do not need to worry when I am away for some reason from my community unit (CU). This is especially during the days when I have to attend functions such as funerals. There was a time when a client came to my home for treatment yet I was on my way out of the village to attend to a personal problem. Instead of sending away the client, I called my neighboring CHV and asked her to kindly assist the client on my behalf which she agreed to do. I therefore politely asked the client to go to that CHV as I attended to the personal issue that needed my attention. The client was relieved having heard me having the conversation with the other CHV (40-year-old, female CHV).

Connections among the CHVs were strengthened, a sense of community support and friendship are reinforced through interactions through mobile phones. The mobile phone has connected the world in ensuring that through relevant managerial stakeholders, healthcare policies are implemented so that all children receive proper and prompt care despite the challenges of culture. This was experienced by one of the CHVs who narrated that during an informal discussion;

> There was a case I encountered of a mother who said that she was saved and did not believe in seeking treatment from the health facility yet the child was severely sick. However, through the use of the mobile phone I contacted the health facility and narrated the case to the in-charge who notified the chief and the chief came to my village accompanied me to the home of this particular caregiver who was notified that it was illegal to keep the sick child in the house without medical care hence the mother was asked to either cooperate by taking the sick child for treatment or face the rule of the law. The caregiver noting the seriousness of the matter and through the presence of authority, she cooperated and the child eventually received proper healthcare. This was made possible through connections via mobile phone (49-year-old female CHV).

The use of the basic mobile phone is perceived to be a helpful material culture that ensures connections are made towards ensuring proper care for the sick children less than five years. Similarly, the k4Health project in Malawi introduced an SMS text-messaging network to improve the exchange and use of reproductive health and HIV/AIDS information among CHVs

(Medhi et al., 2012). After an 18-month pilot period, the authors found that CHVs who used the text-message network were more likely to contact supervisors for clinical support from the field. The authors argue that timely exchange of information led to improved quality of care, particularly in cases of obstetric emergency (Medhi et al., 2012). The study conducted in Malawi shed more light on the use of mobile phones in reproductive health. The current study however provides information within the context of iCCM in Nyaguda sub-location. The next section addresses views of health workers during their use of mobile phones in the monitoring of commodities.

5.3 Health workers' views on the integration of mobile phones in monitoring commodities and provision of Health Information

Mobile phones are perceived to be tools used to make life easier through their nature of ensuring connectedness. This for example was shown through an informal narration by one of the CHVs;

> When I am running out of commodities yet I am busy with other chores that tie me to the village, I would call the neighbouring CHV and find out if she is going to the health facility, if she is going I would request her to pick for me the commodities that I need and in turn call the CHEW informing her of my commitments at the community and of my communication with the neighbouring CHV to pick for me commodities (38-year-old female CHV).

CHVs are able to attend to their important chores in their day-to-day life and at the same time not miss out on ensuring they are well equipped to serve the community. This is made possible through the use of mobile phone that has helped ensure connectedness. On the other hand, some CHVs noted the mobile phone has been helpful in establishing the availability of the CHEW to offer the necessary commodities. This is since the CHEW is committed to work on a vast area. This view was narrated by one of the CHVs during an informal discussion stating that;

> I would be going to the facility to seek commodities yet the CHEW in-charge of distributing the commodities is not at the facility. Through the use of mobile phone, I am able to save resources such as time and money by first ascertaining the availability

of the CHEW and if indeed even the commodities that I need are available at the health facility. (45-year-old, Female CHV)

Connectedness through the use of the mobile phone has helped the CHVs to save on resources especially transport costs and time. This is through first ascertaining the availability of commodities and the CHEW or in-charge who is responsible for distribution of commodities. Mobile phone use was perceived by CHVs as important because it ensured that there was an improvement in medicine supply chain management.

The mobile phone is also perceived as a beneficial material culture because of its use in clarifying necessary information on commodities that may have otherwise been not clear at the beginning. This is especially information passed on among the staff at the sub-county hospital, the CHEWs and the CHVs. A male CHV during an in-depth interview mentioned that;

> The mobile phone is very helpful to me because if we were having a session as CHVs where information was being passed on to us yet by the time I reach home I may have forgotten some or part of the information, I can just comfortably call the CHEW and ask for further clarifications. This is more convenient unlike when there are no mobile phones and we need to walk back to the health facility to obtain clarifications on information about the use of certain commodities (48-year-old, male CHV).

The informal use of mobile phone is viewed by the CHVs as a tool that has helped break the barriers of distance and create new spatial and temporal configurations in healthcare. This is because the CHVs can work within comfortable spaces at all times and ensure that children less than five years with common childhood illnesses in Nyaguda sub-location are receiving the necessary services in health care. A study conducted by Githinji et al. (2013), reported that district managers accessed the mHealth system an average of eight times a week to monitor drug stock levels and responded to 44–73% of the stock-out signals by redistributing the commodities between different facilities. This study by Githinji et al. (2013), also revealed that the Kenyan Division of Malaria Control (DOMC) used incentives to optimize reliable measurement of facility stock-outs for which non-responses higher than 10% were deemed

unsatisfactory and likely to introduce a substantial reporting bias. Unlike the current study where the CHVs used their mobile phones informally without any incentives offered to them. A review by Agarwal et al. (2015), noted that establishing call-in services for each health facility could also allow community health workers to receive updated information on drug stocks, attendance records, and other relevant information. This current study established from the CHVs perspective that the use of mobile phone helped to deal with the problem of commodity stock outs especially if the commodities had been supplied from the government level. The review by Agarwal et al. (2015), however focused on the call-in services while the focus of this study was on using the interactive features of the basic mobile phone informally to help address the issues of commodity stock-out and information.

The mobile phone was also viewed as an important tool in passing on of health messages to the caregivers. The CHVs mentioned that during their iCCM training emphasis was not just on treating the sick children but more on passing on of health messages to the community members. One of the CHVs during an informal discussion narrated his experience of using the mobile phone to emphasize on the health messages;

> When I receive a caregiver whose child has diarrhea, I advise the caregiver on the need for proper hygiene and cleanliness, the need for digging a pit latrine and boiling or treating drinking water and the need to ensure that the child receive proper hydration through receiving enough oral rehydration salts (ORS) and the need to have the child take zinc to help stop the diarrhea. This is in addition to offering treatment for the illness (40-year-old female CHV).

One of the CHEWs (KII) during a key informant interview also confirmed how the mobile phone has been helpful in transmitting health education to the community members. She narrated thus:

> Most of the time we get to remind the CHVs on the need to ensure they call their clients and remind them to ensure that their children sleep under mosquito nets, the need to

keep their surroundings clean and the importance of having a pit latrine and a dish rack for drying dishes after washing (42-year-old community CHEW).

A study by Jones et al. (2013), in Kenya revealed that SMS text messaging was enthusiastically received by the participants, the content on malaria was also perceived to be a useful active reminder of best practice. The current study goes beyond the study by Jones et al. (2013), by examining the use of mobile phones on the other common childhood illnesses such as diarrhea, pneumonia and malnutrition.

A study conducted by Wairuingi and Underdahl (2009), revealed that through SMS with community members and community health workers, mHealth has opportunities to communicate health messages directly and simultaneously. The SMS were used in campaigns for health education, promotion, and awareness. The SMS were typically used to disseminate health information and prevention messaging or direct patients to services. This study however, found out that within the context of iCCM in Nyaguda sub-location, the CHVs not only used SMS to communicate such messages but also incorporated the interactive use of mobile phone through voice calls to offer the necessary health messages.

Most CHVs preferred the use of voice calls while using the mobile phones during communication. One of the CHVs narrated during an in-depth interview that;

> Calling is my preferred way of communicating using the mobile phone for example, there was a time I had a client who was not getting better even after having received medications. Immediately I noticed that, I called the health facility officer in-charge to establish way forward for the child who has been treated and yet during follow-up the child is not showing any signs of recovery but the ailment is getting even more complicated (50-year-old male CHV).

The number of times for the CHVs to be called by the caregivers and other health care stakeholders was thought by most CHVs to be any time there is need to do so. It depended on the number of cases on the ground or the number of rounds conducted by the CHEW during

supervision. Some of the CHVs reported that they only appreciated to be called when need be and not at all times because they had other chores to attend to. This was brought out during an in-depth interview by one of the CHVs;

> I prefer being called for supervision from 10am to night time. I switch on my phone at 10am because I am a fisherman who goes to the lake from 6am to 10am (35-year-old, male CHV)

The mobile phone has expanded the options of the health workers especially through the use of voice calls which enables real-time communication whereby two-way interactions are made possible. For example, one of the caregivers mentioned that the mobile phone has made it easier to know exactly where the CHV is and even explain the problem through the phone. The caregivers are advised on the first aid to give the child as they rush to seek care from the caregiver. A caregiver stated during an in-depth interview that;

> The mobile phone has brought healthcare for our children even closer after the introduction of iCCM. There is a time when my child had fever at night and the caregiver advised me to wipe the child with a cloth put in warm water to help reduce the fever as she was on her way coming to attend to my child. This really helped me to relax and know that my child is going to be ok (30-year-old female caregiver).

A significant number of CHVs thought of using the SMS as a process that would end up taking long to address common child health illnesses. One of the CHVs whose narration was reiterated by most of the other CHVs mentioned during an in-depth interview that;

> I do not prefer the use of SMS because most of the time the person I am sending to the message is too busy and does not get to see the SMS until a later time. However, when I make a call, the phone mostly rings loudly and alerts the person being called immediately (48-year-old male CHV).

A study conducted in India revealed that messages sent through the use of mobile technology were viewed by health workers as important since they came from an expert (Treatman & Lesh, 2012). In Tanzania, a study by DeRenzi et al. (2012), showed that messages sent via mobile technology focused on reinforcing timely home visits by CHVs. The study also revealed that CHVs had considerable enthusiasm with the use of mobile phones within the health care system

(DeRenzi et al. 2012). However, the current study further explained the frequency of message delivery, duration of messaging and SMS interaction with participants within the context of iCCM in Nyaguda sub-location. These views on the frequency and duration of sending messages are important within different contexts. This is because they will eventually determine the sustainability of the integration of mobile phones within iCCM. The current study which was conducted in a hard-to-reach area of Nyaguda within the context of iCCM revealed that health workers acknowledged that there was some level of illiteracy among the health workers. Therefore, calling was the most preferred method of communication. This is because most caregivers experienced challenges with writing SMS.

One of the CHVs during an informal discussion mentioned that;

> Writing an SMS is not easy and it does not bring out the clear picture of the matter unlike when I call and give a clear explanation and receive a clear explanation on my side. During the call I can easily ask for clarifications where I do not understand. This makes it easier to handle cases at the community level (38-year-old female CHV).

However, it was also reported by a CHV that in the incidence that a caregiver's mobile phone is off, they can send a message if the case is not as urgent. In cases of emergency, the CHV calls and if there is no response they physically look for the caregivers as narrated during an informal discussion by one of the CHVs;

> When I call a client and there is no response from the caregiver, most of the time I just walk to their homes to find out what is happening to ensure that all is well. But for our colleagues especially the CHEW, I just send a message and she is usually very fast to act on it immediately (42-year-old female CHV).

The mHealth interventions often used SMS to provide information, motivate individuals, and encourage self-management or promote disease prevention. However, illiteracy poses challenges for text-based prevention interventions (Mechael et al. 2010). Mechael et al. (2010), further mention that culturally specific provision of health information is important because poorly designed campaigns can have negative unintended effects; good understanding of cultural context and strategies to overcome language and literacy barriers are therefore needed.

According Duclos (2015), it is important to map out how mobile phones shape, generate and distribute knowledge in ways that encode and enforce existing relations among the various stakeholders. This is necessary because the achievement of acceptance and promotion of the formal use of mobile phones in health care requires overcoming social and cultural barriers within specific contexts.

Connectivity through the use of mobile phones is viewed as a great incentive. This is exemplified through this narration by a CHV during an informal discussion;

> There was a period when I was away, a patient contacted me through the mobile phone, I referred the case to the next CHV who was closer to the client through also just calling the CHV and alerting her about the case (45-year-old female CHV).

The CHV though away to attend to her personal duties, she can still be able to ensure that the members within her community unit are taken care of in terms of the health of their children. This is through maintaining contacts via mobile phone with the community members and other CHVs and other health stakeholders. This not only makes the life of the CHV manageable but also ensures that quality care is provided for at all times. This is a clear indication of how mobile phones have helped break barriers to health care. A review conducted by Källander et al. (2013), revealed that the most commonly documented use of mHealth was 1-way text-message and phone reminders to encourage follow-up appointments, healthy behaviors, and data gathering. Källander et al. (2013), further note that two-way communication applications focused primarily on data transmission with automated feedback response, and few projects were implementing real-time communication. The current study however, has addressed the use of the mobile phone in its interactive nature and not only through one-way text message communication or focusing on data transmission with automated feedback response. This study also found out the views of CHVs within iCCM during supervision as discussed in the section below.

5.4 Information real-time and an incentive to work: Views of health workers on the integration of Mobile Phones in Supervision

The mobile phone is perceived to be an effective tool in helping the supervision process. The CHEWs can use it to inform the CHVs of their intended visits to the various villages so that work can go on smoothly. The CHEW narrated during an informal discussion how the mobile phone has helped make her supervision easier and manageable;

> Before I set out to go to a particular village, I will first establish through making a call, the availability and location of the CHV who could be very far in the village attending to cases of illnesses. Calling before going to the village helps me to know the exact location of the CHV and does not need to waste time looking for the CHV all over the village (42-year-old community CHEW).

The CHEW further narrated during an in-depth interview the importance of using the mobile phone in giving feedback to the CHVs after her supervision process;

> After conducting supervision, I can later on inform the CHVs on my findings through the mobile phone and incase of any health-related problem that needs to be addressed a meeting can be called immediately to attend to the problem (42-year-old Community CHEW).

There are times when the CHEW is in need of data from the CHVs urgently. The mobile phone has been helpful to ensure that the required data is provided real-time. This is still part of our supervisory role to ensure that we furnish the sub-county hospital with the necessary data in time for the compilation of the ministry of health reports. A narration was provided by one of the KIIs at the sub-county hospital;

> There are certain times that we run the risks of stock-out of commodities especially RDTs, when we realize that certain health facilities have started suffering from stock-outs of certain commodities we do a mapping of the commodities within the sub-county by asking the CHEWs to furnish us with information from the CHVs and from the health facilities. This data is usually received easily and faster through mobile phone communication due to the different locations of the health facilities within the rugged terrain of the area (42-year-old female community CHEW).

The mobile phones have been deemed to be helpful within the context of Nyaguda sub-location in providing real-time data that is needed by the CHEW. This was further confirmed by the CHEW during a key informant interview who mentioned that;

> Through mobile phone communication I have easy access to information from the CHVs. Therefore, when the sub-county hospital personnel need urgent data, I provide it with ease through calling the CHVs. For example, information of the incidences of illnesses and the number of referrals done (42-year-old community CHEW).

According to Braun et al. (2013), when CHVs are equipped with mobile devices, they receive the capability to collect complete, high quality, and timely data from the field. More specifically, as compared to paper-based data collection, data collected by CHVs using mHealth tools had fewer errors (Bernabe-Ortiz et al., 2008) and less data loss (Tomlinson et al., 2009). The current study however, focused on the informal use of basic mobile phone, the achievement of necessary data by the CHEWs who would transmit it to the sub-county health workers. In Uganda, 12 projects used mobile technology for data collection and reporting (Mwagale & Kakaire, 2010). Most of these were designed as 1-way communication systems to improve data collection or management in surveys, routine care, and vaccine trials. In the context of Nyaguda sub-location, mobile phones employed the two-way communication because data was needed immediately to advise further decisions. This is because the data being collected in Nyaguda sub-location was mainly focused on the number of commodities and reports on the various disease occurrences and number of referrals done.

mHealth tools were also used to facilitate the creation of professional networks, both among CHVs and between CHVs and their supervisors, providing real-time advice, information, and support for frontline health workers (Agarwal et al., 2015). In Nyaguda sub-location, this was realized through sharing of information with regard to best practices and general discussions about the community. One of the CHVs thus explained during an in-depth interview:

> As CHVs, there are times we receive calls from the CHEW asking us on our wellbeing and the wellbeing of the community members. She also gives us an opportunity to ask any questions in regards to work and our daily experiences (42-year-old female CHV).

In the Aceh-Behar midwives study in Indonesia, the use of mobile phones was positively associated with access to institutional and peer information resources, which was in turn positively associated with an increase in knowledge about best practices for providing obstetric care (Chib et al., 2012). This study by Chib et al. (2012), however focused on obstetric care while this study is focused on integrated community case management for common childhood illnesses. The k4Health project in Malawi introduced an SMS text-messaging network to improve the exchange and use of reproductive health and HIV/AIDS information among CHVs. After an 18-month pilot period, the authors found that CHVs who used the text-message network were more likely to contact supervisors for clinical support from the field. The authors argue that timely exchange of information led to improved quality of care, particularly in cases of obstetric emergency (Medhi et al., 2012). Their study Medhi et al. (2012), focused on reproductive health and HIV/AIDs information with the use of SMS whereas the current study focused on childhood illnesses and on all the interactive uses of basic mobile phone informally for health care.

A review by Agarwal further reveals that mHealth tools can be used to facilitate better practices in leadership and management, particularly in terms of providing remote supervision to CHVs. A salient example, the Tanzania CommCare project, used an automated text-message system to remotely monitor real-time job performance of midwives and to provide workers with alerts and reminders to their mobile phone about past-due patient visits (Little et al., 2013). Compared to a group of midwives who did not receive alerts and reminders, midwives who received these messages improved the number of timely visits to expectant mothers. A study conducted by Braun et al. (2013), showed a comparative effect of adding a phone call from supervisors to

alert midwives about missed and late visits. This was associated with an 86% reduction in the number of days that CHVs were overdue in visiting their clients. In a study conducted by Andreatta et al. (2011), in-depth interviews with CHVs and supervisors revealed high rates of acceptability, use, and satisfaction with the alert and reminder system. The evidence suggests that mHealth tools, in hands of CHVs and committed supervisors, can facilitate real time supervision of teams of health workers that are distributed widely in geography. These studies (Little et al., 2013; Braun et al., 2011; Andreatta et al., 2011) further reveal the need to utilize the interactive nature of mobile phones to create new spaces of care that will enhance efficient and prompt care for the members of community. The current study at an informal level engaged the interactive use of mobile phone in iCCM. The next paragraph further discusses the views of the CHVs of the mobile phone as an incentive to work and despite the amount of work entrusted upon the them.

The mobile phone has helped to reduce work load among health workers. For example, due to their ease of use, information can be received in the comfort of the CHV's homes for them to initiate immediate action. The use of mobile phones within iCCM is viewed as an incentive to the health workers. During referrals they can call the clinician at the health facility and establish his availability before sending the caregiver to hospital unlike before when they had to walk with the caregiver and the sick child to hospital even for long distances. They can also through the phone establish whether the referred child has been taken to hospital or if the caregiver did not reach the facility through the phone as an immediate measure before receiving the referral sheet back from the caregiver. One of the CHVs reported during an in-depth interview that;

> The mobile phones has made my work easier and is a great motivation to my work since this place is so big and the roads are bad getting to move all the time has been reduced by the phone. For example, when we refer a patient I do not need to go with the caregiver but just to call and alert the doctor about the referral and call the caregiver to bring me back the signed referral after visiting the doctor (52-year-old, male CHV).

Most of the caregivers have been furnished with the CHVs numbers and therefore they can easily contact the CHVs and receive prompt care which has also made access to health care easier. The mobile phone is deemed among the CHVs to have brought about easy communication amongst themselves and also with their clients. The mobile phone is used to furnish the CHVs with a lot of health information especially from their supervisors which is good for them and has raised even their status in the community. The communication amongst them as the CHVs acts as a motivation to them because they are able to encourage each other and share their different experiences at work. This was illustrated through an informal discussion by one of the CHVs,

> There are times when I feel overwhelmed with the duties of work but when I call my fellow CHV she really encourages me to keep on for this work is to ensure that our community becomes a better place with us helping address most of the health issues that we can manage as we were taught. We also look back at where the community was before iCCM and where it is now in terms of improvements in the management of childhood illnesses and this really keeps us going in our various duties (48-year-old, female CHV).

The mobile phone is also a great incentive to the caregivers who can call their CHVs at any time and establish if they can get health care and at which place of convenience for both the client and the CHV. For example, the caregiver can call the CHV and establish if the CHV can either visit her or attend to the child at his/her home or if the CHV is attending to another client the caregiver can then just take the child to where the CHV is. According to Strachan et al. (2012), mobile phones present opportunities for community health workers to communicate directly with one another and provide peer support.

A Review by Källander et al. (2013), revealed that a limited number of mHealth projects were found which specifically targeted community health workers. Of the few projects identified, most used a combination of simple mobile phone applications for data submission, job aids to

improve diagnostics, and for sending and receiving SMS messages and reminders. None of these projects had evaluated the impact of these tools on community health workers' quality of care provided. This is despite the argument by Chib, Lwin and Jung (2009), who state that the perception of value offered by mobile phones eventually influences acceptance. Acceptance according to Kim, Chan and Gupta (2007), refers to the general benefits of technology. The perception of value and for example, self-efficacy according to Chib et al. (2009), also influences perception of use. In the Aceh-Behar study (Chib et al., 2009), mobile phones use was positively associated with higher self-efficacy among CHVs, as measured through a series of items regarding confidence about their abilities. Higher self-efficacy was positively associated with health knowledge of maternal health practices in the areas of family planning practices, prenatal, and child delivery processes (Chib et al., 2012).

A study conducted by Zurovac et al. (2011), reported that health workers who received motivational messages about management of children with malaria had a demonstrated improvement in correct management by 24% compared to those workers who did not receive similar messages. This effect was maintained even 6 months after the start of the study. Several studies included in this review also suggest that use of mobile tools is perceived as an opportunity for self-improvement and can consequently improve female health worker (FHW) motivation, self-efficacy and enthusiasm to continue their work (Chib, 2010; Lee, Chib & Kim, 2011; Lori et al., 2012; Jennings et al., 2013; Jimoh et al., 2012; Medhi et al., 2012). Improved FHW motivation, access to knowledge and organizational support are critical non-financial incentives that contribute to FHW retention (Dambisya, 2007; Lehmann, Dieleman & Martineau, 2008). Therefore, the introduction of a new technology and in this case the formal use of mobile phones can also be enhanced by educational assistance which enhances user confidence.

In conclusion, the mobile phone has been put to use as a form of material culture that is helping the members of that community to navigate their ecological barriers. Therefore, to ensure sustainability of the integration of mobile phones into healthcare, this study has acknowledged the views of various stakeholders within the ecological and cultural context of Nyaguda sub-location. The health workers have acknowledged that the mobile phone is an important tool that has helped them achieve their various goals. The mobile phone has broken barriers of distance and made healthcare spaces even closer within iCCM. This cultural tool helped to navigate the problems of topography and made a hard-to-reach area reachable. It has therefore created new spatial and temporal configurations by breaking barriers in the overall relations in health care.

CHAPTER SIX

Challenges in the creation of new spaces of care via the mobile phone within iCCM

6.0   Introduction

This chapter focuses on the presentation and discussion of the challenges experienced by health workers in the informal integration of mobile phones in iCCM. It provides an in-depth discussion based on the findings of this study on barriers to communication via mobile phone within iCCM. Secondly, based on the study findings it discusses the challenge of integrity in the integration of mobile phones within iCCM. Lastly, it provides an understanding on the challenges of kin-link up in the integration of mobile phones within iCCM.

6.1 Barriers to Communication: Lost phone, Low Charge and No Airtime

This study found out that there are physical challenges which pose a challenge to the utilization of mobile phone among the various stakeholders in child health. These challenges include the breakdown or loss of a mobile phone among others that are discussed in this chapter. This may culminate to communication breakdown which can be salvaged by only going back to the physical meetings among the various stakeholders. The physical meetings however, can be challenging at times given the hard-to-reach nature of Nyaguda sub-location. This interferes with accessibility that the mobile phone has been deemed to bring especially in this hard-to-reach area. One of the caregiver's narrated how the physical challenges would affect their interactions and eventually the health of their children who are less than five years.

> Agnetta: What are some of the challenges that you experience while integrating the mobile phone informally within the process of iCCM?
> Atieno: The mobile phone is a good tool of communication especially within iCCM, however, when the phone breaks down like mine which recently fell in water, communication becomes a problem for me. For example, after my phone fell in water

while I was washing clothes, before I got another one, my child fell ill and I had no way to call the CHV and ask her for help. I therefore had to walk to her home with the sick child at night. If I had the phone working, I would have called her for advice and bring the child to her in the morning depending on her advice.

Agnetta: Any other challenge that you have experienced in the integration of the mobile phone in iCCM?

Atieno: When there is no power, it becomes a challenge to charge my phone hence I cannot communicate with anyone.

Agnetta: How is that a challenge to the health of the child?

Atieno: When the phone is off and my child is sick even when she has been attended to I may need to alert the CHV on how the child is faring on. There is a time when I could not communicate to the CHV who had treated my child yet my child was vomiting the medication and needed to just ask her if I can give another dose immediately or what I needed to do. This necessitated me to go to her home which had an implication on my resources like time and money to take a boda boda (motorbike transport) to her home.

This conversation reveals some of the physical challenges that influence the use of mobile phone in iCCM. These physical challenges bring back the problem of accessibility to healthcare for children less than five years with common childhood illnesses. Given the context of Nyaguda sub-location which is a hard-to-reach area, the integration of the mobile phone is of great importance in breaking the barriers of communication which is a key strategy in ensuring proper healthcare management. A study conducted by Albabtain et al. (2014), also showed that the quality of mobile services in the developing world is a challenge within mHealth. The mobile service quality is influenced by a range of things such as a broken down mobile device, poor mobile network, and the cost of communicating via mobile phones, (Akter, 2012; Akter S, D'Ambra, & Ray, 2010; Mechael et al.,2010).

The challenge of mobile phone charging was also reported among most stakeholders especially at the community level by the caregivers and the CHVs. They stated that most of their homes did not have power to charge the mobile phone and sometimes queues at the market places where they would take their phones to charge were too long. This made it difficult to communicate as soon as possible because it meant that they had to physically locate their clients. Given the vastness of the area and the poor and rugged terrain they ended up using far

too much in terms of resources such as time and money to get a motorbike transport to visit clients. This would make them have a sense of fatigue even though they had decided to work as volunteers. During an informal discussion one of the CHVs narrated that;

> When power goes off and it is not a sunny day, communication really becomes a challenge. The members of this community may use the electric power to charge the mobile phones or use solar power. There are certain charging places which when not affected by lack of power, the queues there are normally unbearable. However, when both cannot work, communication gets affected and we are now forced to go round checking on the members of our various households, which can be such a tedious process (35-year-old, female CHV).

Studies (Mechael et al., 2010; Yu et al., 2006), reveal that the battery life and memory storage are among the service quality challenges that affect the integration of mobile phones in health care management of illnesses. The findings of this study concurred with the previous studies. The current study found out that the informal use of mobile phones within iCCM was interfered with when the battery charge went low and eventually when the phone goes off.

Customers in the developing world are mainly using mobile phones with chargeable minutes meaning that with every minute they communicate using the mobile phone, they are charged. Health consultation or personal health monitoring require additional minutes which might be unaffordable for numerous people in the developing world (Waruingi & Underdahl, 2009). Within the context of iCCM in Nyaguda sub-location, CHVs are not provided with airtime for their phones. This is especially because the use of mobile phones for communication within iCCM in Nyaguda sub-location is done informally. The lack of airtime presents a challenge to communication among the various stakeholders in health. One of the CHVs during an informal discussion narrated that;

> Most caregivers would call in case of an illness and the phone goes off just as they have started having a conversation. The CHV is mostly the one expected by the caregivers to call back because they view it as their job to serve them and address the health issues of their children. Most of the caregivers do not understand that we can lack airtime and when we do not call back some of the caregivers will even take offense. Therefore, if I

do not have airtime, I am forced to physically visit the caregiver (39-year-old, male CHV).

The CHVs have been tasked with the mandate to follow-up a sick child and especially after having referred a child for treatment and even when the child has been seen at the community level. Due to their diverse roles and their need in different parts of the vast community, they are forced to use the mobile phone to check on the child's welfare as they plan to see the child physically. Most of the caregivers will not take it upon themselves to furnish the CHVs with information on the health of the child. However, though when the CHVs would manage to call them they would not only find out about the health of the sick child but also of the other family members and advise them accordingly in matters of health. A CHV reported during an informal discussion that:

> Even though airtime is a challenge, it is proper within the African context and especially for us here in Nyaguda that when you call someone to find out about the health of their child, you first and foremost find out about the health of the caregiver and all the other members of the family before delving into the real reason for calling. This is usually a great opportunity to find out the health issues affecting the members of the community at the family and even at the community level (32-year-old, female CHV).

The above narration reveals how the mobile phone as material culture has helped to bring about bonding to the members of the community. The narrative also shows the challenge of not having enough airtime. However, despite the scarcity of airtime, it is still important to remember the values of the community which are entrenched in the culture of the members of Nyaguda sub-location. Some of the values within the context of Nyaguda sub-location include, greetings which are key before any conversation commences and it involves more than just finding out how you as an individual is faring on and entails finding out even how the members of one's family are faring on. The greetings and finding out how the various members of the family of clients consumes a lot of the CHVs' airtime which comes at a cost to the CHV. Therefore, the lack of airtime really poses a challenge to the integration of mobile phone in

iCCM. A study by Istepanian and Lacal (2003), noted the cost challenge at the macro systems level and at the level of the individual citizen and healthcare provider. A key aspect for any of these technology systems to work is that they are affordable at point of use. According to Rivett (2007), a billing structure must be implemented that allows for a "reverse cost" approach, such that, the MOH or other responsible party will pay for it. Otherwise it is not feasible or sustainable (Rivett, 2007).

These challenges call for collaborations within the various stakeholders in health. This will help to quickly identify the problem and have it addressed within the shortest time possible because all stakeholders will be knowledgeable of the importance of mobile phones within iCCM. The challenge is to have health cabinet ministers and officials at the same table as mobile service providers, doctors, technologists, and financiers. Coordination among these stakeholders and agreement of incentive structures and responsibilities for meaningful collaboration is needed. This is in order to better inform public and private investments and the deployment of commercially viable solutions (Mechael et al., 2010). This challenge notwithstanding, sustainability of countrywide mHealth programs relies on incorporation with the national health care program of the country, yet few African countries have developed national eHealth or mHealth policies, strategies, or guidelines (Mechael et al., 2010). This has been attributed to limited knowledge of what works, how it works, and how much it costs because most of the mhealth studies have been conducted at small scale levels. Therefore, the national ownership of mHealth applications cannot be overemphasized. Some good examples of country ownership exist, such as state programs in Ghana and Nigeria, which address maternal and neonatal health using mobile phones (Sharp, 2011).

6.2 The truth of the mobile phone is only known to individual

This study found out that the use of mobile phone would bring about a lot of misinformation especially among the different stakeholders. Some CHVs mentioned that some caregivers would lie on phone about the ages of their children. This would be established through the physical follow-up. A CHV narrated during an informal discussion that;

> Not all caregivers are truthful when it comes to providing the correct age of their children. This is especially because they know that our mandate as CHVs is only to treat children who are less than five years old. One of the caregiver's called me that her child was unwell, she lied about the age of her child and when i got there and insisted on examining the clinic card before offering any healthcare, I found out that the child was older than five years (42-year-old, female CHV).

They would lie in order to have their children receive healthcare from the CHVs who are within their comfortable reach instead of having to go all the way to the health facility. However, iCCM has been implemented to offer healthcare management for common childhood only to children less than five years old. This was therefore not just a challenge with the mobile phone but generally a challenge in child health care through the implementation of iCCM.

This study found out that one of the challenges to the integration of mobile phones in iCCM included caregivers lying during follow-ups that they were home with the child to be reviewed only to be found absent when the CHV physically visits. A CHV narrated during an informal discussion her experience concerning the caregivers who do not tell the truth about their whereabouts during the follow-up process.

> There are clients who I treat their children and for me to ensure that the child is improving I call to find out about their well-being but will also schedule a follow-up visit with the caregiver. At one time, I called a caregiver and notified her that I would like to visit them and see how the child was doing and she told me to just go ahead and visit. I started my journey to the home only to reach there and only find the child alone at the door with no caregiver (45-year-old female, CHV)

The location of Nyaguda sub-location near the shores of Lake Victoria makes most of the caregivers too busy sometimes even to focus on the health of their children. Especially after the sick child has received treatment, they immediately go back to their chores and get so engrossed in that forgetting to be close to the child who is still recovering. Therefore, most of the time when a CHV calls and schedules a follow-up visit, some caregivers will lie that they are at home. However, when the CHV goes there physically, she finds that only the child had been left either alone or with other siblings. iCCM has brought healthcare for children near the caregivers and the use of mobile phones to find out the recovery progress of the child before physically visiting the child has also made life so easy for caregivers. They therefore take basic requirements within iCCM such as follow-ups for the child for granted yet it is a vital process to ensuring good health for the child.

Some caregivers when referred they do not go to the facility yet when called by the CHV, they state that they took the sick child to the facility. One of the CHVs during an informal discussion narrated her experience with a caregiver who instead of going to the local health facility where she had been referred for treatment, she went to the sub-county hospital.

> Our caregivers sometimes can be hard to understand just like all human beings are sometimes. This is because, there is a particular caregiver I referred to the local health facility and I had even talked to the doctor about her taking the child there only for her not to even come back with the referral form to me to show that she had gone to the facility. When I followed her up at her home, she mentioned that she did not think it was wise to take her child to the local facility and instead went to the sub-county hospital where she thought the child would receive proper care (39-year-old, female CHV).

One of the sub-county management member mentioned during a key informant interview that most of the community members believed that they can only get the best care from the sub-county hospital and not the local health facility.

> Most caregivers just believe in getting treatment when referred from the community by the CHVs from the sub-county hospital. Most of them do not think they can get the best

107

care from the local facility, a myth that we are trying to get out of them and making them aware that the local health facility can handle most of the cases and those they cannot handle they refer to us (A female Sub-County Health Management Team member).

This study revealed the need to further equip and empower the local health facilities through provision of the necessary health supplies in order to enhance the effectiveness of iCCM. This will boost the confidence of the local members to go to the local health facilities for health and referral services instead of just going straight from the CHVs to the sub-county hospital. The mobile phone helps however, in addressing the challenge of not going to the local health facility when referred. This is because the CHVs can still follow-up further by calling the facility in-charge during the process of referral and inform the facility in-charge concerning the particular case. Later the CHV can confirm from the in-charge if indeed that caregiver went to the facility. In cases where caregivers give false information about having gone for referral yet they did not go, the CHVs follow them up physically in their homes to establish the problem and seek for a way forward to ensure the sick child receives proper health care.

The mobile phone being indeed mobile in nature, brings with it the challenge of ensuring or ascertaining that the information given is trustworthy. Furthermore, during supervision incorrect information may be offered such as when a CHV informs a CHEW that all is well in the community when that is not so.

> Sometimes, I may be cooking or taking care of my visitors when the phone rings from the CHEW. It is during that time that the CHEW may be inquiring about the welfare of the members of my community unit and because I have not visited the members due to my prior preparations and the hosting of the guests on the particular day, I quickly just tell her that all is well in my community unit even without consulting to know whether what I am reporting is true. This is how sometimes we end up giving incorrect information which is not the right thing to do (35-Year-old, female CHV).

The information from this study has clearly shown that the mobile nature of the phone is a challenge in itself. This is because people tend to give false information through the mobile

phone yet when they are visited physically, the situation on the ground is different. Studies have however not adequately exposed this challenge of the integrity of using the mobile phone within health care.

6.3 Sharing of mobile phones and its challenges to the integration of mobile phones in iCCM

When clients use their relatives or neighbours' phones or friend's phones to communicate it becomes hard later on to follow them up. There are moments when a visit is made to a client after having called and given directions to her home. However, after having visited the client and attended to the child, it becomes a challenge tracing that client back with that same number. The owner of the number may at times not even remember the caregiver who used her phone because many other people often borrow her phone to make contacts. A CHV during an informal discussion narrated her experience in an incident where a caregiver borrowed a mobile phone.

> A caregiver called me very distressed at night that her child was unwell. I went and attended to the child but later on when I tried to call her and find out how the child was faring on, the person who received the call kept on telling me that that was a wrong number and that she did not know the person who called using her number and actually told me not to disturb her again with my persistent calls (42-year-old male CHV).

The above narrative shows that in times of need mobile phones can be shared in order to communicate for help. Within the context of iCCM within Nyaguda sub-location mobile phones are shared to communicate health problems among children less than five years in a bid to have them receive the needed care. However, it seems the sharing of phones is a persistent phenomenon that the person who shares may not even remember all the persons who have been helped with the mobile phone for communication purposes. Mobile phones in low and middle income countries are often shared among household members (Mechael, 2006). While mobile devices are becoming affordable for many people in the developing world, they are still

expensive for a large majority especially in the rural areas (Mechael et al., 2010). In addition, in South Asia and Africa, women are less likely to own a mobile phone compared to men due to the cost, illiteracy and unavailability of electricity. People usually own a mobile phone for business needs and they borrow a phone from a short time for any other purpose (Derenzi et al., 2011). This is especially a challenge within Nyaguda sub-location where mobile phones are being used informally hence no one takes up the financial responsibility that comes with its use within iCCM.

mHealth can be a good solution for communities with unique culture and customs such as the developing world, but at the same time this cultural diversity may restrict the implementation of mHealth applications. People in these countries have different cultural values, beliefs and customs which affect their health behaviors and reduce their ability to take control of their health (World Bank, 2012; Waruingi & Underdahl, 2009). The current study revealed several cultural issues that acted as barriers to the effective integration of mobile phones within iCCM. For example, the informal use of mobile phone within Nyaguda sub-location has made client expectations become too high. This is because most of the caregivers with sick children will just call the CHV and notify them of the incidences and wait as they go about their other chores. Even when a CHV is attending to a neighbour's child, they will not bring the sick child to the neighbor but will instead wait to be served at the comfort of their homes. This becomes a challenge to the CHVs whose work load may sometimes be so high given the vast and rugged terrain of Nyaguda sub-location. A CHV during an informal discussion explained her experience when work was too much yet the caregiver kept waiting and calling for her to rush to her home and attend to her sick child.

> There was a day when I had two children brought to me at once and as I attended to the
> first child a call came in from one of the caregivers within my community unit that her

child was sick and she wanted me to go to her home and attend to her. I explained to her the scenario at my home and asked her to bring the child such that by the time she arrives I will have already finished with the second child and attend to her child. She however refused and stated that she would rather wait for me to go and attend to her at her home. I tried to reason with her putting to mind the health of the child but that did not work and I eventually had to go myself to attend to the child (49-year-old Female CHV).

Therefore, despite the fact that the mobile phone is important for communication, it has also encouraged laziness among some caregivers in seeking health care for their children because all they do is to call and receive help at the comfort of their homes.

This study revealed that the work of a CHV especially with the informal use of mobile phones entails a lot of calling and receiving calls. These calls are at times made even in the middle of the night. The frequent calls have made some spouses of the CHVs uncomfortable and insecure. This is because their spouses may wonder how this CHV just receives a phone call even in the late evenings and leaves for duty. They may at times think that the calls could just be from their friends and some even conclude that their spouses who are CHVs are having affairs outside the marriage. The mobile phone has therefore posed a challenge of breaking trust in some of the CHVs marriages. This was narrated during informal discussion by one of the CHV;

> When I used to receive frequent calls at night my husband kept wondering what kind of job this was where there was no rest. He kept questioning who is calling and to some extent would not even allow me to leave the house at night to go and attend to some client thinking that I was having an affair yet pretending that it was a call for duty (39-year-old, female CHV).

Another narrated her experience also during an informal that;

> My spouse questioned that I have enough airtime to call patients and find out their welfare yet whenever he was away I would not call him and when he called and his airtime got finished I would not call back claiming that I had no airtime. He therefore did not understand what was of priority in my life, whether it was the voluntary work of a CHV or him who even provided for me and the family (42-year-old, female CHV).

CHVs themselves believe that the mobile phone has to some extent even threatened their bond of togetherness. This study revealed that at a certain level if not checked mobile phones can

make CHVs not meet together as they used to before when bringing their returns to the CHEW at the health facility. This is because most of the returns can just be made via phone and they only come when available to pick the commodities that are out of stock. During a key informant interview one of the CHEWs revealed that;

> As CHVs we would meet most of the times especially at the end of each month to bring our reports to the CHEW for compilation to the SHMT who eventually compile the reports for the sub-county. However, the use of mobile phones has reduced these interactions because most of the CHVs prefer just calling the CHEW and providing the needed records via voice calls or text messaging (40-year-old CHEW).

The use of mobile phones has reduced the work for the CHVs in terms of their journeys to the health facility to give out the monthly reports. This is because most of the reports are mostly conveyed through the use of mobile phones. However, for the CHEWs this increases their work load becoming a challenge for them. This is because the CHEWs take a lot of time compiling the messages unlike if the CHVs compiled the messages fully on their own. Contrary to the cultural practice of having meetings physically, things have now to change. This has in some way broken physical and social relationships when the health workers would all meet and have discussions on a weekly basis as opposed to just calling each other to receive any needed information. The physical meetings that the health workers used to have are being ignored to some extent due to the transformation that is taking place in global health. Global health is being transformed by a proliferation of screens, interfaces, and networks – infrastructures that link bodies, knowledge, and care practices in new spatial and temporal configurations (Duclos, 2015). Duclos (2015), further notes that technologies such as mobile phones connect patients, medical practitioners, hospitals, and lay people, either through private networks or the internet, and affect the circulation of medical knowledge, expertise, and data.

In conclusion, this chapter has provided a deeper understanding of the dynamics involved in the various challenges to the integration of mobile phones informally within iCCM. These

challenges include: the physical barriers though given within the context of Nyaguda sub-location, the challenge of integrity in terms of ensuring truthfulness in the various interactions through mobile phone and lastly, challenges in sharing of the mobile phone between several members of the community that have not been adequately addressed by other studies. Despite the various challenges that it faces when integrated in iCCM, the mobile phone has come in handy to create new spaces of care. The current study has provided ethnographic data on the challenges experienced in the integration of mobile phones in iCCM. This data is based on observed realities in order to promote the involvement of end-users in the design of iCCM. For example, when the challenges being experienced in the integration of mobile phones within iCCM is addressed, all the stakeholders will be fulfilled as the key goal of a health society is achieved.

CHAPTER 7

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

7.0 Introduction

This chapter provides a summary of the findings of this study. It further presents the conclusions and recommendations derived from the study findings. In addition, the chapter presents information on further areas of research based on the analysis of the study findings.

7.1 Summary

The main objective of this study was to assess the health workers' perceptions and use of mobile phones in integrated community case management of illnesses among children under five in Nyaguda sub-location, Western Kenya. The study adopted the theory of cultural ecology (Steward, 1955), and the concept of care spaces (Duclos, 2015), to explain the assessment of health workers' perceptions and use of mobile phones in iCCM.

The first objective endeavored to investigate the uses of mobile phones in the management of illnesses among children under five in Nyaguda sub-location, Western Kenya. This study deduced that the implementation of iCCM has made health care for children less than five years more accessible by reducing barriers to care as discussed in chapter four. The study findings further showed that health care provided by CHVs has the potential to reduce barriers of accessibility by widening care spaces. Through the interactive process between the caregivers and the CHVs who are members of the same community, iCCM provides health care management for children less than five years. This interaction is one that makes the caregivers comfortable to access healthcare that is not only within their reach but offered by someone who is a member of their community with a better understanding of their deeper needs. This care provided by CHVs was also available to caregivers outside normal "business hours" and more

114

frequent follow-up also provided which enhanced adherence to recommended treatment regimen. In chapter four this thesis has shown that factors such as affordability, accessibility and availability interact to influence level of access to prompt and effective health management of children less than five years old. This access to prompt and effective health care has worked towards helping reduce morbidity and mortality rates among children less than five years.

Consequently, through the use of mobile phones, networks are created, care is sought and negotiated through those networked spaces within Nyaguda from both the public and the nearest private health facility. Through the use of the concept of care spaces (Duclos, 2015), this thesis has demonstrated that the mobile phone helps to create new spaces of care other than the usual ways of seeking care for sick children less than five years. These new spaces of care for children less than five years provide greater access to effective and efficient health care services. This happens when caregivers promptly communicate with the CHVs through the mobile phone who in turn attends to the health needs of the child appropriately. Such newly created spaces of care have the potential to enhance effectiveness of health system performance with regard to management of common childhood illnesses through iCCM.

This study found out that voice calls were preferred in order to achieve real-time communication as compared to SMS which may not be read immediately and hence not responded to in time. This study has shown how the mobile phone has been used as a means by which people in Nyaguda sub-location address certain socio-environmental constraints through use of voice calls. This shows that contemporary material culture such as the mobile phone form the primary means by which people establish their viability given the constraints imposed upon them by their environment and the demands of social integration. Therefore, other than just improving access to care, the mobile phone is also useful in establishing social relationships even as healthcare is achieved. The voice calls most of the times are not geared

only to find out if adherence has been achieved but in the process, the CHV is also able to find out how the caregiver and the members of the caregiver's household are managing the illness. This communication via mobile phone by the CHVs gives the caregivers and the community members the sense that CHVs have a genuine concern for their welfare which includes their health, thus enhancing trust in the local health services delivery system.

Chapter four of this thesis has further shown how the use of mobile phones within iCCM has helped break the barriers of supervision and accessibility to information to enhance health care of the children less than five years. Mobile phones also bring forth a connection among patients, medical practitioners, hospitals and lay people affecting the circulation of knowledge, expertise and data. Through this connectivity, the thesis has used the concept of care spaces (Duclos, 2015) to illustrate how spaces of care have been created to enhance health service delivery to children under five years of age. These enhanced spaces of care blend with the theory of cultural ecology which argues that the use of various sociotechnical tools should be based on particular contexts where they are being put to use. For example, within the hard-to-reach area such as is the case of Nyaguda sub-location, the mobile phone is being put to use to help in accessibility issues especially within health care.

The referral and supervision process within iCCM reveals the vital need for networking and communication for childhood illnesses. The caregivers also noted that the use of mobile phones ensured the efficiency of services through breaking the barriers of accessibility given the vastness and the rugged terrain. This study revealed that the interactive nature of the use of mobile phones has enhanced the provision of healthcare for the child as envisaged in the context of Nyaguda sub-location. This study therefore explains the informal uses and benefits of mobile phones in iCCM within a hard-to-reach area. The thesis has further addressed the

interactive uses of mobile phones within health care which is also important in providing real time communication between the different players in health.

The second objective was to examine the views of health workers on the integration of mobile phones in the management of illnesses among children under five in Nyaguda sub-location, Western Kenya. This study found out that CHVs use the mobile phone as an important tool to establish relations despite the challenges of the physical environment of Nyaguda sub-location which is a hard-to-reach-area. The networking function of the mobile phones, therefore, helps in distributing knowledge towards ensuring that the relations between various stakeholders in health are still reinforced. This is in ensuring that the health care of children less than five years is well managed. Connectivity through the use of mobile phones has made healthcare management less burdensome for the CHV. The use of mobile phones has been useful in addressing emergent cases of illnesses among children less than five years old. The mobile phone acts in such a way to reassure the caregivers whenever they have a sick child. This is due to the quick and easy communication that they have with the CHV when a child is unwell. The guidance they receive even before the CHV arrives to examine and manage the illness is very important because it helps the caregiver calm down knowing that following that direction the child will be well. The mobile phone therefore provided real-time information through the function of voice calls. Connections among the CHVs were strengthened, a sense of community support and friendship are reinforced through interactions with mobile phones.

Chapter five of this thesis provides additional evidence that the mobile phone use was perceived by CHVs as important because it ensured that there was an improvement in medicine supply chain management. The mobile phone is used in clarifying necessary information on commodities that may have otherwise been not clear at the beginning. This is especially information passed on among the staff at the sub-county hospital, the CHEWs and the CHVs.

In addition, this current study established from the CHVs perspective that the use of mobile phone helped to deal with the problem of commodity stock outs especially if the commodities had been supplied from the health facility. This study found out that within the context of Nyaguda, the CHVs not only used SMS to communicate necessary health messages but also incorporated the interactive use of mobile phone through voice calls. Health workers also provided views on the frequency and duration of calls and the number of messages to be sent to them by other stakeholders in child health. This thesis has described the use of mobile phones in iCCM via text messaging but also through other functions such as voice calls. This study which was conducted in a hard-to-reach area of Nyaguda revealed that health workers acknowledged that there was some level of illiteracy amongst them hence calling was the best preferred method of communication although this happens at an additional cost because of the different charges for sending SMS and calling charged by the mobile telephone service providers. This is because most caregivers experienced challenges with writing SMS. Through maintaining contacts via mobile phone with the community members, CHVs and other health stakeholders, the health of children less than five years is well taken care of. This not only makes the life of the CHV who combine iCCM with the use of mobile phones manageable but also ensures that quality care is provided for at all times. This is a clear indication of how mobile phones have helped break barriers to health care. In Nyaguda sub-location, mobile phones employed the two-way communication because data was needed immediately to advise further decisions among the key stakeholders in child health. This is because the data being collected in Nyaguda sub-location was mainly focused on the number of commodities and reports on the various disease occurrences and number of referrals done. In Nyaguda sub-location, the mobile phone was useful in the sharing of information with regard to best practices and general discussions about the community. The mobile phone has helped to reduce work load among health workers. For example, due to their ease of use, information can be received

in the comfort of the CHV's homes for them to act on immediately. The use of mobile phones within iCCM is viewed as an incentive to the health workers. The mobile phone is used to furnish the CHVs with health information especially from their supervisors which is good for them and has raised their status in the community. The communication amongst them as the CHVs acts as a motivation to them because they are able to encourage each other and share their different experiences at work.

Chapter six of this thesis has discussed the challenges associated with the use of mobile phones among health workers and how these challenges influence the management of illness among children under five in Nyaguda sub-location, Western Kenya; this study found out that the mobile phone is a relatively new cultural tool that the members of Nyaguda sub-location as is the case elsewhere in the developing world are trying to use to make their lives easier. Its integration in health care management of children less than five years with common childhood illnesses is still at the infancy level hence a few challenges are being experienced. This study revealed that the informal use of mobile phones within iCCM was interfered with when the battery charge went low and eventually when the phone goes off. The lack of airtime presents a challenge to communication among the various stakeholders in health. However, despite the scarcity of airtime, it is still important to remember the values of the community which are entrenched in the culture of the members of Nyaguda sub-location. Some of the values within the context of Nyaguda sub-location include, greetings are key before any conversation commences and it involves more than just finding out how you as an individual is faring and entails finding out even how the members of one's family are doing. The greetings and finding out how the various members of the family of clients consumes a lot of the CHVs' airtime which comes at a cost to the CHV. Caregivers within Nyaguda sub-location would lie about the ages of their children. They would lie to have their children who were above the age of five

years also receive healthcare from the CHVs who are within their comfortable reach instead of having to go all the way to the health facility. This exposes unmet need by the community through the implementation of iCCM. This is because iCCM focuses on providing healthcare for children less than five years only. Furthermore, through the mobile telephony, caregivers would lie about their physical location when called by the CHV during follow-up, they would also lie about having taken the referred children to hospital. The information from this study has clearly shown that the mobile nature of the phone is a challenge in itself. This is because people tend to give false information through the mobile phone yet when they are visited physically, the situation on the ground is different. Sharing of mobile phones is also a challenge in its integration within iCCM. This is because it becomes difficult to follow up the clients when they use their relatives or neighbours'or friends 'phones.

This current study revealed several cultural issues that acted as barriers to the effective integration of mobile phones within iCCM. For example, the informal use of mobile phone within Nyaguda sub-location has made client expectations become too high. This is because most of the caregivers with sick children will just call the CHV and notify them of the incidences and wait as they go about their other chores. The mobile phone has therefore posed a challenge of breaking trust in some of the CHV marriages due to the frequency and timings of the calls. CHVs themselves believe that the mobile phone has to some extent even threatened their bond of togetherness. This study revealed that at a certain level if not checked mobile phones can make CHVs not to meet together as they used to before when bringing their returns to the CHEW at the health facility. This is because most of the time the returns will be done through the use of mobile phones which has been used to break barriers of accessibility within the hard-to-reach area of Nyaguda sub-location.

7.2 Conclusions

Based on the findings of this study, the following conclusions are made;

In an endeavor to ascertain the uses of mobile phones in the management of illnesses among children under five in Nyaguda sub-location, Western Kenya this study concludes that the mobile phone is useful. Some of the uses to the informal integration of mobile phones within iCCM in the hard-to-reach area of Nyaguda sub-location include, the use of mobile phones to improve access and opening up of new spaces for health care. Health care for the people of Nyaguda sub-location has been made not only accessible but prompt through the use of mobile phones. The mobile phone within this context has been proved to be effective in finding out and alerting the doctor at the health facility about a referral case to ensure proper preparation for emergencies. The mobile phone also comes in handy in the aspect of monitoring commodities and assisting to ensure that reports are prepared in good time. Timely reporting and sourcing of commodities will ensure accessibility, efficiency and effective management of children less than five with common childhood illnesses. It is therefore important to note that the integration of mobile phones within iCCM as a strategy will greatly enhance proper and timely care for children less than five years old with common childhood illnesses.

In studying the health workers' perceptions in the integration of mobile phones within iCCM, the mobile phone was viewed by the health workers as an important tool in helping them achieve their various goals within iCCM. The health workers viewed the mobile phone as a tool that has helped in breaking barriers of distance and made healthcare spaces even closer within iCCM. This cultural tool helped to navigate the problems of topography and made a hard-to-reach area accessible. It has therefore created new spatial and temporal configurations by breaking barriers in the overall relations in health care. The mobile phone has been put to

use as a form of material culture that is helping the members of that community to navigate their ecological barriers.

This study also documented ethnographic data on the challenges experienced in the integration of mobile phones in iCCM. These challenges include: the physical barriers though given within the context of Nyaguda sub-location, the challenge of integrity in terms of ensuring truthfulness in the various interactions through mobile phone and lastly, challenges in sharing of the mobile phone between several members of the community.

7.3 Recommendations

1. There is need for the Government to formally integrate the mobile phone within iCCM given the documented informal uses that have been realized in this study.

2. To ensure sustainability in the integration of mobile phones within iCCM, it is important tointegrate the perceptions of the various health workers in different contexts.

3. The key stakeholders in health especially the sub-county health management team needs to ensure that the process of follow-up is also physically done to address the few challenges in the integration of mobile phones within iCCM.

7.4 Suggestions for further research

1. An integrated research should be conducted whereby mobile phones are formally integrated within iCCM for comparison with the results of this study on the uses of mobile phones within iCCM.

2. A further study should be conducted to integrating both the views of the health workers and the caregivers in the integration of mobile phones within iCCM.

3. Further feasibility studies can be conducted on the how feasible it is to address the challenges faced in the   integration of mobile phones within iCCM.

References

Ahmed, H.M., Mitchell, M. & Hedt, B. (2010). National Implementation of Integrated
Management of Childhood Illness (IMCI): Policy Constraints and Strategies. *Health Policy,* 96 *(2), 128– 133.*

Ajrouch, Kristine J., Heather R. Fuller, Hiroko Akiyama, and Toni C. Antonucci. "Convoys of social relations in cross-national context." *The Gerontologist* 58, no. 3 (2017): 488-499.

Akter, S., D'Ambra, J. & Ray, P. (2010). Service Quality of mHealth: Development and Validation of a Hierarchical Model using PLS. Electronic Markets, 20(3), 209-227.

Akter, S. (2012). *Service quality dynamics of mHealth in a developing country.* Sydney,

Australia: The University of New South Wales.

Agarwal S., Perry H.B., Long L. A., Labrique A. B. (2015) Evidence on feasibility and effective use of mHealth strategies by frontline health workers in developing countries: A systematic review. *Tropical Medicine International Health;20(8):1003–14.*

Andreatta, P., Debpuur, D., Danquah, A. & Perosky, J. (2011). Using cell phones to collect postpartum hemorrhage outcome data in rural Ghana. *International journal of gynecology & obstetrics, 113, 148–151.*

Albabtain, A.F., AlMulhim, D.A., Yunus, F., Househ, M.S., (2014). The Role of Mobile Health in the Developing World: A Review of Current Knowledge and Future Trends Cyber Journals: *Multidisciplinary Journals in Science and Technology, Journal of Selected Areas in Health Informatics (JSHI), February Edition, Volume 4, Issue 2.*

Arah, O.A., Ogbu, U.C. & Okeke, C.E. (2008). Too poor to leave, too rich to stay: developmental and global health correlates of physician migration to the United States, Canada, Australia, and the United Kingdom. *American Journal of Public Health, 98(1), 148–54.*

Aranda-Jan, C.B, Mohutsiwa-Dibe, N. & Loukanova, S (2014). Systematic review on what works, what does not work and why of implementation of mobile health (mHealth) projects in Africa. *Biomedical Central Journal of Public Health, 14, 188.*

Agarwal, S., Perry, H.B., Long, L.A., Labrique, A.B. (2015). Evidence on feasibility and

effective use of mHealth strategies by frontline health workers in developing countries:

systematic review. *Tropical Medicine & International Health, 20(8):1003–14.*

Asiimwe, C., Gelvin, D., Lee, E., Amor, Y.B., Quinto, E., Katureebe, C., Sundaram, L., Bell, D., & Berg, M. (2011) Use of an innovative, affordable, and open-source short message service-based tool to monitor malaria in remote areas of Uganda. *American Journal of Tropical Medicine & Hygiene, 85(1), 26–33.*

Axel, B.K. (2006). Anthropology and the New Technologies of Communication. *Cultural Anthropology, 21(3), 354-384.*

Aysha, Z., Kashif, S., Saleem, I., & Shagufta, P. (2016). Strengthening health systems: using mobile phones for co-ordinated community case management of childhood diarrhea and pneumonia in district Badin. *Pakistan Health Systems Policy Res*, *3*, 2.

Bannigan, K., & Watson, R. (2009). Reliability and validity in a nutshell. *Journal of clinical nursing*, *18*(23), 3237-3243.

Barrington, J., Wereko-Brobby, O., Ward, P., Mwafongo, W. & Kungulwe, S. (2010). SMS for Life: a pilot project to improve anti-malarial drug supply management in rural Tanzania using standard technology. *Malaria Journal, 9:298.*

Basalla, G. (1988). *The Evolution of Technology*. Cambridge: Cambridge University Press

Bhutta, Z. A., Lassi, Z. S., Pariyo, G., & Huicho, L. (2010). Global experience of community health workers for delivery of health related millennium development goals: a systematic review, country case studies, and recommendations for integration into national health systems. *Global health workforce Alliance*, *1*(249), 61.

Binford, L. R. (1962). Archaeology as anthropology. *American antiquity*, *28*(2), 217-225.

Braun R, Catalani C, Wimbush J, Israelski D. (2013). Community health workers and mobile technology: a systematic review of the literature. PLoS ONE: 8: e65772. 52.

Bernabe-Ortiz, A, Curioso, W.H., Gonzales, M.A., Evangelista, W., Castagnetto, J.M., Carcamo C. P., Hughes J.P., Garcia P.J, Garnett G.P., King K Holmes K.K (2008). Handheld computers for self-administered sensitive data collection: a comparative study in Peru. *Biomedical Central Medical Informatics Decision Making; 8:11.*

Bernard, H. R. (2006). Interviewing: Unstructured and semi-structured. *Research methods in anthropology: Qualitative and quantitative approaches*, *210-250.*

Bryce, J., Gilroy, K., Jones, G., Hazel, E., Black, R.E., & Victoria, C.G. (2010). The

Accelerated Child Survival and Development Programme in West Africa: a retrospective evaluation. *The Lancet, 375(9714), 572-582.*

Calnan, M. & Rowe, R., (2006)**.** Trust relations in health care: developing a theoretical framework for the "new" NHS. *Journal of Health Organization & Management. 2006;20(5):376–96.*

Car, J., Gurol-Urganci, I., de Jongh, T., Vodopivec-Jamsek, V., & Atun, R. (2012). Mobile phone messaging reminders for attendance at scheduled healthcare appointments. *Cochrane Database of Systematic Reviews*, (4).

Chaiyachati, K.H., Loveday, M., Lorenz, S., Lesh, N., Larkan, L., Cinti, S., Friedland, G. H., & Haberer J.E. (2013). A pilot study of an mHealth application for healthcare workers: poor uptake despite high reported acceptability at a rural South African community-based MDR-TB treatment program, *PLoS One, 8, 5.*

Chang, L. W., Kagaayi, J., Arem, H., Nakigozi, G., Ssempijja, V., Serwadda, D., … Reynolds, S. J. (2011). Impact of a mHealth intervention for peer health workers on AIDS care in rural Uganda: a mixed methods evaluation of a cluster-randomized trial. *AIDS and behavior, 15(8), 1776–1784.*

Chang, L.W., Njie-Carr, V., Kalenge, S., Kelly, J.F., Bollinger, R.C. & Alamo-Talisuna, S. (2013). Perceptions and acceptability of mHealth interventions for improving patient care at a community based HIV/AIDS clinic in Uganda: a mixed methods study. *AIDS Care, 25, 874–80.*

Chib, A. (2010). The Aceh Besar midwives with mobile phones project: Design and evaluation perspectives using the information and communication technologies for healthcare development model. *Journal of Computer-Mediated Communication, 15(3), 500–525.*

Chib, A., Lwin, M.O., & Jung, Y. (2009). Adoption of mobile phones to enhance health care: A technology acceptance study of maternal care workers in Indonesia. *Media Asia, 36(4),216-222.*

Cohen, Y.A. (ed.). (1974). Culture as Adaptation. In: *Man in Adaptation: The Cultural Present*. Yehudi A. Cohen, New York: Aldine.

Cole-Ceesay R, Cherian M, Sonko A et al. (2010). Strengthening the emergency healthcare system for mothers and children in The Gambia. *Reproductive Health, 7: 21.*

Croker, J.E., Swancutt, D.R., Roberts, M.J., Abel, G.A., Roland, M., Campbell, J.L., (2013). Factors affecting patients' trust and confidence in GPs: evidence from the English

national GP patient survey. *Biomedical Journal open. 2013;3(5).*

Dambisya, Y.M. (2007) *A review of non-financial incentives for health worker retention in east and southern Africa.* Health Systems Research Group, Department of Pharmacy, School of Health Sciences, University of Limpopo, South Africa.

Dawson, P., Pradhan, Y. V., Houston, R., Karki, S., Poudel, D., & Hodgins, S. (2008). From research to national expansion: 20 years' experience of community-based management of childhood pneumonia in Nepal. *Bulletin of the World Health Organization*, *86*, 339-343.

Degefie, T., Marsh, D., Gebremariam, A., Tefera, W., Osborn, G., & Waltensperger, K. (2009). Community case management improves use of treatment for childhood diarrhea, malaria and pneumonia in a remote district of Ethiopia. *Ethiopian Journal of Health Development*, *23*(2).

DeRenzi, B., Findlater, L., Payne, J., Birnbaum, B., Mangilima, J., Parikh, T., Borriello, G. & Lesh, N. (2012). Improving Community Health Worker Performance through Automated SMS. *Proceedings of the Fifth International Conference on Information And Communication Technologies and Development*. Association for Computing Machinery 25–34. ACM, New York, NY, USA.

DeSouza, Sherwin I., M. R. Rashmi, Agalya P. Vasanthi, Suchitha Maria Joseph, and Rashmi Rodrigues. "Mobile phones: the next step towards healthcare delivery in rural India?" *PloS one* 9, no. 8 (2014): e104895.

Dobres M.A. (1999). Book Reviews. *Visual Anthropology Review, 15, 88-92.*
Earth Institute. (2010). *Barriers and Gaps Affecting mHealth in Low and Middle Income Countries: A Policy White Paper.* Washington, D.C., mHealth Alliance

Dobzhansky, T. (1972). Natural selection in mankind. *The structure of human populations*, 213-233.

Duclos, V. (2015). Global eHealth Designing spaces of care in the era of global connectivity. *global health*.

Florez-Arango, J. F., Iyengar, M. S., Dunn, K., & Zhang, J. (2011). Performance factors of mobile rich media job aids for community health workers. *Journal of the American Medical Informatics Association*, *18*(2), 131-137.

Frog & UNICEF (2013). Mobile Technologies & Community Case Management — Solving the Last Mile in Health Care Delivery.

Geertz, C. (Ed.). (1972). *Myth, symbol, and culture*. Norton.

Ghimire, M., Pradhan, Y. V., & Maskey, M. K. (2010). Community-based interventions for diarrhoeal diseases and acute respiratory infections in Nepal. *Bulletin of the World Health Organization*, *88*, 216-221.

Githinji, S., Kigen, S., Memusi, D., Nyandigisi, A., Mbithi, A.M., Wamari, A., Muturi, A.N., Jagoe, G., Barrington, J., Snow, R. W. & Zurovac, D. (2013). Reducing stock-outs of lifesaving malaria commodities using mobile phone text-messaging: SMS for life study in Kenya. *PLoS One, 8, 1.*

Gitonga, C.W., Karanja, P.N., Kihara, J., Mwanje, M., Juma, E., Snow, R.W., Noor, A.M., & Brooker, S. (2010). Implementing school malaria surveys in Kenya: towards a national surveillance system. *Malaria Journal, 9,306.*

Gove, S. (1997). Integrated management of childhood illness by outpatient health workers: technical basis and overview. The WHO Working Group on Guidelines for Integrated Management of the Sick Child. *Bulletin of the World Health Organization*, *75*(Suppl 1), 7.

Grimsbø, G.H., Engelsrud, G.H., Ruland, C.M. & Finset, A. (2012). Cancer patients' experiences of using an Interactive Health Communication Application (IHCA). *International Journal of Qualitative Studies on Health and Well-being, 7, 1–14.*

Guy, R., Hocking, J., Wand, H., Stott, S., Ali, H., & Kaldor, J. (2012). How effective are short message service reminders at increasing clinic attendance? A meta-analysis and systematic review. *Health Services Research, 47, 614–632.*

Gyapong, J., Garshong, B., Akazili, J., Aikins, M., Agyepong, I., & Nyonator, F. (2007). Critical Analysis of Ghana's Health System with a focus on equity challenges and the National Health Insurance. *SHIELD Work package*, *1*, 27.

Hammersley, M., & Atkinson, P. (2007). *Ethnography: Principles in practice*. London: Routledge.

Hall, M.A, Dugan, E., Zheng, B.Y, Mishra, A.K. (2001) Trust in physicians and medical institutions: What is it, can it be measured, and does it matter? *The Milbank quarterly;79(4):613+.*

Hess, D.J., & Layne L.L., (1992) *The Anthropology of Science and Technology: Knowledge and Society.* Greenwich: Jai Press.

Hindess, B. (1986). *Actors and Social Relations* in Wardell M.L and Turner S.P. Turner (eds.)

Sociological Theory in Transition, London: Allen and Unwin.

Hoffman, J.A., Cunningham, J.R., Suleh, A.J., Sundsmo, A., Dekker, D., Vago, F., Munly, K., Igonya, E.K., & Hunt-Glassman, J (2010). Mobile direct observation treatment for tuberculosis patients: a technical feasibility pilot using mobile phones in Nairobi, Kenya. *American Journal of Preventive Medicine, 39(1), 78–80.*

Horst, H.A. & Miller, D. (2006). *The Cell Phone: An Anthropology of Communication.* Oxford (UK) Berg, Publishers.

Horvath T, Azman H, Kennedy GE, Rutherford GW (2012) Mobile phone text messaging for promoting adherence to antiretroviral therapy in patients with HIV infection. Cochrane Database Systematic Review 3: CD009756.

Hughes, T. (1983). *Networks of Power: Electrification in Western Society*, 1880-1930. Baltimore, Johns Hopkins Univ. Press.

Hughes, T. (1990). *From deterministic dynamos to seamless-web systems.* In Engineering as a Social Enterprise, H. Sladovich, H. (ed.). Washington: Natl. Acad. Press.

Iluyemi, A. (2009). *Community-based health workers in developing countries and the role of m-health.* In: Wootton, R., Patil, N., Scott, R. & Ho, K. (eds.) Telehealth in the developing world: London (UK): Royal Society of Medicine Press/International Development Research Centre.

Ingold, T. (1988). Tools, minds, and machines: an excursion into the philosophy of technology. *Techniques et Cultures 12(15), 1- 76.*

Istepanian, R. and J. Lacal (2003). "Emerging Mobile Communication Technologies for Health: Some Imperative notes on m-Health." Paper presented at the 25th International Conference of the IEEE Engineering in Medicine and Biology Society, Cancun, Mexico.

ITU (2013). *The World in 2013: ICT Facts and Figures*. Geneva: International Telecommunication Union.

Jamison, D.T. (2006). *Investing in health.* Chapter 1 in: Jamison, D.T., Breman, J.G., Measham, A.R., Alleyne, G., Claeson, M., Evans D, et al. (Eds). Disease control priorities in developing countries (2ed.). New York, NY, Oxford University Press and World Bank.

Jennings, L., Ong'ech, J., Simiyu, R., Sirengo, M. & Kassaye, S (2013). Exploring the use of

mobile phone technology for the enhancement of the prevention of mother-to-child

transmission of HIV program in Nyanza, Kenya: a qualitative study. *Biomedical*

Central Journal of Public Health, 13, 1131.

Jimoh, L., Pate, M.A., Lin, L., Schulman, K.A. (2012). A model for the adoption of ICT by

health workers in Africa. *International Journal of Medical Informatics, 81, 773–781.*

Jones, C.O., Wasunna, B., Sudoi, R., Githinji, S., Snow, R.W. & Zurovac, D. (2012). "Even

if you know everything you can forget": health worker perceptions of mobile phone

text-messaging to improve malaria case-management in Kenya. *PLoS One, 7, 6.*

Kabue, M.M., Otieno, D, Shiroya-Wandabwa, M, Subramanian, S, Tsuma, L, and Waka C.

(2016) Feasibility Study of the Implementation of iCCM in Bondo Sub-County:

Leveraging Existing Systems. Arlington, Virginia: John Snow, Inc.

Kahn, J. G., Yang, J. S., & Kahn, J. S. (2010). ''Mobile'' health needs and opportunities in

developing countries. *Health Affairs, 29, 252–258.*

Källander, K., Tibenderana, J.K., Akpogheneta, O.J., Strachan, D.L., Hill, Z., ten Asbroek,

A.H., Conteh, L., Kirkwood, B.R. & Meek S.R. (2013). Mobile health (mHealth)

approaches and lessons for increased performance and retention of community health

workers in low-and middle-income countries: a review. *Journal of Medical Internet*

Research, 15, 1.

Kalyango, J. N., Rutebemberwa, E., Karamagi, C., Mworozi, E., Ssali, S., Alfven, T., &

Peterson, S. (2013). High adherence to antimalarials and antibiotics under integrated

community case management of illness in children less than five years in eastern

Uganda. *PLoS One*, *8*(3), e60481.

Kamanga, A., Moono, P., Stresman, G., Mharakurwa, S. & Shiff, C. (2010). Rural health

centres, communities and malaria case detection in Zambia using mobile telephones: a

means to detect potential reservoirs of infection in unstable transmission conditions.

Malaria Journal, 9, 96.

Kaplan, W. A. (2006). Can the ubiquitous power of mobile phones be used to improve health

outcomes in developing countries? *Global Health, 2, 9.*

Kenya National Bureau of Statistics (KNBS) and ICF Macro. (2010). *Kenya Demographic and*

Health Survey 2008-09. Calverton, Maryland: KNBS and ICF Macro.

Kenya National Bureau of Statistics (KNBS) and ICF Macro. (2015). *Kenya Demographic and*

Health Survey 2014. Calverton, Maryland: KNBS and ICF Macro.

Kim, H. W., Chan, H. C., & Gupta, S. (2007). Value-based adoption of mobile Internet: An empirical investigation. *Decision Support Systems, 43(1), 111–126.*

Kirch, P. V. (1980). The archaeological study of adaptation: theoretical and methodological issues. In *Advances in archaeological method and theory* (pp. 101-156). Academic Press.

Lacal, J. (2003). Cell Phones and telemedicine. *Paper presented at the Fifth International Workshop on Enterprise Networking and Computing in the Healthcare Industry.* Santa Monica, California.

LeCompte, M.D. & Schensul, J. J. (2010). *Designing and Conducting Ethnographic Research: An Introduction (2ed.*). Alta Mira Press, U.K

Lee, S., Chib, A. & Kim, J.N. (2011). Midwives' cell phone use and health knowledge in rural communities. *Journal of Health Communication 16(9), 1006–23.*

Lehmann U, Dieleman M, Martineau T. (2008). Staffing remote rural areas in middle-and low-income countries: a literature review of attraction and retention. *Biomedical central Health Servres, 8: 19.*

Lemay, N. V., Sullivan, T., Jumbe, B., & Perry, C. P. (2012). Reaching remote health workers in Malawi: Baseline assessment of a pilot mHealth intervention. *Journal of Health Communication, 17(Suppl. 1), 105–117.*

Lester, R., Ritvo, P., Mills, E., Kariri, A., Karanja, S., Chung, M.C., Jack, W., Habyarimana, J., Sadatsafavi, M., Najafzadeh, M., Marra, C.A., Estambale, B., Ngugi, E., Ball, T.B., Thabane, L., Gelmon, L.J., Kimani, J., Ackers, M. & Plummer, F.A. (2010). Effects of mobile phone short message service on antiretroviral treatment adherence in Kenya (WelTel Kenya1): a randomised trial. *Lancet, 376:1838–1845.*

Levesque, J., Harris, M.F., Russell, G. (2013) Patient-centred access to health care: conceptualising access at the interface of health systems and populations International. *Journal for Equity in Health, 12(1).*

Little A, Medhanyie A, Yebyo H, Spigt M, Dinant G-J, Blanco R. (2013). Meeting community health worker needs for maternal health care service delivery using appropriate mobile technologies in Ethiopia. PLoS ONE: 8: e77563.

Long, N. (2001). *Development Sociology: Actor Perspectives.* London, Routledge.

Lopez, A.D. & Mathers, C.D. (2006). Measuring the global burden of disease and

epidemiological transitions: 2002– 2030. *Annals of Tropical Medicine and Parasitology, 100(5–6), 481–99.*

Lori, J.R., Munro, M.L., Boyd, C.J. & Andreatta P. (2012). Cell phones to collect pregnancy data from remote areas in Liberia. *Journal of Nursing Scholarship, 44, 294–301.*

Lund, S., Hemed, M., Nielsen, B.B., A. Said, K. Said, Makungu, M.H. & Rasch, V. (2012). Mobile phones as a health communication tool to improve skilled attendance at delivery in Zanzibar: a cluster-randomised controlled trial. *BJOG: An International Journal of Obstetrics and Gynaecology, 119(10), 1256–1264.*

Macleod B, Phillips J, Stone AE, Walji A, Awoonor-Williams JK. (2012). The Architecture of a Software System for Supporting Community-based Primary Health Care with Mobile Technology: The Mobile Technology for Community Health (MoTeCH) Initiative in Ghana. *Journal of Public Health Informatics, 4: 1–17.*

Malvey, D., & Slovensky, D. J. (2014). *mHealth: transforming healthcare.* New York Heidelberg Dordrecht London: Springer.

Manda T.D & Herstad J. (2010) "Implementing Mobile Phone Solutions for Health in Resource Constrained Areas: Understanding the Opportunities and Challenges." *E-Infrastructures and E-Services on Developing Countries.* Springer: Berlin, Heidelberg, 95–104.

Mechael, P., Batavia, H., Kaonga, N., Searle, S., Kwan, A., Goldberger, A., Fu, L. & Ossman, J. (2010). *Barriers and Gaps Affecting mHealth in Low and Middle Income Countries: Policy White Paper.* New York: Center for Global Health and Economic Development Earth Institute, Columbia University.

Mechael, P.N. (2009). The case for mHealth in developing countries. *Innovations: Technology, Governance, Globalization, 4,103.*

Medhanyie, A.A., Little, A., Yebyo, H., Spigt, M., Tadesse, K., Blanco, R. et al. (2015). Health workers' experiences, barriers, preferences and motivating factors in using mHealth forms in Ethiopia. *Human Resources for Health 13, 2.*

Medhi, I., Jain, M., Tewari, A., Bhavsar, M., Matheke-Fischer, M. & Cutrell, E. (Eds.) (2012). Combating rural child malnutrition through inexpensive mobile phones. *Proceedings of the 7th Nordic Conference on Human-Computer Interaction: Making Sense through Design.* ACM, New York, NY, USA.

Mort, M., May, C. R., & Williams, T. (2003). Remote doctors and absent patients: acting at a distance in telemedicine? *Science, Technology, & Human Values*, *28*(2), 274-295.

Milligan C. (2001). *Geographies of care: space, place and the voluntary sector.* Aldershot; Ashgate

Ministry of Health (2013). *A National Framework and Plan of Action for the Implementation of Integrated Case Management (ICCM) in Kenya, 2013–2018.* Unpublished. Nairobi: Afya House.

Ministry of Health (2014). *Kenya Health Policy 2014–2030.* Nairobi, Kenya: Afya House.

Mullan F. (2005). The metrics of the physician brain drain. *New England Journal of Medicine. 353(17), 1810–8.*

Ngabo F, Nguimfack J, Nwaigwe F et al. (2012) Designing and Implementing an Innovative SMS-based alert system (RapidSMS-MCH) to monitor pregnancy and reduce maternal and child deaths in Rwanda. *Pan African Medical Journal, 13: 31-27.*

Nglazi, M.D, Bekker, L.G, Wood, R, Hussey, G.D, Wiysonge, C.S, (2013). Mobile phone text messaging for promoting adherence to anti-tuberculosis treatment: a systematic review. *Biomedical Central Infectious Diseases,13:566*

Noordam, A. C., Kuepper, B. M., Stekelenburg, J., & Milen, A. (2011). Improvement of maternal health services through the use of mobile phones. *Tropical Medicine & International Health*, *16*(5), 622-626.

Odeny, T. A., Bailey, R. C., Bukusi, E. A., Simoni, J. M., Tapia, K. A., Yuhas, K., ... & McClelland, R. S. (2012). Text messaging to improve attendance at post-operative clinic visits after adult male circumcision for HIV prevention: a randomized controlled trial. *PloS one, 7*(9), e43832.

Park, L. G., Beatty, A., Stafford, Z., & Whooley, M. A. (2016). Mobile Phone Interventions for the Secondary Prevention of Cardiovascular Disease. *Progress in cardiovascular diseases*, *58*(6), 639–650.

Percival, J. & Hanson, J. (2006) Big brother or brave new world? Telecare and its implications for older people's independence and social inclusion. *Critical Social Policy; 26; 888*

Pfaffenberger, B. (1992). Social Anthropology of Technology. *Annual Review of Anthropology 21, 491– 516.*

Phillips, G., Free, C., Felix, L., Galli, L., Patel, V., Edwards, P., (2010) The effectiveness of

M-health technologies for improving health and health services: a systematic review protocol. *Biomedical Central Research Notes 3: 250.*

Poland, B., Lehoux, P., Holmes, D. and Andrews, G. (2005) How place matters: unpacking technology and power in health and social care. *Health and Social Care in the Community;13, 170–80.*

Pop-Eleches, C., Thirumurthy, H., Habyarimana, J. P., Zivin, J. G., Goldstein, M. P., de Walque, D., & Bangsberg, D. R. (2011). Mobile phone technologies improve adherence to antiretroviral treatment in a resource-limited setting: A randomized controlled trial of text message reminders. *AIDS, 25, 825–834.*

Ramachandran, A., Snehalatha, C., Ram, J., Selvam, S., Simon, M., Nanditha, A., ... & Oliver, N. (2013). Effectiveness of mobile phone messaging in prevention of type 2 diabetes by lifestyle modification in men in India: a prospective, parallel-group, randomized controlled trial. *The lancet Diabetes & endocrinology*, *1*(3), *191-198.*

Rivett, G. (2007). *National Health Service History.* Geoffrey Rivett.

Rodrigues R, Shet A, Antony J, Sidney K, Arumugam K, et al. (2012) Supporting Adherence to Antiretroviral Therapy with Mobile Phone Reminders: Results from a Cohort in South India. *PLoS ONE 7(8): e40723.*

Rotheram-Borus, M.J., Tomlinson, M., Gwegwe, M., Comulada, W.S., Kaufman, N., Keim, M. (2012). Diabetes buddies: peer support through a mobile phone buddy system. *Diabetes Education, 38(3), 357–365.*

Rowe, S.Y., Kelly, J.M., Olewe, M.A., Kleinbaum, D.G., McGowan, J.E., McFarland, D.A., RogerRochat, R. & Deming, M.S. (2007). 'Effect of Multiple Intervention's on Community Health Workers' Adherence to Clinical Guidelines in Siaya District, Kenya.'*Transactions of the Royal Society of Tropical Medicine and Hygiene, 101 (2), 188–202.*

Sakallaris BR, Miller WL, Saper R, Kreitzer M & Jonas W. (2016) Meeting the Challenge of a more person-centered Future for US Healthcare. *Global Advances in Health and Medicine. 5(1):51–60.*

Schellenberg, D., Schellenberg, J. R. M., Mushi, A., Savigny, D. D., Mgalula, L., Mbuya, C., & Victora, C. G. (2003). The silent burden of anaemia in Tanzanian children: a

community-based study. *Bulletin of the World Health Organization*, *81*, 581-590.

Siedner, M.J., Haberer, J.E., Bwana, M.B., Ware, N.C. & Bangsberg, D.R. (2012). High acceptability for cell phone text messages to improve communication of laboratory results with HIV-infected patients in rural Uganda: a cross sectional survey study. *Biomedical Central Journal of Medical Information and Decision Making, 12, 56.*

Schillmeier, M & Domènech, M (eds). (2010). *New Technologies and Emerging Spaces of Care*, Ashgate Publishing, Farnham, UK.

Sharp, J.W. (2011). *Social media in health care: What's Working, What's Not.* HIMSS 2011, Conference on Social Media Presentation, Orlando, Florida.

Shrivastava, S. R., Shrivastava, P. S., & Ramasamy, J. (2013). Integrated management of childhood illness: Bringing treatment closer to home. *Progress in Health Sciences*, *3*(2), 187-190.

Steward, J.H (1955), *Theory of Culture Change*. Urbana: University of Illinois Press.

Sutton, M.Q. and Anderson E.N (2010), *Introduction to Cultural Ecology* (2ed). Altamira Press, Rowman and Little Publishers Inc.

Tamrat, T. & Kachnowski, S. (2012). Special delivery: An analysis of mHealth in maternal and newborn health programs and their outcomes around the world. *Maternal Child Health Journal, 16, 1092–1101.*

Tariq, A. & Akter, S. (2011). *An assessment of m-Health in developing countries using task technology fit model. AMCIS 2011 Proceedings (pp. 1-12)*. Detroit, USA: Association for Information Systems.

Treatman, D., & Lesh, N. (2012). Strengthening community health systems with localized multimedia. *Proceedings of M4D 2012 28-29 February 2012 New Delhi, India*, *28*(29), 7.

Tomlinson, M., Siedner, M.J., Rotheram-Borus, M.J., Swartz, L. & Tsai, A.C. (2013). "Scaling up mHealth: where is the evidence?" *PLoSMedicine, 10, 2.*

UN General Assembly (2015) *Transforming our world: the 2030 Agenda for Sustainable Development.* 21 October 2015, A/RES/70/.

UNICEF (2015). *Levels and Trends in Child Mortality, UN Inter-Agency Group for Child Mortality Estimation Report, 2015.* New York, USA.

Van Heerden, A., Norris, S., Tollman, S., Richter, L., & Rotheram-Borus, M. J. (2013).

Collecting maternal health information from HIV-positive pregnant women using mobile phone-assisted face-to-face interviews in Southern Africa. *Journal of medical Internet research, 15*(6), e116.

Vervloet M, Linn AJ, van Weert JC, De Bakker DH, Bouvy ML, Van Dijk L (2012). The

effectiveness of interventions using electronic reminders to improve adherence to chronic medication: a systematic review of the literature. *Journal of the American Medical Informatics Association, 19(5):696–704.*

Vervloet M, van Dijk L, Santen-Reestman J, et al. Improving medication adherence in diabetes

type 2 patients through real time medication monitoring: a randomised controlled trial to evaluate the effect of monitoring patients' medication use combined with short message service (SMS) reminders. *Biomedical central Health Servres 2011; (11):5.*

Victora, C.G., Wagstaff, A., Schellenberg, J.A., Gwaitkin, D., Claeson, M., Habicht, J.P., (2003). Applying an equity lens to child health and mortality: more of the same is not enough. *Lancet 362: 233–241.*

Vital Wave Consulting (2009). *The opportunity of   mobile technology for healthcare in the developing world.* Washington (DC) and Berkshire (UK): UN Foundation–Vodafone Foundation Partnership.

Vodafone (2006). The role of mobile phones in increasing accessibility and efficiency in healthcare. In The Vodafone policy paper series. Vodafone Group Plc. ISBN 0-9552578-0-8 ISBN 978-0-9552578-0-3.

Waruingi, M., Underdahl, L., & Macharia, W. (2009). Opportunity in delivery of health care over mobile devices in developing countries. *AJFAND*, *9*(5), 2.

Weinberg, J., Kaddu, S., Gabler, G. & Kovarik, C.L. (2009). The African tele-dermatology project: providing access to dermatologic care and education in sub-Saharan Africa. *Pan-African Medical Journal, 3,16.*

West, D. (2013). "*How mobile devices are transforming healthcare*, "in Brookings: Issues in Technology Innovation, Brookings.

World Health Organization (2011). "*mHealth: new horizons for health through mobile technologies*," in WHO: Global Observatory for eHealth Series, vol.3, World Health Organization.

World Health Organization. (2012). WHO/UNICEF Joint Statement Integrated Community

Case Management (iCCM). An Equity-Focused Strategy to Improve Access to Essential Treatment Services for Children. *Geneva and New York: WHO and UNICEF*.

Yeboah-Antwi, K., Pilingana, P., Macleod, W. B., Semrau, K., Siazeele, K., Kalesha, P., ... & Kamholz, K. (2010). Community case management of fever due to malaria and pneumonia in children under five in Zambia: a cluster randomized controlled trial. *PLoS Medicine*, *7*(9), e1000340.

Yu, P., de Courten, M., Pan, E., Galea, G., Pryor, J. (2009).
The development and evaluation of a PDA-
based method for public health surveillance data collection in developing countries."
International Journal of Medical Informatics, 78(8):532-542.

Zurovac, D., Larson, B.A., Sudoi, R.K., & Snow R.W. (2012). Costs and cost-effectiveness of a mobile phone text-message reminder programmes to improve health workers' adherence to malaria guidelines in Kenya. *PLoS One, 7,12.*

Zurovac, D., Sudoi, R.K., Akhwale, S., Ndiritu, M., Hamer, D.H., Rowe, A.K. & Snow, R.W. (2011). The effect of mobile phone text-message reminders on Kenyan health workers' adherence to malaria atrestment guidelines: a cluster randomised trial. *Lancet, 378, 795–803.*

Zurovac, D., Talisuma, A.O. & Snow, R.W. (2012). Mobile phone text messaging: tool for malaria control in Africa. *PLoS Medicine, 9, 2.*

8.0 APPENDICES

APPENDIX 1: In-depth Interview Schedule (For Health workers)

My name is Agnetta Adiedo Nyabundi. I am a post graduate student at Maseno University, department of Sociology and Anthropology. I am carrying out a study on the health workers perceptions and use of mobile technology in case management of children under five in Nyaguda sub-location. You have been sampled as one of the respondent. With your permission I will audiotape and take notes during the interview. If Yes tick and continue, if No, X and stop.

Yes

No.

A. Demographic Characteristics

1. Respondent No.: ………….
2. Village: …………………

Uses of Mobile Technology in ICCM

1. Has iCCM been of help within the community?
2. What challenges does iCCM face that the mobile would help to address within the context of Nyaguda?
3. How will the introduction of mobile phones be helpful within the context of Nyaguda sub-location in the identification of illnesses?
4. How would the mobile phone be used in increasing thoroughness in the examination of children under five with common childhood illnesses within the context of Nyaguda Sub-location?
5. How would the mobile phone be used to increase identification of danger signs for referral among children less than five years within the context of Nyaguda sub-location?
6. What role do the mobile phones play during the referral of severe cases of illnesses among children less than five years given the ecological setting of Nyaguda sub-location?
7. How can mobile phones be used in support supervision of community health workers by the Community health Extension workers (CHEWs) given the ecological setting of Nyaguda?

8. How can mobile phones be used in the supervision of CHEWs by the Sub-county health facility workers within their work context in Nyaguda sub-location?

9. How can mobile phones be used in the monitoring of commodities used in the management of childhood illnesses within the ecological setting of Nyaguda sub-location?

Health Workers Perceptions on the integration of Mobile phones in the management of childhood illnesses

1. In your own view do you think mobile phones can be used in the identification of childhood illnesses within the context of Nyaguda sub-location and if so how?

2. In your view how appropriate is the use mobile phones during treatment of childhood illnesses within the ecological setting of Nyaguda?

3. In your view how appropriate is it to use mobile phones for referral of severe cases of illnesses among children less than five?

4. In your view can the mobile phone be used as an incentive within your work setting and if so how?

5. Which functions of the mobile phones would be most appropriate within your setting?

6. During supervision what time of the day and how many times would you prefer to be contacted?

7. In your view how would the mobile phone help to monitor commodities given the ecological setting of the study area?

8. In your view how would the use of mobile phone help in reducing the workload within the health sector especially the management of childhood illnesses within the settings of the study area?

Challenges associated with the use of mobile technology in the management of childhood illnesses.

1. What are the challenges associated with the integration of mobile phone in the management of childhood illnesses within this context?

2. Can the use of the mobile phone pose a challenge in the identification of childhood illnesses and if Yes which challenges?

3. What can hinder the integration of mobile phone in the treatment of childhood illnesses within the setting of Nyaguda sub-location?

4. What challenges can be experienced in the use of mobile phones during support supervision of community health workers within the ecological setting of Nyaguda sub-location?

5. What can hinder the use of mobile phone during the monitoring of commodities?

6. With the increased engagement of your mobile phone use would this be a challenge to your personal life within the socio-cultural context of Nyaguda?

APPENDIX 2: In-depth Interview Schedule (For Caregivers)

My name is Agnetta Adiedo Nyabundi. I am a post graduate student at Maseno University, department of Sociology and Anthropology. I am carrying out a study on the health workers perceptions and use of mobile technology in case management of children under five in Nyaguda sub-location. You have been sampled as one of the respondent. With your permission I will audiotape and take notes during the interview. If Yes tick and continue, if No, X and stop.

Yes

No.

A. **Demographic Characteristics**

Respondent No.: ………….

Village: …………………

Uses of Mobile Technology in ICCM

1. How would the integration of mobile phones in iCCM be used in the identification of childhood illnesses within the context of Nyaguda sub-location.

2. Within the socio-cultural and ecological context of Nyaguda sub-location, how would the mobile phone be used in the treatment of childhood illnesses.

3. How would the integration of mobile phones be useful in the follow-up of treatment procedures by the CHVs within this context.

4. How would mobile phones be used in the provision of health messages in relation to childhood illnesses within the ecological setting of Nyaguda.

5. Within the ecological setting of Nyaguda sub-location, how would mobile phones be useful during referral of severely sick children under five.

6. How would the integration of mobile phones encourage the commitment of health workers in their daily routine given the context of Nyaguda.

7. Within the context of Nyaguda sub-location, how would mobile phones be used in the monitoring of supply commodities.

Challenges associated with the use of mobile technology in the management of childhood illnesses.

1. What challenges would be experienced in the integration of mobile phones during identification of childhood illnesses within the context of Nyaguda.

2. Given the socio-cultural context of Nyaguda, what challenges would be faced in the integration of mobile phones during the treatment of childhood illnesses.

3. Within the ecological context of Nyaguda, would there be challenges in the integration of mobile phones within the routine follow-up of sick children and if yes explain.

4. Would there be challenges in the integration of mobile phones in the supply of support commodities given the context of Nyaguda.

5. Within the context of Nyaguda, would the integration of mobile phones in the referral process face any challenges and if so explain.

APPENDIX 3: Key Informant Interview Schedule
My name is Agnetta Adiedo Nyabundi. I am a post graduate student at Maseno University, department of Sociology and Anthropology. I am carrying out a study on the health workers perceptions and use of mobile technology in case management of children under five in Nyaguda sub-location. With your permission I will audiotape and take notes during the interview. You have been sampled as one of the respondent. Would you please allow me to interview you? If Yes tick and continue, if No, X and stop.
Yes
No.
Uses of Mobile Technology in ICCM

1. Are there any challenges within iCCM that can be addressed through the integration of mobile phones?
2. How can the mobile phone be used in iCCM within Nyaguda sub-location?

3. How can the integration of mobile phones be useful during the referral of severe cases of illnesses among children less than five years within the context of Nyaguda sub-location?

4. How can mobile phones be used in support supervision of community health workers by the Community health Extension workers (CHEWs) given the ecological setting of Nyaguda sub-location?

5. How can mobile phones be used in the supervision of CHEWs by the Sub-county health facility workers within the context of Nyaguda sub-location?

6. How can mobile phones be used in the monitoring of commodities used in the management of childhood illnesses given the ecological setting of Nyaguda sub-location?

7. How can the integration of mobile phones help in bridging the gap of accessibility to health care within the context of Nyaguda?

8. Within the context of Nyaguda sub-location, how can the integration of mobile phones help in reducing the workload within the health sector especially the management of childhood illnesses?

Challenges associated with the use of mobile technology in the management of childhood illnesses.

1. What are the challenges associated with the integration of mobile phone in the management of childhood illnesses?

2. How can the challenges in the integration of mobile phone influence the management of common illnesses among children under five within the context of Nyaguda sub-location?

3. What challenges can be experienced in the use of mobile phones during support supervision of community health workers within Nyaguda sub-location?

4. What can hinder the use of mobile phone during the monitoring of commodities given the context of Nyaguda sub-location?

APPENDIX 4: Focus Group Discussions (FGDs) (for Caregivers)

My name is Agnetta Adiedo Nyabundi. I am a post graduate student at Maseno University, department of Sociology and Anthropology. I am carrying out a study on the health workers perceptions and use of mobile technology in case management of children under five in Nyaguda sub-location. With your permission I will audiotape and take notes during the interview. You have been sampled as one of the respondent. Would you please allow me to interview you? If Yes tick and continue, if No, X and stop.

Yes

No.

Uses of Mobile Technology in ICCM

1. How would the mobile phone be of use in the improvement of diagnosis among children under five within this context?

2. How would mobile phones in the hands of the CHVs be of use in the treatment of childhood illnesses within the setting of Nyaguda

3. Given the ecological setting of Nyaguda, how appropriate would the use of mobile phones be in the identification of danger signs and referral of children under five?

4. Would the interaction with the CHVs through mobile phones make you feel more engaged in the assessment of the illnesses among children under five within the context of Nyaguda sub-location?

5. How would mobile phones be of use during the referral of severe cases of illnesses among children less than five years?

6. How can mobile phones be used by community health workers to give advice to the caregivers within the context of Nyaguda sub-location?

7. How can mobile phones be used in the monitoring of commodities used in the management of childhood illnesses given the ecological setting of Nyaguda?

8. In your view how would mobile phones be used to bridge the gap of accessibility to health care for children less than five within the context of Nyaguda sub-location?

9. What is your view on the integration of mobile phones in the management of childhood illnesses?

Challenges associated with the use of mobile technology in the management of childhood illnesses.

1. What would be the challenges associated with the integration of mobile phone in the management of childhood illnesses?

2. Can the use of the mobile phone pose a challenge in the identification of childhood illnesses and if Yes which challenges?

3. What can hinder the use of mobile phone in the treatment of childhood illnesses?

4. What challenges can be experienced in the use of mobile phones the routine work of community health workers?

5. Can the use of mobile phones interfere with messages on advice provided by community health workers?

6. What can hinder the use of mobile phone during the monitoring of commodities?

APPENDIX 5: Focus Group Discussions (FGDs) (for Community Health Workers)

My name is Agnetta Adiedo Nyabundi. I am a post graduate student at Maseno University, department of Sociology and Anthropology. I am carrying out a study on the health workers perceptions and use of mobile technology in case management of children under five in Nyaguda sub-location. With your permission I will audiotape and take notes during the interview. You have been sampled as one of the respondent. Would you please allow me to interview you? If Yes tick and continue, if No, X and stop.

Yes

No.

Uses of Mobile Technology in ICCM

1. How would the use of mobile phones in this context improve the efficiency in iCCM?

2. How would the use of mobile phones aid in the identification of danger signs and referral of children under five with common illnesses within this context?

3. Given the ecological setting of this area, how would the mobile phones be of help during the referral process of a child under five with severe condition?

4. How can mobile phones be used in support supervision of community health workers by the Community health Extension workers (CHEWs) within the cultural and ecological context of Nyaguda sub-location?

5. How can mobile phones be used in the supervision of CHEWs by the Sub-county health facility workers within their work context?

6. How can mobile phones be used in the monitoring of commodities used in the management of childhood illnesses given the ecological setting of the area?

Health Workers Perceptions on the integration of Mobile phones in the management of childhood illnesses

1. Do you think mobile phones can be used in the identification of childhood illnesses within this cultural context?

2. Giving your opinion, how appropriate is the integration of mobile phones during treatment of childhood illnesses within the context of Nyaguda sub-location?

3. In your view, how appropriate is it to use mobile phones for referral of severe cases of illnesses among children less than five given the ecological setting of the study area?

4. Do you consider that mobile phones can be used in the supervision of the health workers within this context, and if yes how?

5. In your view how appropriate are mobile phones in the monitoring of commodities used in the management of childhood illnesses?

6. In your view how can the use of mobile phone help in bridging the gap of accessibility to health care and if so How?

7. In your opinion how would the use of mobile phone help in reducing the workload within the health sector especially the management of childhood illnesses?

Challenges associated with the use of mobile technology in the management of childhood illnesses.

1. Would the integration of mobile phone to iCCM pose any cultural challenges and if Yes which ones?

2. How would the integration of mobile phones within the identification of common childhood illnesses within this context be of any challenge?

3. Within this context what would hinder the use of mobile phone in the treatment of childhood illnesses?

4. Given the context of Nyaguda sub-location what challenges can be experienced in the use of mobile phones during support supervision of community health workers?

5. What can hinder the use of mobile phone during the monitoring of commodities within this context?

APPENDIX 6: Focus Group Discussions (FDGs) (FOR Community Health and Extension Workers)

My name is Agnetta Adiedo Nyabundi. I am a post graduate student at Maseno University, department of Sociology and Anthropology. I am carrying out a study on the health workers perceptions and use of mobile technology in case management of children under five in Nyaguda sub-location. With your permission I will audiotape and take notes during the

interview. You have been sampled as one of the respondent. Would you please allow me to interview you? If Yes tick and continue, if No, X and stop.

Yes

No.

Uses of Mobile Technology in ICCM

1. How would the integration of mobile phones in iCCM improve accessibility of health care services within this context?

2. Would the integration of mobile phones within iCCM help during referral for severe cases of children under five with childhood illnesses within this ecological setting?

3. How can mobile phones be used in support supervision of community health workers by the Community health Extension workers (CHEWs)?

4. How can mobile phones be used in the supervision of CHEWs by the Sub-county health facility workers within their context of work?

5. How can mobile phones be used in the monitoring of commodities used in the management of childhood illnesses within the context of Nyaguda sub-location?

Health Workers Perceptions on the integration of Mobile phones in the management of childhood illnesses

1. How appropriate would the integration of mobile phones within this context be in the management of childhood illnesses?

2. Given the cultural and ecological context of Nyaguda how would mobile phones be used in the supervision of the CHVs?

3. In your view, how appropriate are mobile phones in the monitoring of commodities used in the management of childhood illnesses?

4. According to your views can the use of mobile phone help in bridging the gap of accessibility to health care within the ecological and cultural setting of Nyaguda sub-location?

5. From your perspective would the integration of mobile phone help in reducing the workload within the health sector especially in the management of childhood illnesses?

6. How do you view the integration of mobile phones in the management of childhood illnesses?

Challenges associated with the use of mobile technology in the management of childhood illnesses.

1. What are the challenges associated with the integration of mobile phone in the management of childhood illnesses within the work context?
2. Can the use of the mobile phone pose a challenge in the identification of childhood illnesses within this context and if Yes which challenges?
3. What can hinder the use of mobile phone in the treatment of childhood illnesses within the work context?
4. What challenges can be experienced in the use of mobile phones during support supervision of community health workers?
5. Given the cultural setting of Nyaguda sub-location, how would the integration of mobile phones improve or influence the monitoring of commodities?

APPENDIX 7: Focus Group Discussions (FGDs) (for Facility Health Workers)

My name is Agnetta Adiedo Nyabundi. I am a post graduate student at Maseno University, department of Sociology and Anthropology. I am carrying out a study on the health workers perceptions and use of mobile technology in case management of children under five in Nyaguda sub-location. With your permission I will audiotape and take notes during the interview. You have been sampled as one of the respondent. Would you please allow me to interview you? If Yes tick and continue, if No, X and stop.

Yes

No.

Uses of Mobile Technology in ICCM

1. What functions of the mobile phone can be put to use effectively in iCCM?
2. How would the mobile phone be effective in iCCM?
3. How would the mobile phone be integrated in the proper diagnosis of a child with common illnesses within this context?
4. How appropriate would mobile phones be during the referral of severe cases of illnesses among children less than five years?
5. How appropriate would mobile phones be within this context in support supervision of community health workers by the Community health Extension workers (CHEWs)?

6. How appropriate would the mobile phones be used in the supervision of CHEWs by the Sub-county health facility workers?

7. How can mobile phones be used in the monitoring of commodities used in the management of childhood illnesses?

8. How comfortable do/would you feel to exchange with CHVs over mobile phones?

Health Workers Perceptions on the integration of Mobile phones in the management of childhood illnesses

1. Do you think mobile phones can be used in the identification of childhood illnesses?

2. How appropriate is the use mobile phones during treatment of childhood illnesses?

3. How appropriate is it to use mobile phones for referral of severe cases of illnesses among children less than five?

4. How appropriate would the integration of mobile phones be in the supervision of the health workers?

5. How appropriate are mobile phones in the monitoring of commodities used in the management of childhood illnesses?

6. How would the integration of mobile phone in iCCM help in bridging the gap of accessibility to health care within the context of Nyaguda sub-location?

7. How appropriate will the integration of mobile phone help in reducing the workload within the health sector especially the management of childhood illnesses within the work context?

Challenges associated with the use of mobile technology in the management of childhood illnesses.

1. What are the challenges associated with the integration of mobile phone in the management of childhood illnesses within the context of Nyaguda sub-location?

2. How can the challenges in the integration of mobile phones influence the management of childhood illnesses within the context of Nyaguda sub-location?

3. What challenges can be experienced in the use of mobile phones during support supervision of community health workers given the cultural and ecological setting of Nyaguda sub-location?

4. What can hinder the integration of mobile phones during the monitoring of commodities in iCCM within the context of Nyaguda sub-location?

APPENDIX 8: CONSENT FORM

TITLE OF THE RESEARCH: Health Workers' Perceptions and Use of Mobile Phones in Integrated Community Case Management of Childhood Illnesses in Nyaguda Sub-location, Kenya.

What you should know about the research

My name is Agnetta Adiedo Nyabundi. I am a post graduate student at Maseno University, department of Sociology and Anthropology. I am carrying out a study on the health workers perceptions and use of mobile technology in case management of children under five in Nyaguda sub-location.

The purpose of the research

This study aims to assess the health workers' views and use of mobile phones in community case management of childhood illnesses in Nyaguda sub-location, Kenya. We would like to invite you to join this study because your participation together with others will assist us in understanding how mobile phones can be used in iCCM to ensure efficiency and effectiveness in the management of common childhood illnesses for children less than five years in Nyaguda sub-location.

Why you should join:

You have been identified as one of the 25 CHVs in Nyaguda Sub-location to be part of the research because you can assist with information regarding iCCM and how mobile phones have been put to use informally during your day-to-day activities within iCCM. Your role in providing this information will also provide an avenue for other researchers and funding agencies to put into consideration the need to formally integrate mobile phones in iCCM

I will elaborate to you the contents of consent form but you can also take time to read it at your convenience. Feel free to ask me any time for any clarification on areas that are not clear to you.

Your Role

If you agree to be part of this research, your work will be to answer questions concerning the informal use of mobile phone in iCCM. It will take approximately 40-45 minutes to answer these questions.

You are free to stop me or interrupt and ask any question even after the session has started we start and you will receive no punishment for doing that. The session of the interview can be postponed to a later time or date in case something comes up and needs your urgent attention.

Disadvantage

You may feel bad talking about narrating some of the experiences in your daily routine of work and interaction with mobile phones but you are not doing this not just for your own benefit but for the benefit of improving the welfare of the community. In the event that it becomes too difficult to narrate certain experiences, the interview can be rescheduled until such a time when you are ready to talk about those experiences.

Advantages

You may not benefit directly from this research but your response will enable me and other partners who will be interested in the results of this study to devise ways of managing child health services to obtain better results.

Payment

There is no payment for participating in this research.

Confidentiality

We will try our best to keep whatever you have told us in confidence. You will not be identified by them nor shall we present them in a way that easily identifies you. Your name or any other means of identifying you will be not be used in your responses.

All the information collected through note-taking or audio-recording will be kept in safe custody and will only be accessible by permission to those who qualify to access it. The data in our computers will be stored safely and accessibility allowed to only those who qualify to do so.

Confidentiality during data collection

Data will be collected in your preferred location where there will be no interruption from other people through note-taking and audio-recording and will not be shared with others who are not employed to carry out this research.

Other issues

Your participation in this research is voluntary and you may opt out at your will. Your withdrawal from the study will not result in any penalty and it will not harm your relationship with the researcher.

Who can you contact in case of clarifications or problems?

In case of any clarifications or problems you may contact Maseno University Ethic Review Committee. Maseno University Ethics and Review Committee (MUERC) P.O. BOX Private Bag, Maseno. Telephone Numbers: 057 351 622 EXT. 3050

I agree to take part in this study having read and understood the information above

Signature _____Date _____