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**ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES
SCHOOL OF INFORMATION SCIENCE
AND
SCHOOL OF PUBLIC HEALTH**

**PROSPECTS OF mHEALTH ON IMPROVING NON COMMUNICABLE CHRONIC
DISEASE MANAGEMENT IN ADDIS ABABA: THE CASE OF PUBLIC HOSPITALS
OWNED BY ADDIS ABABA CITY ADMINISTRATION HEALTH BUREAU**

GASHAW LULIE

JUNE, 2013

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**A Thesis Submitted to the School of Graduate Studies of Addis Ababa University
in Partial Fulfillment of the Requirements for the Degree of Master of Science in
Health Informatics**

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LIST OF ABBREVIATIONS

CD ... Chronic Disease

CDM ... Chronic Disease Management

CSA ... Central Statistical Agency

DRA ... Disparity Reducing Advances

EMCIT ... Ethiopian Ministry of Communication and Information Technology

Ethio telecom ... Ethiopian Tele Communication

FMoH ... Federal Ministry of Health

HIS ... Health Information System

HMIS ... Health Management Information System

ICT ... Information and Communication Technology

IT ... Information Technology

mHealth ... Mobile Health

NCCDM ... Non Communicable Chronic Disease Management

NCCD ... Non Communicable Chronic Disease

NCDs ... Non Communicable Diseases

ND ... No Date

NGO ... Non Governmental Organizations

SMS ... Short Message Service

SPSS ... Statistical Package for Social Science

WHO ... World Health Organization

ABSTRACT

Introduction: Mobile Health is not a new technology today, but is a novel approach for Ethiopia, and in fact, has more profound impact on the country due to unmet demands for health and unprecedented health related challenges. Mobile Health could potentially reduce waiting times for patients, reduce the cost of the health system's operations, improve interdepartmental, inter-clinical communication and collaboration, improve Health Management Information System, improve self health management and enhance better resource allocation for the Chronic Disease care sector.

Objective: This study explores the prospects of Mobile Health on improving Non Communicable Chronic Disease Management in Addis Ababa Health Bureau Owned Hospitals in order to highlight the current status of mHealth, level of mHealth knowledge and the attitudes towards mHealth among the healthcare providers, other professionals and patients in Ethiopia.

Methodology: The study follows a descriptive cross – sectional study employing quantitative methods using self administered questionnaire and qualitative method using a key informant interview between the months of March and May 2013. A total of 403 respondents consisting of IT professionals, health professionals and patients are involved to depict the prospect of mHealth on improving non communicable chronic disease management in Addis Ababa. Qualitative data is collected by key informant interview supported by questionnaire held. Data analysis is done using Statistical Package for Social Sciences (SPSS) Version 20.

Results: The study reveals that healthcare providers, patients and other professionals in the health facilities had low mHealth knowledge level. The health facilities are not sufficiently furnished for implementing mHealth. However, health institutes' professionals have positive attitude towards mHealth and its application for non communicable chronic disease management. Based on the findings I have developed mHealth prototype which can improve non communicable chronic disease management.

Conclusions and Recommendations: The findings indicate there needs to train professionals and establish policy framework about mHealth. It is, therefore, recommended that Addis Ababa City Administration Health Bureau and Ministry of Health should allocate sufficient resources to implement mHealth.

Keywords

eHealth, Mobile Health, Chronic Disease, Non Communicable Chronic Disease, Chronic Disease Management, Mobile Technologies, Prototype, Information and Communication Technology.

CHAPTER ONE: INTRODUCTION

1.1. Background

The term mHealth is defined as "use of emerging mobile communications and network technologies for healthcare" (1). The mHealth field has appeared as a sub-segment of eHealth, which is the use of Information and Communication Technology (ICT), such as computers, mobile phones, communications satellite, patient monitors, etc., for health services and information (2). mHealth applications include the use of mobile devices in collecting community and clinical health data, delivery of healthcare information to practitioners, researchers, and patients, real-time monitoring of patient vital signs, and direct provision of care (3).

According to the Cisco Visual Networking, global mobile data traffic has doubled. And looking toward the future, the report estimates that global mobile data traffic will increase 18-fold between 2011 and 2016. By the end of that period, it is projected that there will be 10 billion mobile devices in use around the world (4).

The increasing incidence of CD has focused more attention on possible uses of ICT to improve the costly and time consuming nature of CD management and care. There are several stages in a complex chain of information sharing to improve delivery of care. A broad variety of stakeholders involved in the management and exchange of information relating to healthcare. More recently, a move to extend the sharing of information to empower patients and enable them to take an informed role in the management of their conditions has begun (5).

Mobile telephone service was launched in Ethiopia and ethio mobile was established in 1991 E.C. and infrastructures were built widely throughout the country (6). The subscription per 100 populations is 4.89. The country uses mHealth informally to general medication reminder, child vaccination reminder and to alert citizens during an emergency. Formally, the country uses Enate messenger for delivery reminder purpose. But the country is not applying this technology as expected to address other public health challenges (7).

1.2. Statement of the Problem

Chronic Diseases are diseases of long duration and generally slow progression, such as heart disease, hypertension, cancer, chronic respiratory diseases and diabetes, are by far the leading cause of mortality in the world, representing 63% of all deaths. Out of the 36 million people who died from chronic disease in 2008, 9 million were under 60 and 9% of these premature deaths occurred in low and middle-income countries including Ethiopia (8).

Patients are using Mobile Phones that monitor and transmit information to caregivers while also reminding patients to undertake different tests. This puts people in charge of their own test-taking and monitoring and keeps them out of doctor's offices until they need more detailed care. Software that reminds patients to take medications, set up appointments, and track compliance with medical instructions. This and other types of "virtual health assistants" are particularly helpful with those suffering from chronic illnesses (4).

Ethiopia is engaged in addressing various public health related challenges, including strengthening of the HISs (9). The motivation behind the development of mHealth arises from two factors. The first factor concerns the numerous constraints felt by healthcare systems. These constraints include high population growth, high burden of disease prevalence (10), low health care workforce, and limited financial resources. The second factor is the recent rapid rise in mobile phone penetration in the world (10). With greater access to mobile phones, the potential of lowering information and transaction costs in order eventually to deliver and improve healthcare.

The combinations of these two factors have motivated much discussion of how greater access to mobile phone technology can be forced to alleviate the numerous pressures faced by the country healthcare systems.

Hence, this study seeks to answer the following basic questions:

1. What are the opportunities to establish mHealth to Improve NCCDM?
2. What are the challenges to establish mHealth to Improve NCCDM?
3. What are the prospects of mHealth to improve NCCDM?

1.3. Objective of the Study

1.3.1. General Objective

To explore and identify the prospects of mHealth to improve Non Communicable Chronic Disease Management in Addis Ababa City Administration Health Bureau Owned Hospitals.

1.3.2. Specific Objective

Specific Objectives of the study are:

- To identify opportunities to establish mHealth in Addis Ababa City Administration Health Bureau Owned Hospitals.
- To identify challenges to establish mHealth in Addis Ababa City Administration Health Bureau Owned Hospitals.
- To explore the prospects of mHealth on improving NCCDM.
- To propose a suitable prototype based on the observed findings.

1.4. Significance of the Study

The study will contribute to get the following benefits. It will help to understand the prospects of mHealth on improving NCCDM in Addis Ababa while, mHealth provides comprehensive benefits to improve accessibility and quality of care. Assessing the prospects of mHealth on improving NCCDM in Addis Ababa City Administration Health Bureau Owned Hospitals provides facts and recommendations that should be considered by policy makers, program managers, and managers of health facilities in mHealth implementation and an input for further research conducted in the area. The facts that mHealth allows to remove such difficulties by sharing self monitoring responsibilities for their health have created the motivation for me to choose this topic for research.

Addressing the research question helps to identify next steps that will be taken by policy makers, program managers and managers of hospitals in order to realize a successful mHealth system and its subsequent nationwide scale up. Output of this study will also provide direction and

motivation for stakeholders interested in health care services. This study is also important to mobile infrastructure provider, such as telecommunication equipment manufacturers, distributors and service providers.

1.5. Scope and Limitation of the Study

The research was specifically limited on the prospects of mHealth on improving NCCDM by considering hospitals. Moreover, it focused only on Addis Ababa City Administration Health Bureau Owned Hospitals; the study does not include private health facility, federal owned hospitals, health centers, health posts and other possible stakeholders like Ethio telecom and EMCIT. In mobile telephone infrastructure coverage Addis Ababa City Administration Health Bureau Owned Hospitals were preferable to the regions health facility so the result of this finding might not be the representative of the prospects of mHealth on improving NCCDM of health facility which is found in the regions of the country. Due to lack of resources like time, budget, and other constraints this study only focused on Addis Ababa City Administration Health Bureau Owned Hospitals because Addis Ababa health facilities were a reference frame of other public and private health facilities found all over the country. The study included Yekatit 12 Hospital, Menelik II Hospital, Ras Desta Memorial Hospital, Zewditu Memorial Hospital and Tirunesh Beijing Memorial Hospital.

1.6. Organization of the Study

This research was divided in to five chapters. The first chapter which consists of the introductory part includes the back ground of the study, the statement of the problem, objective of the study, significance of the study, scope and limitation of the study, rational of the study and organization of the study. Chapter two present literature review. Chapter three, deals with the research methodology that was used to collect the desired data so as to attain the objective of the study. It discusses data collection instruments, data collection procedures and method of data analysis used in carrying out the research. Chapter four presents the findings of the research and the last chapter make conclusion and recommendation based on analysis and findings.

CHAPTER TWO: LITERATURE REVIEW

2.1. Previous Researches in the study area

mHealth is a component of eHealth, which is the use of information and communication technology (ICT), such as computers, mobile phones, communications satellite, patient monitors, etc., for health services and information (11). To date, no standardized definition of mHealth has been established. For the purposes of the survey, the Global Observatory for eHealth (GOe) defined mHealth as medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices (7). The U.S. Department of Health and Human Services defined, mHealth as the use of mobile and wireless devices to improve health outcomes, healthcare services and health research (12). The mHealth Alliance states that “mHealth stands for mobile-based or mobile-enhanced solutions that deliver health services”. US Broadband Plan define mHealth as "The use of mobile networks and devices in supporting e-care” (13). It emphasizes leveraging health-focused applications on general-purpose tools such as smart phones and Short Message Service (SMS) messaging to drive active health participation by consumers and clinicians (13).

The most common application of mHealth is the use of mobile phones and communication devices to educate customers about preventive health care services. However, mHealth is also used for disease surveillance, treatment support, epidemic outbreak tracking and chronic disease management (11). According to Wikipedia: mHealth the use of mobile telecommunication and multimedia technologies integrated within mobile and wireless health care delivery systems and is part of a movement towards patient-centered (decentralized) health service delivery (11).

Since mHealth field is relatively new, most literature on the subject has been written during this decade. Moreover, studies concerning the prospects of mHealth on NCCDM are scarce in developing countries. However, in low resourced environment, mHealth technologies are increasingly recognized as feasible platform for improving chronic disease management (14). Mobile phones enable end to end health care delivery, from rural village to urban center, populating a HIS with more complete data and providing a better view of the health. Mobile

phones may encourage more use of health care services because patients can seek care using the phone instead of spending their time and money to travel to see a doctor (2).

NCDs are caused to large extents, due to four behavioral risk factors: economic transition, rapid urbanization and 21st-century lifestyles: tobacco use, unhealthy diet, insufficient physical activity and the harmful use of alcohol. The greatest effects of these risk factors fall increasingly on low- and middle-income countries, and on poorer people within all countries, reflecting the underlying socioeconomic determinants. A major reduction in the burden of NCDs will come from population-wide interventions. The most effective interventions, such as tobacco control measures and salt reduction, are not implemented on a wide scale because of inadequate political commitment, insufficient engagement of non-health sectors, lack of resources, vested interests of critical constituencies, and limited engagement of key stakeholders (15).

According to the WHO Global Observatory for eHealth (GOe) has documented the analysis of four aspects of mHealth: adoption of initiatives, types of initiatives, status of evaluation, and barriers to implementation. Fourteen categories of mHealth services were surveyed. The survey has found that mHealth initiatives have been established in many countries, but there is variation in adoption levels. The most common activity was the creation of health call centers, which respond to patient inquiries using SMS for appointment reminders, using telemedicine, accessing patient records, measuring treatment compliance, raising health awareness, monitoring patients, and physician decision support (7).

Not surprisingly, there were big differentials between developed and developing nations. Africa had the lowest rate of mHealth adoption while North America, South America, and Southeast Asia showed the highest adoption levels. A number of countries have initiatives in the pilot stage or have informal activities that are underway. Member states reported their biggest mHealth obstacles (7).

The use of mobile devices in the health sector in Ghana has been increasing over the past five years. There are various pilot projects where mobile devices are being used to collect health data, facilitate Telemedicine, provide health messages to clients, follow-up children and women to reduce drop-out from service, manage logistics to reduce stock-outs, conduct health surveys and conduct facilitative supervision (16).

The research conducted on a Mobile Agent Approach for Ubiquitous and Personalized eHealth Information Systems, National and Kapodistrian University of Athens, in the face of the existing systems and platforms diversity and information scarcity, mobile agent technologies can provide the base for ever-present, transparent, secure, interoperable, and integrated eHealth information systems for the provision of adapted and personalized sustainable services to the citizens (3).

A research conducted in Bangladesh stated that, the people of the developing countries extensively use mobile devices but they are not familiar with mobile device based intelligent services. So Intelligent Mobile Health Monitoring System (IMHMS) can be very useful for them by providing health care services anywhere anytime through their mobile devices. For developing countries, IMHMS can aid physicians and specialists for better treatment of the patients as their whole medical data and treatment history is stored in Intelligent Medical Server (IMS) (17).

Institute for Alternative Futures, Cell Phones and Reducing Health Disparities, has employed cell phone health applications for recording and reinforcing nutrition, testing glucose, and managing diabetes. In addition, cell phones will become integral tools in delivering audio, text, and video messages including games that reinforce healthy behavior. The value to health is that cell phone related applications could provide early warning of disease, give real time monitoring of conditions, reinforcing effective treatment, and support healthier behavior in culturally appropriate ways (18).

Mobile technology is helping with chronic disease management, empowering the aged and pregnant mothers, reminding people to take medication at the proper time, extending service to rural areas, and improving health outcomes and medical system efficiency (7).

Chronic disease management represents the greatest health care challenge in many locales. Remote monitoring devices enable patients with serious problems to record their own health measures and send them electronically to physicians or specialists. This keeps them out of doctor's offices for routine care, and thereby helps to reduce health care costs.

Real-time management is especially important in the case of chronic diseases. In the area of diabetes, for example, it is crucial that patients monitor their blood glucose levels and gear their

insulin intake to proper levels. In the “old days” based on face-to-face encounters, patients had to visit a doctor’s lab or medical office, take a test, and wait for results to be delivered. That process was expensive, time-consuming, and inconvenient for all-involved. Having to get regular tests for this and other conditions is one of the factors that force medical costs up. However, it is possible to use remote monitoring devices at home that record glucose levels directly and electronically send them to the appropriate health care provider. Patients are using “Gluco Phones” that monitor and transmit glucose information to caregivers while also reminding patients when they need to undertake glucose tests. This puts people in charge of their own test-taking and monitoring and keeps them out of doctor’s offices until they need more detailed care. Software that reminds patients to take medications, set up appointments, and track compliance with medical instructions (4).

NCCD in low-income countries has started to receive the attention that it deserves. The Millennium Development Goals, which have dominated the global health agenda for the last decade, did not include chronic disease, but in 2005 a WHO report drew attention to the neglect of chronic disease (19) and in 2011 NCCD was the subject of a United Nations high-level meeting (7). Articles from Jimma University and collaborators published in this issue are timely and serve to highlight the problem of NCCD in Ethiopia (20).

An article published on the assessment of health care system for diabetics in 21 health centers and 5 regional hospitals in Addis Ababa found that lack of professionals was observed in all the health institutions in general and the health centers, in particular. Only 21% of patients had access for blood glucose monitoring at the same health institutions. The emphasis given for diabetic education (24%) was less than expected. Only 11 (5%) of diabetic patients were able to do self blood glucose monitoring at home (21).

The research team from Jimma conducted a cross sectional study of chronic disease and risk factors for chronic disease in 4,469 adults from the population around Gilgel Gibe Field Research Centre in southwest Ethiopia using the WHO’s STEPS protocol. They found an overall prevalence of chronic disease of “ 8.9% (diabetes 0.5%, cardiac disease 3%, hypertension 2.6%, asthma 1.5%, epilepsy 0.5%, depression 1.7%), and 80% of the subjects studied had at least one risk factor for chronic disease ” (20). When a sample was screened for hypertension and

diabetes, the prevalence of hypertension was found to be 3.5 times higher than that reported by the subjects and the prevalence of diabetes six times higher, indicating a large hidden burden of disease (20).

The prevalence of diabetes and hypertension, both self-reported and measured, was unsurprisingly higher in urban communities. The high prevalence of risk factors (exercise, diet and alcohol) in this group underlines the urgent need for policies for the prevention of these conditions (20).

Mobile health report presented by A.T. Kearney, states that with well established health systems the devastating challenge is, to meet the rising expectations of citizens while controlling costs to a manageable level. This situation is made more challenging by chronic disease conditions such as diabetes and heart disease which are increasingly in prevalence due to an aging population, changes in behavior, eating habits and life style.

The mobile health promise is to achieve co-location through the technology solution, offers a wide range of mechanisms by which patients can transact with health professionals, or systems which act as a proxy for health professionals, wherever they are. Even when a health professional is with the patient, he or she can interact with other parts of the health system remotely, accessing diagnostic tools, other health professionals, and images and prescribing drugs without needing to be in a hospital. Provide the opportunity to ask patients to input data about their condition or to connect to remote sensors. The report present potential applications of mobile health cardiac monitor along heart failure pathway as follows (22):

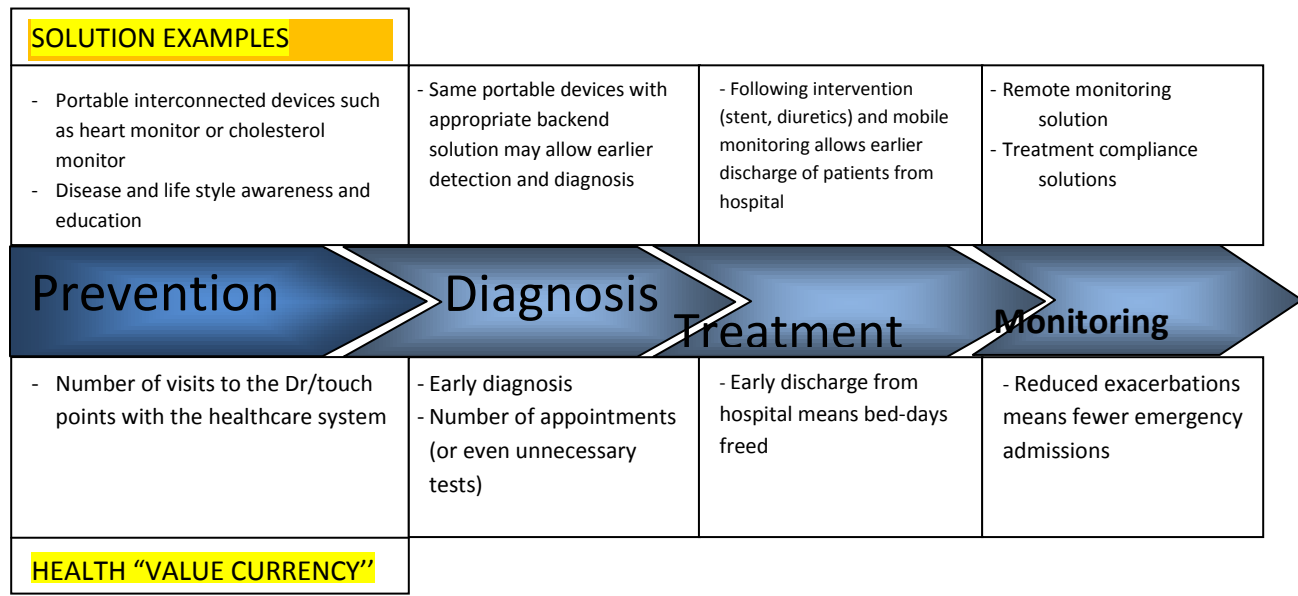


Figure 1.1. Potential applications of mobile health cardiac monitor along heart failure

The research conducted in New Zealand, using exploratory method states that Vital signs monitoring and the transmission of test results for patients with chronic conditions were recognized as increasingly important roles for mobile technologies and the simplicity and standard format of SMS promoted them as backbone mobile phone services for the present and fore seeable future. SMS services could also enhance the impact of public health and lifestyle messages within the context of preventative care if a suitable format or incentives could be found. Providers saw the use of mobile technologies to collect data in an electronic format as a major advance in increasing the utility of data and its value in both operational and strategic decision making. Data collection in chronic disease care is an ongoing and vital procedure for both clinician care and patient self management (5).

The study conducted in New Zealand using Semi-structured interviews stated that Mobile technologies can contribute holistically across the whole spectrum of chronic care ranging from public information access and awareness, monitoring and treatment of chronic disease and support for patient carriers. The study also stated that mHealth is much helpful in the monitoring of vital sign and transmission of test results for patients with chronic conditions (24).

Based on the study conducted on effectiveness of a reminder call in improving utilization of essential maternal and child health services in Addis Ababa using an interventional design indicate that the reminder phone calls increase the utilization of antenatal care and facility delivery rates. It also explains that reminder phone calls are good intervention strategies to increase the existing low anti natal care and health facility delivery rates (23).

2.2. Theoretical Framework

There are numerous existing mHealth systems on improving NCCD management that vary in terms of objective, methodology and results. This is to say that no mHealth system is likely to cover all topics and deliver the complete set of required data. The selected mHealth system must fit the user's goal.

Nevertheless, there are wide ranges of mHealth system on improving NCCDM available, but each has its own strengths and limitations.

In Italy a wireless health outcomes monitoring system (WHOMS) developed to improve communication between medical teams and patients about symptoms and quality of life. The WHOMS system allowed structured questionnaires to be sent directly to a patient's mobile phone by the medical team. Patients could use the phone keypad to transfer their responses automatically to an authorized website. This information was then accessed by the medical team and provided graphical representation of the patient's health status. WHOMS was tested with 97 cancer inpatients and found that more than half successfully completed a health-related quality of life questionnaire with minimal missing data. However, 42% of the patients refused to use the system, which suggests that compliance could be an issue, particularly for those individuals who may be less familiar with the technology. The study highlights some issues with acceptability of technology, particularly for older individuals who may be less familiar with mobile phones in everyday life. However, data suggest that older adults are more likely to use mobile phones than the internet, and, as technology infiltrates more aspects of daily living, generational differences in use are likely to decline (25).

The research conducted in McMaster University, on improving self management in NCCD using mobile phone, identified the following challenges to the further development of smart electronic personal health record systems: establishing effectiveness, privacy and security, usability and

adoption, and change management (26). mHealth tools can play an important role in improving the quality of NCDs (Non Communicable Diseases) care while avoiding unsustainable increases in the costs of human resources associated with more traditional delivery modes (27).

With funding from the Mobile Citizen project of the Inter-American Development Bank, developed the COSMOS mHealth model based on tele counseling, short message service (SMS), and interactive voice response (IVR) for type 2 diabetes (DM2). The specific goals were: Activate individuals with high blood sugar levels to confirm or rule-out the diagnosis of DM2 within 45 days, improve the efficacy of the diagnostic confirmation process and improve adherence to pharmacological treatment and lifestyle changes.

Some of the organizational challenges which are common in primary care include: limited provider availability during certain periods such as holidays; variable interest and complex incentive structures for participating clinical staff; and an overall bias against research collaborations which are often seen as limited in their value and a distraction to the day-to-day clinical work (27).

In the United States, Honduras, and Mexico led by Dr. John Piette, the program on Quality Improvement for Complex Chronic Conditions in the University of Michigan develops the CarePartner model designed to use IVR self-management support programs for patients with chronic illnesses such as diabetes, heart failure, depression, hypertension, and cancer. The model is designed to improve CD outcomes through three mechanisms of action: customized self-care information to patients provided during weekly IVR interactions, feedback about urgent issues to patients' clinical team that can be customized by the provider based on patients' IVR reports, and targeted advice for family members and other informal caregivers provided via email or a structured voicemail service about how to address patient self-care problems and communicate effectively (27). Experiences from the above two models shows that the adoption of mHealth systems can potentially improve: Patient self-management capabilities, patient medication adherence, access to health resources, access to information, and health education (27).

The brochure prepared by United Nations Foundation states that, Mobile technology represents a high reach, cost-efficient method for making health care more accessible, affordable and effective across the developing world. mHealth has the capacity to dramatically expand access to

communications and to transmit voice and data at the specific time it is needed, which will empower health care workers to make better diagnoses and provide citizens with access to health care where it is needed most. This benefit can be measured in two distinct but interrelated ways:

- ✓ Improving access to health-related services by reducing the delay for receiving care.
- ✓ Enabling improved clinical outcomes (28).

Ethiopia uses mHealth informally to general medication reminder, child vaccination reminder and to alert citizens during an emergency (7). Formally, the country uses Enate messenger for delivery reminder purpose.

Technology Development and Commercialization, University of Health Network (UHN), stated that Mobile phone-based remote patient monitoring enables the cost-effective management of CD. UHN has developed a user-centric remote monitoring system that allows patients to take various physiological measurements (e.g. blood glucose, blood pressure, and weight) and record symptoms at home. These measurements are then automatically and wirelessly sent via Bluetooth from the medical devices to a mobile phone, which in turn sends the data to the application servers. Clinicians are able to access their patients' summary data and are sent alerts as required. In addition, patients are able to view their own physiological data and are provided with alerts and instructions for self-care. This system has the following key features: user centric design, Efficacy Supported by Clinical Trials, Multiple CD-Area Modules, Flexible Platform and Low-Cost Solution (29).

The research conducted on Mobile Healthcare Information System using Actor Network Theory (ANT), examined the mobile health care framework through an appraisal of current technologies, applications, issues – from a socio technical view point of ANT. The research derives that the future of the mHealth care framework – including its practices and application deployment, would depend on a global consensus of medical organization, people and policy makers. All of these 'actants', although different in dissimilar socio-economic contexts, contribute to a stable but efficient revolutionary framework for mobile healthcare applications (30).

CHAPTER THREE: METHODOLOGY

This chapter explains the methodologies that were used to conduct the study. It describes the research design and the way to determine the sample size and gives readers guidelines on how the needed information gathered and processed. Moreover, the sampling and analysis procedures revealed.

3.1. Study Design

The study has used health facility based descriptive cross – sectional survey finding the representative of governmental health facility owned by Addis Ababa Health Bureau. The study employed quantitative methods using self administered questionnaire; whereas a key informant interview was used to assess the knowledge, attitudes, believes and substantiates the quantitative findings.

3.2. Study Area and Period

This study was conducted in Addis Ababa. Addis Ababa is the capital city of Ethiopia and has 10 sub cities. There are 34 health facilities in the city, 28 health centers and 11 hospitals. Among the 11 hospitals, 4 under the Federal Ministry of Health administration, six are under Addis Ababa Health Bureau Administration, and 1 under Addis Ababa University. There are also private and NGO owned health facilities in Addis Ababa, however, the study considered only public health facilities under Addis Ababa Health Bureau due to resource constraint.

3.3. Source Population

Government health facilities, (Hospitals) that were found under Addis Ababa Health Bureau administration were the source population of the study. Medical directors, administrators, health care professionals, IT experts working in these public health facilities and patients were the study population. The inclusion criteria in this study were that the health facility should be Addis Ababa Health Bureau administration owned and providing non communicable chronic disease care. All health facilities that had not conformed to these requirements are excluded from the study.

3.4. Sample Size Determination

The sample size was calculated based on the standard sample size formula as (31):

$$n = \frac{(Z_{\alpha/2})^2 * (P) * (1-P)}{e^2}$$

Where: $Z(\alpha/2) = 1.96$ for 95% Confidence Level, for selecting respondents.

$P = 0.5$. Since there was no previous study, p is unknown and is set to 0.5, and

e = the margin of error (tolerable error), which is 0.05 (5%), for selecting respondents.

To determine the sample size of respondents:

$$n = \frac{(Z_{\alpha/2})^2 * (P) * (1-P)}{e^2} = \frac{(1.96)^2 * 0.5 * 0.5}{(0.05)^2} = 384$$

It was expected that respondents may not respond at all, so estimated non respondent rate was 5%. Moreover, 5% of 384 gave 19. So, adding this value to the sample size 384 gives a total sum of 403 sample size.

3.5. Sampling Procedures

Out of 6 hospitals under Addis Ababa Health Bureau, 5 hospitals were selected purposively which provides non communicable chronic disease care. This concluded the first round of sampling. The second round of sampling was conducted by making a preliminary survey aimed at identifying number of medical directors, administrators, health care professionals, IT experts and patients in each of 5 selected hospitals in the sample. In doing so 10 study participants were selected purposively because of their positions, which are medical directors and administrators, from 5 hospitals. In their respective health facility, these participants were expected to involve in strategy formulation and organizational tasks. Proportional probability sampling was used to get the desired sample size of 384 study participants from health care providers, IT experts and patients. Finally 403 (384+19) study subjects were selected.

3.6. Data Collection Procedure

As part of quantitative data collection method, a self administered questionnaire survey was used whereas key informant interview method was used to obtain the qualitative data in the study.

Three types of questionnaires were developed in the study: one for medical directors and administrator, second for patients and another for health care professionals and IT experts. The questionnaires were includes socio demography, status of mHealth, knowledge of mHealth and attitude towards mHealth questions. The survey questionnaire included Yes or No questions and multiple choice questions.

The questionnaire was distributed and collected to the selected hospitals by hiring three data collectors. Key informant interviews were conducted with designated officials from Addis Ababa Health Bureau. The interviews were conducted using separate interview guide for each interviewee. The interviews were made by the principal investigator. The key informant interview guide questions were manually recorded. After quantitative data collection completed, data entry, cleaning, and analysis was made using SPSS 20 version.

3.7. Data Analysis Procedure

Frequency tables were used for the descriptive analysis. For the data presentation, tables and different types of graphs were employed. Responses to the qualitative data were organized based on their thematic area. Responses of the interviews were summarized in to thematic areas identified and responses of each key informant interviews merged to these thematic areas.

3.8. Data Quality Management

In order to keep the quality of the data collected, the questionnaire was first translated in to Amharic version for patients. In order to avoid translation-related errors, the Amharic version was then translated back in to English by language professionals (forward and backward translation). The resulting questionnaire was pretested to healthcare professionals and patients. During the tests 40 respondents (20 patients + 20 health professionals) were participated. The first test was made on 26/03/2013 which scored 0.806 reliability level (Cronbach's Alpha) and the second test was made on 10/04/2013 which scored 0.811 reliability level. For the health

professional, I have used similar items for similar individuals, but for patients I have used similar items for different individuals. According to the result it was satisfactory (above 0.70) (31) and had no significant changes between the two.

Before the data collection was commenced, the data collectors were given detail training and orientation and they were supervised while collecting data. After collection of data was over, questionnaires with missed values and inconsistency were rejected. Encoding and data entry were conducted using statistical software- SPSS 20 version. The investigator had provided a template and data encoders on their side had to take the responsibility of entering all the responses accurately. After encoding was over, cross check was made with the data from the questionnaire.

3.9. Ethical Considerations

Ethical clearance was obtained from Addis Ababa University, Joint Academic Commission of the Faculty of Informatics and Public Health. Following the issuance of the ethical clearance, the proposal was provided to Addis Ababa Health Bureau Administration for getting permission for data collection from the selected health facilities. The needed permission was obtained and used for collecting both quantitative as well as qualitative data.

The objective of the study was clearly stated on the information sheet preceding the questionnaire and interview guides. Participants were asked about their consent to participate in the study orally as well as via consent letter. The information sheet and consent letter was presented and described to participants, both in the questionnaire and orally for the interviews to conduct before any kind of consultation was initiated. The discussants of the key informant interview were told that their responses were confidential and used only for the purpose of the research work.

3.10. Dissemination of Results

The findings of the study will be presented to the Joint Academic Commission of School of Informatics and School of Public Health, AAU, as a thesis in partial fulfillment of Masters of Science Degree (M.Sc.) in Health Informatics. The findings of the study will also be submitted to

Addis Ababa Health Bureau, Federal Ministry of Health and interested development partners of FMOH and Addis Ababa Health Bureau. In addition the results may also be presented in various conferences.

3.11. Variables in the Study

Dependent variable

- Prospects of mHealth on improving NCCDM

Independent variables

- Socio demographic characteristics
- Status of mHealth
- Knowledge of mHealth
- Attitudes of mHealth

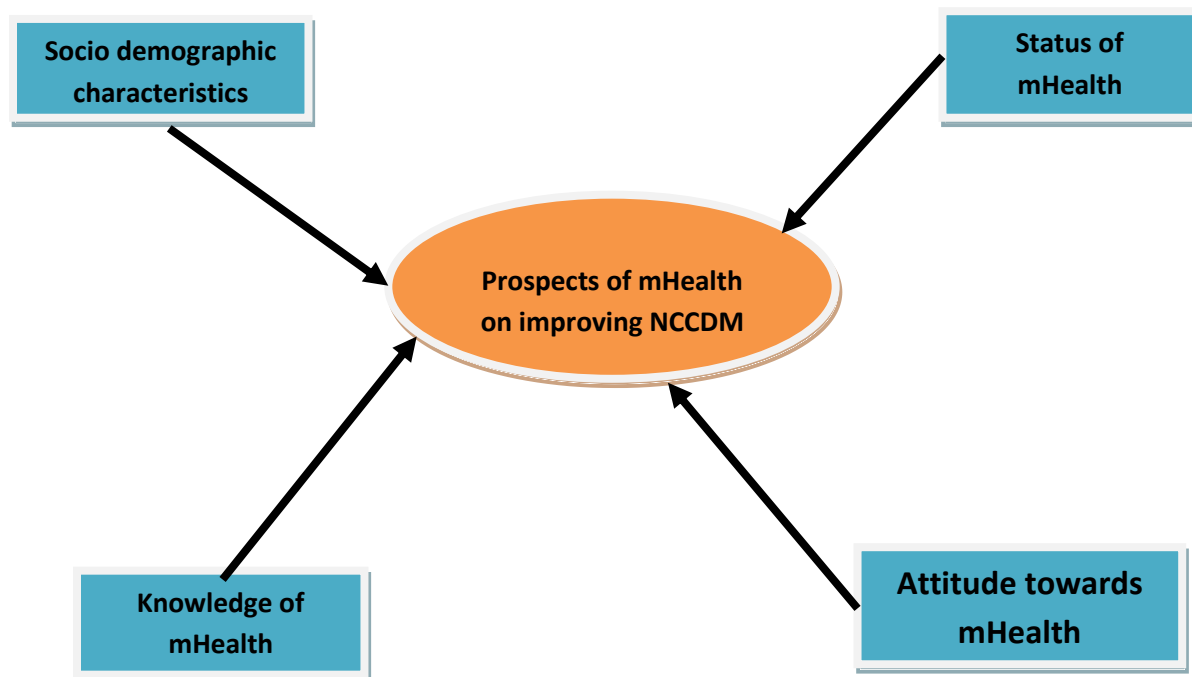


Figure 3.1. Conceptual Frame Work of the Study

3.12. Operational Definitions

Internet: is an international network of computer networks – hence the Name ‘inter’ from international and ‘net’ from network. These networks use a Common language and addressing system which allows them to communicate and share data, files and other information (1).

e-health: is the transfer of health resources and health care by electronic means.

mHealth: is a component of eHealth, which is the use of information and communication technology (ICT), such as computers, mobile phones, communications satellite, patient monitors, etc., for health services and information (11).

ICT: Mainly focuses respondents, access and utilization of computer, Internet and Electronic documents (32).

Health professionals: those health workers with at least a diploma certificate on their Profession.

Chronic Disease: are diseases of long duration and generally slow progression that needs lifelong treatment.

Prototype: Unfinished application which needs further improvement based on the user requirements.

Non Communicable Chronic Disease: are diseases of long duration, slow progression, needs lifelong treatment and cannot be transmitted.

Socio demography: refer to a set of variables such as a given population's age, sex, educational level, profession and service year.

Status: availability of mHealth services and requirements for mHealth implementation.

Knowledge: the fact or condition of knowing something with familiarity gained through experience or association.

Attitude: A predisposition or a tendency to respond positively or negatively towards mHealth technology.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1 Quantitative Results

In this section, descriptive and analytical analysis parts of the thesis are presented. Firstly, the descriptive analysis is presented and then followed by the analytical and qualitative analysis. Both descriptive and analytical statistical results for quantitative and qualitative sections of the study had been analyzed in accordance with the specific objective.

4.1.1. Socio Demographic Characteristics of Health Professionals

Four hundred fifty (450) self administered questionnaires were distributed across the 5 hospitals in Addis Ababa. Out of which 433 questionnaires were returned and 30 of them were discarded in the analysis time due to incompleteness. The required sample size 403 questionnaires were obtained for the quantitative study. Socio demographic characteristics of health professionals were analyzed separately from the patients. Results of the analysis were presented in sex, age, profession and professional services on the following table.

N=203		
Item	Frequency	Percentage
Sex		
Male	108	53.2
Female	95	46.8
Age		
20-25	93	45.8
26-35	72	35.5
36-45	29	14.3
46-55	7	3.4
>55	2	1

Profession:		
Specialist	5	2.5
Professional Nurse	87	42.9
General Doctor	22	10.8
Diploma Nurse	43	21.2
Pharmacy	10	4.9
Laboratory	5	2.5
Others	31	15.3
Professional Services		
< 1 Year	52	25.6
1-4 Years	99	48.8
>=5 Years	52	25.6

Table 4.1. Socio Demographic Characteristics of health care professionals at Addis Ababa City Administration Health Bureau Owned Hospitals, June, 2013

4.1.2. Status of mHealth in the Health Facility

Variable	Frequency	Percentage
Does the facility have clearly articulated mission and vision about mHealth?		
Yes	22	10.8
No	89	43.8
Don't know	92	45.3
Does the facility have a plan to implement mHealth?		
Yes	21	10.3
No	87	42.9
Don't know	95	46.8

Does the institutional policy promote the implementation of mHealth?		
Yes	25	12.3
No	84	41.4
Don't know	95	46.3
Have staffs and stakeholders been involved in planning the mHealth project?		
Yes	31	15.3
No	46	22.7
Don't know	126	62.1
Do you know any legal framework of ICT for mHealth?		
Yes	26	12.8
No	150	73.9
Don't know	27	13.3
Are there trainings for health care providers about mHealth and its implementation?		
Yes	12	5.9
No	121	59.6
Don't know	70	34.5
Is there any mHealth service in your facility?		
Yes	22	10.8
No	175	86.2
Don't know	6	3.0
Is there efficient and affordable support from Ethio telecom?		
Yes	27	13.3
No	88	43.3
Don't know	88	43.3
Does the facility have Internet access?		
Yes	60	29.6
No	139	68.5
Don't know	4	2.0

Do you think speed and quality of connection is appropriate for the proposed use?		
Yes	78	38.4
No	87	42.9
Don't know	38	18.7
Does the health facility have enough budgets for the Internet?		
Yes	33	16.3
No	99	48.8
Don't know	71	35.0
Do you have IT department in the facility?		
Yes	58	28.6
No	134	66.0
Don't know	11	5.4
Do you have sufficient IT professionals in your facility?		
Yes	51	25.1
No	136	67.0
Don't know	16	7.9

Table 4.2. Status of mHealth at Addis Ababa City Administration Health Bureau Owned Hospitals, June, 2013

During the survey, all the 5 health facilities (100%) have no formal mHealth service. Based on the survey result 10.8% of the respondents indicated that the facility had a clear articulated mission and vision related to mHealth, 89 43.8% of the respondents indicated that the facility had no clearly articulated mission and vision related to mHealth and 45.3% of the respondents indicated that they did not know whether the facility had a clearly articulated mission and vision related to mHealth or not. 10.3% of the respondents answered that the facility had a plan to implement mHealth and 42.9% of them have responded that the facility had no plan to implement mHealth. The majority of respondents, 46.8% pointed out that they did not know whether the facility had a plan or not to implement mHealth. 12.3% responded that institutional policy promotes to implement mHealth. 41.4% answered institutional policy did not promote

mHealth implementation. While the remaining 46.3% indicated that they did not know whether the institution policy promotes or hinders mHealth implementation.

The above explanation indicates that most of the respondents do not have a clear understanding of available missions and visions, plan and support of the available health policies regarding to mHealth. Availability of legal framework regarding mHealth was also assessed during this study. The result shows that most of the respondents 73.9% claimed that there was no legal framework related to mHealth.

According to the assessment result, respondents have been requested about the availability of mHealth in the facility. Out of the total respondents 86.2% of the respondents indicated that there were no formally established mHealth services in their facility.

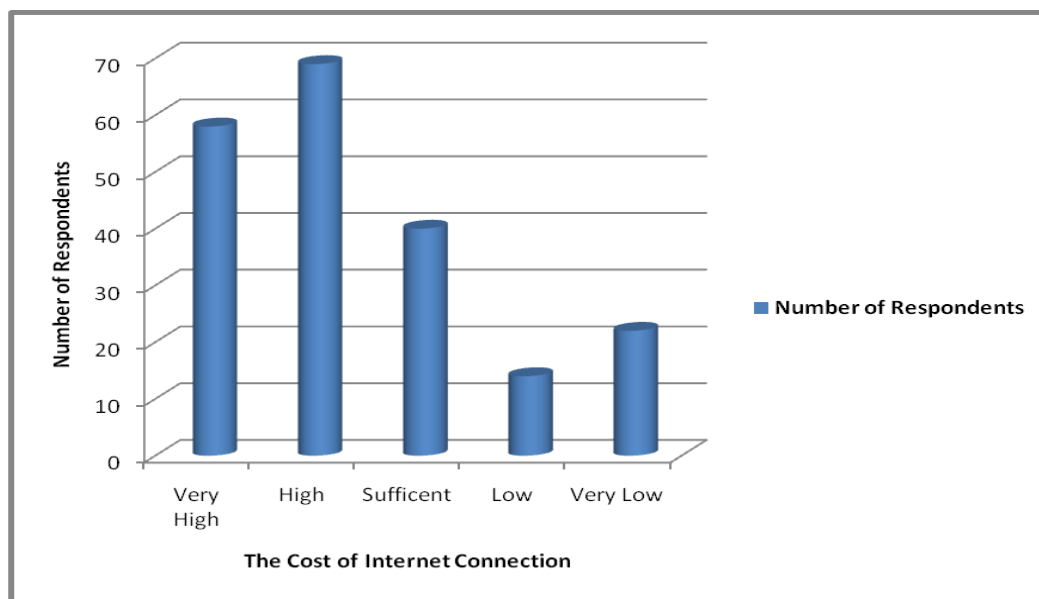


Figure 4.1. Level of Internet connection cost at Addis Ababa City Administration Health Bureau Owned Hospitals, June, 2013

Regarding the cost of internet connection 28.6% of the respondents respond that it was very high. Among those respondents 34% responds high. 19.7% of the respondents respond that it was sufficient. 6.9% of the respondents respond that it was low and the remaining 10.8% responds very low. This indicates that the cost is not longer motivating to use the internet services.

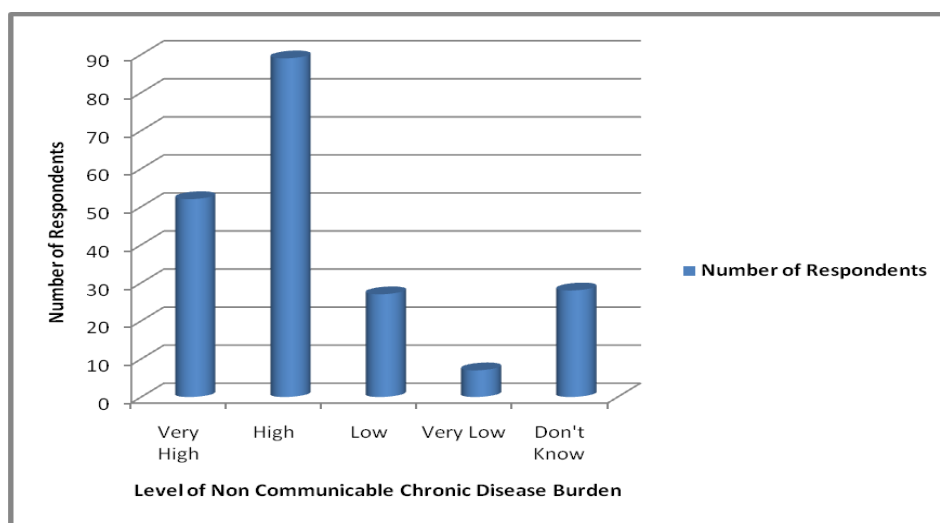


Figure 4.2. Level of Non Communicable Chronic Disease Burdon at Addis Ababa City Administration Health Bureau Owned Hospitals, June, 2013

The level of non communicable chronic disease burden in the facility was also assessed in the survey, 25.6% of the respondents respond that it was very high. 43.8% of the respondents respond that it was high. 13.3% of the respondents respond that it was low. 3.4% of the respondents respond that it was very low. 13.8% of the respondents respond that they did not know. The result shows that the growth of non communicable chronic disease in the selected hospitals becoming challenging to provide quality health care.

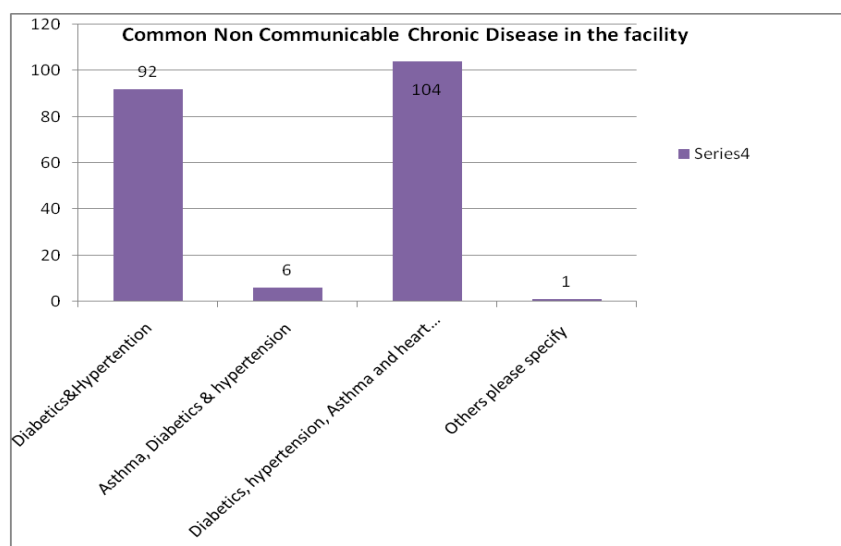


Figure 4.3. Common Non Communicable Chronic Disease at Addis Ababa City Administration Health Bureau Owned Hospitals, June, 2013

Concerning to the common non communicable chronic disease in the facility, 51.2% of the respondents respond that Diabetics, hypertension, Asthma and heart disease are the common non communicable chronic disease in their facility. To give more images about the analysis it is presented in figure 4.3.

4.1.3. mHealth Knowledge of Health Professionals

Respondents were also questioned for their knowledge regarding to mHealth technology.

Variable	Frequency	Percentage
Do you know what mHealth is?		
Yes	81	39.9
No	122	60.1
Don't know	-	-
Have you taken normal training about mHealth?		
Yes	1	0.5
No	202	99.5
Do you use mHealth for non-communicable chronic disease related activities?		
Yes	1	0.5
No	201	99.0
Don't know	1	0.5

Table 4.3. Knowledge of Health Professionals about mHealth at Addis Ababa City Administration Health Bureau Owned Hospitals, June, 2013

On questions related to use of mHealth for non communicable chronic disease, 99% of the respondents did not use mHealth and 99% of the respondents did not take mHealth training. Their use of mHealth on non communicable chronic disease management was also assessed. Among the total respondents, 99% responds did not use it for non communicable chronic disease

management. This shows that the technology is not implemented in the facilities and there were no training provided related to mHealth. Due to these they did not use it for non communicable chronic disease management.

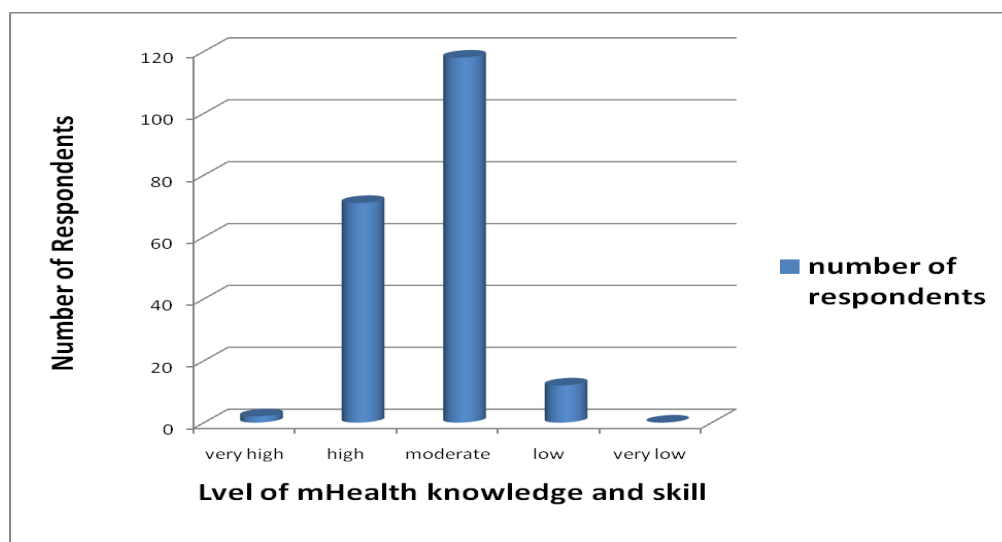


Figure 4.4. Level of Health Professional knowledge and skill related to mHealth technology at Addis Ababa City Administration Health Bureau Owned Hospitals, June, 2013

According to the analysis, majority of respondents' 60.1% responds that they did not know mHealth technology previously. This needs more effort to create awareness regarding to this technology before implementation.

Regarding to questions how much mHealth supports the activities related to non communicable chronic disease, all respondents (100%) were agreed that mHealth supports non communicable chronic disease management very high.

4.1.4. Attitudes of Health Professionals towards mHealth

In this section, results from attitudes of health professional towards mHealth technology questions were addressed. Accordingly, the following table 4.4 depicted the result:

Variable	Frequency	Percentage
mHealth application protect patient privacy?		
Strongly Agree	92	45.3
Agree	12	5.9
Neither Agree nor Disagree	10	4.9
Disagree	89	43.8
Strongly Disagree	-	-
mHealth solves the shortage of health care providers?		
Strongly Agree	135	66.5
Agree	5	2.5
Neither Agree nor Disagree	5	2.5
Disagree	58	28.6
Strongly Disagree	-	-
Our cultures have influence to accept mHealth technology?		
Strongly Agree	95	46.8
Agree	19	9.4
Neither Agree nor Disagree	4	2.0
Disagree	85	41.9
Strongly Disagree	-	-
mHealth improves non communicable chronic disease management?		
Strongly Agree	116	57.1
Agree	4	2.0
Neither Agree nor Disagree	12	5.9
Disagree	71	35.0
Strongly Disagree	-	-

mHealth provides cost effective services for the patients?		
Strongly Agree	112	55.2
Agree	2	1.0
Neither Agree nor Disagree	9	4.4
Disagree	80	39.4
Strongly Disagree	-	-
mHealth reduces waiting time for patients’?		
Strongly Agree	163	80.3
Agree	1	0.5
Neither Agree nor Disagree	5	2.5
Disagree	34	16.7
Strongly Disagree	-	-
mHealth reduces patient visit to their doctor’s office?		
Strongly Agree	154	75.9
Agree	2	1.0
Neither Agree nor Disagree	2	1.0
Disagree	45	22.2
Strongly Disagree	-	-
mHealth can remind patients’ appointment and medication using SMS?		
Strongly Agree	149	73.4
Agree	3	1.5
Neither Agree nor Disagree	3	1.5
Disagree	48	23.6
Strongly Disagree	-	-

It is possible to provide health education through mobile phone?		
Strongly Agree	144	70.9
Agree	2	1.0
Neither Agree nor Disagree	-	-
Disagree	57	28.1
Strongly Disagree	-	-
mHealth can transmit test results for patients with non communicable Chronic disease?		
Strongly Agree	112	55.2
Agree	7	3.4
Neither Agree nor Disagree	4	2.0
Disagree	80	39.4
Strongly Disagree	-	-
mHealth is helpful in collecting data in an electronic format?		
Strongly Agree	136	67.0
Agree	6	3.0
Neither Agree nor Disagree	3	1.5
Disagree	58	28.6
Strongly Disagree	-	-

Table 4.4. Attitudes of Health Professionals on mHealth at Addis Ababa City Administration Health Bureau Owned Hospitals, June, 2013

Based on table 4.4, most of the respondents strongly agree on privacy protection of mHealth and solve problems related to shortage of health professionals. They have also strongly agreed that culture have influences on the implementation of mHealth, contribution of mHealth on improving non communicable chronic disease management, cost effective services, reduce patients waiting time, patients visit to their

Doctors office, transmission of appointment, medication, health education, test result and collecting data in an electronic format. None of the respondents strongly disagree with mHealth services. Most of the respondents disagree on mHealth next to number of respondents who were strongly agreed. This indicates that mHealth improves non communicable chronic disease management by empowering patients to take care of their health.

4.1.5. Socio Demographic Characteristics of Patients

Socio demographic characteristics of patients were analyzed separately from health professionals.

Variables	N=200	
	Frequency	Percentage
Sex		
Male	125	62.5
Female	75	37.5
Age		
20-25	48	24
26-35	64	32
36-45	36	18
46-55	22	11
>55	30	15
Educational Level		
< Grade 6	33	16.5
> Grade 6	81	40.5
Diploma	44	22
Degree	40	20
>Degree	2	1

Occupation:		
Merchant	11	5.5
Public Servant	66	33
Private Employee	44	22
Self Employed	9	4.5
Student	14	7
House Wife	18	9
Others	38	19

Table 4.5. Sex, Age, Educational Level and occupation Distribution of Patients at Addis Ababa City Administration Health Bureau Owned Hospitals, June, 2013

The results of the analysis were depicted in table 4.5. The study results indicate that out of the total respondents 37.5% were females and 62.5% were males out them 24% with age less or equal to 25 years old, 32% with 26-35 years old, 18% with 36-45 years old, 11% with 46-55 years old and 15% were greater than 55 years old. Regarding to educational level 16.5% of the respondents were less than grade 6, 40.5% greater than grade 6, 22% diploma, 20% degree and 1% were above degree. Their occupation was also assessed, 5.5% of the respondents were merchants, 33% public servants, 22% private employee, 4.5% self employed, 7% students, 9% house wife and 19% others. The age group shows that, non communicable chronic disease becomes affecting all age groups of the society.

4.1.6. Status of mHealth Practices by Patients

During the survey status of mHealth practices by patients were assessed. Results of the analysis were presented in the following table 4.6.

Variables	N=200	
	Frequency	Percentage
Do you have a mobile phone?		
Yes	188	94
No	12	6
If your answer is yes for Q201, for what services did you use your mobile?		
Voice call only	66	33
Voice call and Message	30	15
Voice call, video call and text message	14	7
Internet	4	2
Voice call, video call, text message and internet	86	43
If you choose B in Q203, what is your ability?		
Only read	10	5
Read and write	165	82.5
Do not Read and write	25	12.5
Do you use your mobile for health purpose?		
Yes	35	17.5
No	165	82.5
If your answer for Q205 is yes, how do you use it?		
Voice call consultation	35	17.5
SMS consultation	2	1
Online consultation	163	81.5

Table 4.6. Status of mHealth practices by Patients at Addis Ababa City Administration Health Bureau Owned Hospitals, June, 2013

The study also confirmed that 94% of the respondents have mobile phone and 6% of the respondents did not have mobile phone. As displayed in table 4.6 majority of the respondents 43% uses Voice call, video call, text message and internet services from their mobile phone. 33% uses for voice call only. 15% of the respondents use for Voice call and Message services and 9% of the respondents use for Voice call, video call, text message and Internet. This indicates that, almost all the respondents are using their mobile phone for voice call and text message, which are the basic fulfillments to implement mHealth.

Regarding to questions on abilities of patients to use their mobile phone majority 82.5% of the patients can write and read. 5% can write and 12.5% cannot write and read. Questions regarding to the use of mHealth for health purposes 17.5% were use and 82.5% were did not use. This indicates that majority of patients can communicate using voice call and text message with their doctors if the technology is becoming in to effect. But some of the patients are using mHealth informally regarding their health to get support.

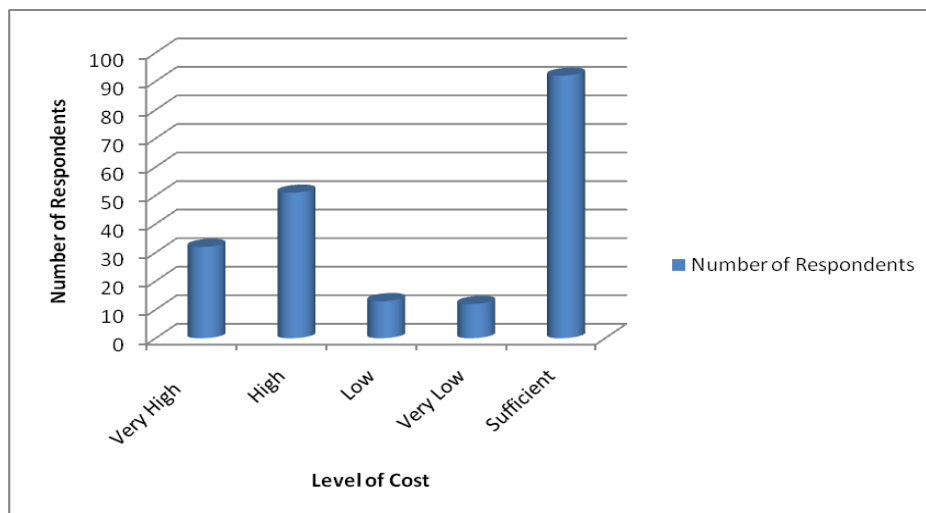


Figure 4.6. Cost of mobile phone services by Patients at Addis Ababa City Administration Health Bureau Owned Hospitals, June, 2013

Concerning to cost of mobile phone services 16% of the respondents respond that very high. 25.5% responds that high. 46% of the respondents respond that sufficient. 6.5% responds low. 6% of the respondents respond that very low. This shows that patients can use mobile phone services in their capacity.

4.1.7. Knowledge of Patients related to mHealth Technology

Knowledge of patients regarding to mHealth technology were also assessed during the study. Results of the analysis were presented in the following table 4.7:

Variables	N=200	
	Frequency	Percentage
Do you know mHealth?		
Yes	82	41
No	116	58
Don't know	2	1
If you say yes for Q301, how do you know it?		
N=58		
From internet	2	3.5
From television and radio	12	20.7
From magazine	44	75.8

Table 4.7. Knowledge of Patients related to mHealth services by Patients at Addis Ababa City Administration Health Bureau Owned Hospitals, June, 2013

Note: Among 82 respondents who know mHealth previously only 58 of the respondents explain how they know mHealth. As I have understood that 24 of the respondents unable to explain from where they know the mHealth technology.

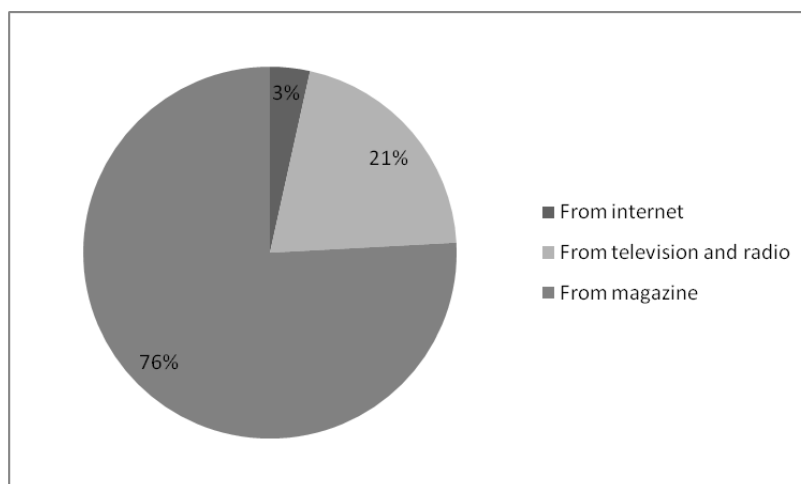


Figure 4.7. Ways of patients know mHealth services at Addis Ababa City Administration Health Bureau Owned Hospitals, June, 2013

4.1.8. Attitudes of Patients towards mHealth Technology

Attitudes of patients regarding to mHealth technology were also assessed during the study. Results of the analysis were presented in the following table 4.8.

Variables	N=200	
	Frequency	Percentage
The health facility plan to provide health care services using your phone?		
Strongly Agree	184	92
Agree	4	2
Neither Agree nor Disagree	-	-
Disagree	12	6
Strongly Disagree	-	-
In your opinion what should be done to implement MHealth?		
Training	46	23
Infrastructure building	7	3.5
Training, Infrastructure building and Dedicated Mobile apparatus	97	48.5
Don't know	50	25
mHealth technology provides quality health care services?		
Strongly Agree	157	78.5
Agree	-	-
Neither Agree nor Disagree	-	-
Disagree	43	21.5
Strongly Disagree	-	-
mHealth keep on the patient privacy and data from abusing?		
Strongly Agree	151	75.5
Agree	-	-
Neither Agree nor Disagree	2	1
Disagree	47	23.5
Strongly Disagree	-	-

Mobile network connection is reliable and affordable?		
Strongly Agree	69	34.5
Agree	-	-
Neither Agree nor Disagree	-	-
Disagree	131	65.5
Strongly Disagree	-	-
The quality of mobile network connection is appropriate for MHealth services?		
Strongly Agree	67	33.5
Agree	-	-
Neither Agree nor Disagree	-	-
Disagree	133	66.5
Strongly Disagree	-	-
mHealth improve your non communicable chronic disease management?		
Strongly Agree	127	63.5
Agree	-	-
Neither Agree nor Disagree	-	-
Disagree	73	36.5
Strongly Disagree	-	-
mHealth provides you a cost effective services?		
Strongly Agree	115	57.5
Agree	-	-
Neither Agree nor Disagree	4	2
Disagree	81	40.5
Strongly Disagree	-	-
mHealth reduces your waiting time for treatment?		
Strongly Agree	174	87
Agree	-	-
Neither Agree nor Disagree	-	-
Disagree	26	13
Strongly Disagree	-	-

mHealth reduces patient visit to their doctor's office?		
Strongly Agree	160	80
Agree	-	-
Neither Agree nor Disagree	-	-
Disagree	40	20
Strongly Disagree	-	-
mHealth reminds your appointment and medication using SMS?		
Strongly Agree	184	92
Agree	-	-
Neither Agree nor Disagree	-	-
Disagree	16	8
Strongly Disagree	-	-
mHealth provides you health education using SMS?		
Strongly Agree	190	95
Agree	-	-
Neither Agree nor Disagree	-	-
Disagree	10	5
Strongly Disagree	-	-
mHealth improve yourself health management?		
Strongly Agree	184	92
Agree	-	-
Neither Agree nor Disagree	-	-
Disagree	16	8
Strongly Disagree	-	-
mHealth transmits your lab test results using SMS?		
Strongly Agree	182	91
Agree	-	-
Neither Agree nor Disagree	-	-
Disagree	18	9
Strongly Disagree	-	-

Table 4.8. Attitudes of Patients related to mHealth services by Patients at Addis Ababa City Administration Health Bureau Owned Hospitals, June, 2013

Based on table 4.8, most of the respondents are strongly agree on the health facility plan on mHealth services, the provision high quality of care and privacy using mHealth. They have also strongly agreed on the reduction of cost, time and Doctors' office visit, transmission of appointment, medication, health education, test result and improvement of self health management using mHealth. None of the respondents strongly disagree with mHealth services. Most of the respondents disagree on mobile network reliability, affordability and network connection quality. 48.5% of the respondents agreed that training, infrastructure building and dedicated mobile phone are the basic requirements to implement mHealth. This result shows that mHealth improves non communicable chronic disease management, but an effort needs to be applied on reliability, affordability and network connection quality.

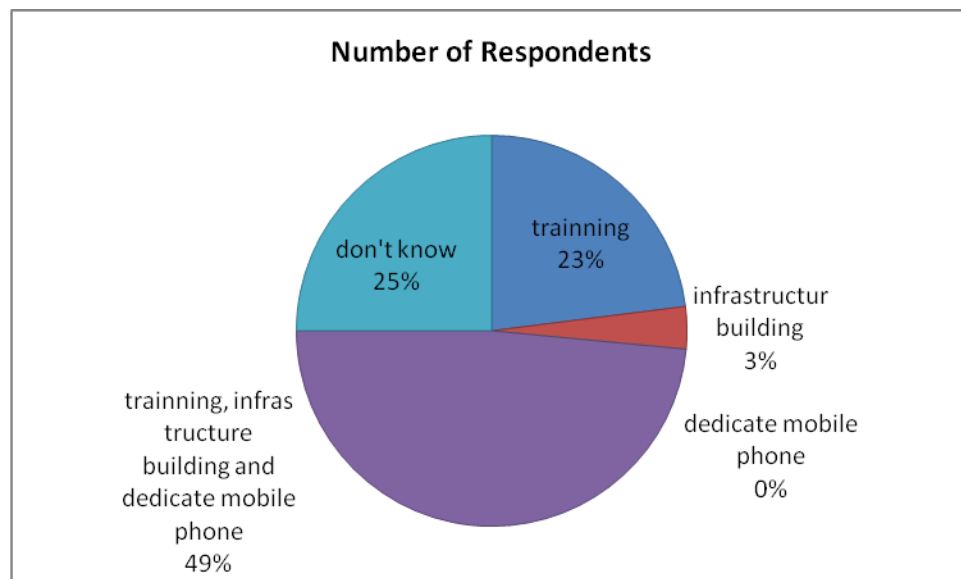


Figure 4.8. Requirements to implement mHealth services by Patients at Addis Ababa City Administration Health Bureau Owned Hospitals, June, 2013

During the study requirements to implement mHealth were also assessed. Based on the assessment, the majority of the respondents 48.5% responds that training, infrastructure building and dedicate mobile phone were the basic requirements to implement mHealth application.

4.2. Qualitative Results

Key informant interview were conducted on 5 selected hospitals. From each hospital administrator and medical director were interviewed. A total of 10 respondents were interviewed. Interview Guiding Questions were prepared and asked uniformly for all respondents. All the questions focused on the current status, knowledge, attitudes and the potential challenges and opportunities of mHealth implementation. The results of the qualitative survey are described below.

4.2.1. The Current Status of Administrators and Medical Directors

mHealth Practice in the Hospitals

Concerning the question about the establishment of mHealth in the facility most of the administrator and medical director replied that the hospital is using mobile phone and fixed line phone for health care, such as for infectious disease, emergency services to solve the problem by communicating with respective facility for referral service (in and out) between the health facilities and ART case to communicate with patients who were absent on their appointment and defaulters. Two of the respondents also indicated that they had given mobile phone for the doctor and lysine for command post and referral system to solve the problem by communicating with other hospital doctor and lysine. They had also worked hard to give medication guide using mobile phone for their patients.

All of the respondents complained that they had no sufficient Information Technology professionals and any policy frame work concerning mHealth in their facility. To introduce mHealth in the current situation in their facility most of the respondents were stated that internet infrastructure, internet connection, computers, information center and IT expert needs to be available.

Correspondingly one medical director stated that:

“I do not know the available ICT infrastructure for mHealth introduction.”

Most of the respondent stated that the health care providers and stakeholders are ready to accept mHealth and one administrator stated that:

”It is difficult to explain their readiness to accept mHealth, to say something related to this we have to create awareness.”

For the question related to ethio telecom cooperation most of the respondents respond that it was possible to get call center. If the service will be ready to avail and the cost can be covered with the facility budget and it is possible to get support from Ethio telecom. They also explained that the existing health policy promotes mHealth technology establishment. Because it is supplementary technology to improve public health by providing quality health care’s.

4.2.2. Knowledge of Administrators and Medical Directors

Related to mHealth

Based on the survey result most of the key informants confirm that there is no mHealth service in their facility, but they heard from different Medias about the service. Some of the respondents also visited the service from abroad in different countries for experience sharing.

One administrator told me that, he had visited mHealth application in China and he was impressed and take notes during the visit. Finally the Chinese guide asked him why he was taking notes during visit time and he had gave to her the following answer:

“I am impressed with the service and I am going to implement the service in my facility.”

She laughed and responded the following:

“Oh! You are not developed/ poor and it is impossible. It is the technology for developed countries. There are different factors which hinders its implementation in your country.”

They have defined mHealth that “it is the communication between the physician and patient to provide support for the patient related to their health using different mobile phone services (text message, voice call, video call and online conversation) wherever they are.”

With respect to the needs for mHealth establishment most of the respondents explained the following requirements: policy and strategy/guide line, legal framework, experience sharing, trained professionals (both IT professionals and physicians), separate furnished room (equipped with materials and infrastructure), budget, awareness creation (both physicians and patients), call center and identification of stakeholders. They have also explained Internet infrastructure, Internet service, dedicated mobile phone, high quality mobile network, server room, mHealth application and call center Information Technology infrastructures are required to implement mHealth.

On the questions related to the significance of mHealth on improving non communicable chronic disease, they have stated that mHealth improves patients self health management through consultation, medication and appointment reminder and health education. One respondent said: “due to its long life treatment mHealth is the vital choice for non communicable chronic disease management improvement.”

4.2.3. Attitudes of Administrators and Medical Directors

Related to mHealth

On the question related to the effects of mHealth on the patient and health care provider, one medical director and administrator stated that it has positive effects on both parties and the rest respondents explained the following: positive effect on the patient:

- Reduce hospital infection (cross contamination),
- Reduce cost,
- Enables to obtain fast service,
- Getting on job services

And negative effect:

- Miss communication,
- Carelessness,
- Incomplete service and
- Delayed treatment.

Positive effects on the health care provider:

- Reduce space,
- Reduce document work and
- Save time which lost on physical examination.

Negative effects:

- Miss diagnostics (absence of physical examination) and
- Consume their rest time.

Questions concerning satisfaction on the availability of health care provider and health service treatment on non communicable chronic disease: Two administrator states that they have satisfied on the available health care providers based on the feedback from patients concerning the service. One medical director explained that they have satisfied because of the availability of sufficient health care providers due to working with Addis Ababa University. One medical director stated that they did not satisfy with the service provision because they did not get media support to provide health education to their patients. One medical director and one administrator explained that they did not satisfy due to shortage of specialized health care providers. One administrator and medical director stated that they have satisfied but they have faced shortage of medicine. If they can get sufficient supply of the desired medicine their satisfaction will be doubled.

4.2.4. Challenges and Opportunities for mHealth Implementation

During the interview respondent's also asked question related to the challenges and opportunities they have to mHealth implementation. This question include: What are the perceived challenges and opportunities of mHealth implementation? Among the 10 interviewed respondents from the five Hospitals 8 respondents or 80% of them replied similar answers. Main challenges and opportunities are summarized as follow:

Challenges

- Awareness towards mHealth
- Trained manpower
- Patient illiteracy level
- Privacy issues
- Mobile network quality
- Cost /Budget to implement the system
- Technological failure
- Dissatisfaction
- Language supported by the system
- Supply of inputs for the system

Opportunities

- Wide mobile telephone network coverage
- Government focus on quality health care
- Internet service availability
- Availability of stakeholders
- Technological improvement
- Peoples awareness on time
- Government focus on new technology
- Expansion of higher institutions

4.3. DISCUSSION

4.3.1. General Consideration of the Result

The main objective of this study was to explore and identify the prospects of mHealth on improving Non Communicable Chronic Disease Management in Addis Ababa City Administration Health Bureau Owned Hospitals. The study has resulted in a unified understanding of prospects of mHealth in health care in general, and to the health facilities under Addis Ababa City Administration Health Bureau, in particular. Since the technology is available in recent days, there is limited study conducted to assess the importance of mHealth on improving non communicable chronic disease management among health facilities. This study contributes as base line for other studies in related field of study.

There are a lot of debate about the potential use of mHealth in improving the health and well being of patients with chronic disease and facilitating self health care management. Used

effectively, mHealth has enormous potential as a tool to increase self health care management through empowering patients.

As determined by Farhaan (2008), application of mobile technology in the health care practices has provided to be a path ridden with many types of risks, dangers and complexities. As the article stated, Mobile technologies can contribute holistically across the whole spectrum of chronic care. The research also stated that social, technical, economic and clinical/organizational issues are the basic factors which affect the adoption of mHealth (24).

Some of the problems and complexities associated with planning and implementation of mHealth in Addis Ababa are presented as follows.

4.3.2. Opportunities to establish mHealth

By considering the current situation of technological improvement, the interaction of various actors in the health services will constitute a solid foundation up on which future mHealth will built. Extensive expansion of mobile telephone infrastructure coverage, Government focuses toward new technology and quality health care services for all, availability of internet services, stakeholders in the area, the wide spread of higher institutions and improvement on people's awareness were identified as the basic opportunities to implement mHealth technology on improving non communicable chronic disease management in Addis Ababa City Administration Health Bureau Owned Hospitals.

mHealth is the most important feasible way to approach modern health care services in many underserved and densely populated areas of developing countries. Addis Ababa is one of the most densely populated cities in Ethiopia. About 4,156,251 people were expected in 2013 (5,535.8 people per square kilo meter) (9). There are only 11 governmental hospitals and 28 health centers. From this statics it is easily visible the inadequate health care infrastructure of this highly populated city. Ageing populations and unhealthy lifestyles have led to some chronic conditions such as diabetes and heart disease. Under this circumstance possible use of ICT in alleviating the problem, particularly application of mobile technologies.

4.3.3. Challenges to establish mHealth

People's awareness towards ICT in general, mHealth technology in particular is one of the major challenges to establish mHealth services. One thing must be mentioned that ICT is only a technology which could not be functioning without a person behind. mHealth should not be a replacement for humans; it should supplement human effort. Trained manpower that has the basic skills to manipulate the technology was also identified as one of the basic challenge.

Illiteracy level is the basic requirements to utilize the technology effectively and efficiently. Especially the ability of patients to read, write and communicate in voice with physicians will play the vital role to establish mHealth. If the ability of patients to read, write and communicate in voice with physicians will improve, the technology will achieve the desired goal of health set by the health facilities and vice versa.

Mobile network quality is a big problem in Addis Ababa. Uninterrupted Mobile network quality is required for mHealth. Inadequate Mobile network quality is becoming a great suffering in daily life in Addis Ababa. Moreover, government has working to solve this problem very soon.

Cost is one of the major challenges to the establishment of mHealth technology in the health facilities. The cost of infrastructure building, application development, training and running budget were required to provide quality health care using the technology. Privacy issues were also taken under consideration during establishment of the service. Unauthorized discloser of health information has to be protected. Technological failure regarding to service provider and health facility has to be considered. Satisfaction of patients has to be the core for the establishment of the service. The type of language the system can support will also be the major issue which can show the usability of the system. At the last availability of supply regarding trained manpower, equipments and maintenance services has to be considered.

4.3.4. Prospects of mHealth

According to the findings of the thesis, concerning privacy issues 60.75% respondents respond that they strongly agree that mHealth protects patients' privacy. The workshop conducted in Athens stated that mobile agent technologies can provide secure eHealth information systems for

to the citizens (3). 66.5% of the respondents also strongly agree that the technology can solve shortage of health care providers. mHealth application plays the vital role on improving non communicable chronic disease management, 60.30% strongly agreed on this point. In support of this finding the study conducted in United State adoption of mHealth systems can potentially improve Patient self-management capabilities (27).

Regarding costs, 56.33% of the respondents respond that mHealth technology provides cost effective services to the community. 83.2% of the respondents respond that mHealth technology reduces waiting time for treatment. It can also reduce patients visit to doctors office, 77.92% respondents indicate this. The research conducted by Darrell stated that the use of remote monitoring devices such as Gluco Phones keeps patients out of doctor's offices for routine care; reduce health care costs and waiting time to get treatment (4).

mHealth application also plays important role on improving non communicable chronic disease management by transmitting medication and appointment reminder 82.63% of respondents strongly agree on this technology. In support of this finding, the study conducted by WHO stated that reminding people to take medication at the proper time improving health outcomes and medical system efficiency (7).

82.89% of the respondents strongly agreed that mHealth technology plays a great role on transmitting health education which can raise awareness and improves self health management. The research conducted in United State stated adoption of mHealth systems can potentially improve: access to health resources, access to information, and health education (27). Among the respondents 72.95% of them strongly agreed that the technology can serve the community by transmitting test results wherever they are. 67% of the respondents strongly agreed that mHealth can be used for electronic health data collection. The research conducted in New Zealand stated the use of mobile technologies to collect Vital signs and transmission of test results for patients enables data collection in an electronic format (5).

4.5. Prototype Development

4.5.1. Introduction

Based on the findings of the study I have proposed the following prototype which is designed using Microsoft Visual Studio 2008 for user interface design, Microsoft SQL Server 2005 for database and Ozeki NG SMS Gateway application for the transmission of message from the database to patients' mobile phone via mobile sim card inserted in to GSM modem or mobile phone. The message transmitted indicates mobile phone number given for the sim inserted in to the GSM modem or mobile phone and the cost is charged on the balance currently available in the sim card.

4.5.2. Procedures for the prototype development

The following procedures are used to develop the prototype: (requirement, design and test)

- A. Identify the basic requirements for the prototype.
- B. Collect comments from different professionals about the requirements and implement it
- C. Coding
- D. Have users experiment with the prototype
- E. Revise the prototype, thereby redefining and completing the requirements

4.5.3. System Documentation

The prototype consists of 4 tables and 6 forms. These are login table, patient table, cause table, reminder, login form, main form, recipient form, reminder form, user form and module.

A. Login form

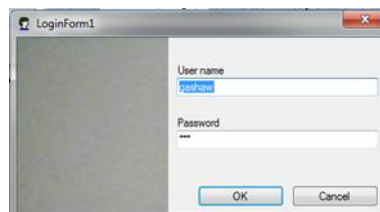


Figure 4.9. Login form for the proposed mHealth prototype at Addis Ababa City Administration Health Bureau Owned Hospitals, June, 2013

Login form consists of user name to identify the user and password text box to authenticate which enables the user to login to the system. Ok button to execute the given username and password and cancel button to exit from the login form. Any users who have username and password can login and use the system.

B. Main Form

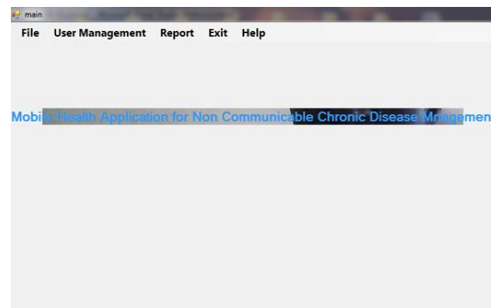


Figure 4.10. Main form for the proposed mHealth prototype at Addis Ababa City Administration Health Bureau Owned Hospitals, June, 2013

The users obtain this form after they have logged. This form contains list of forms, such as recipients form, reminder form and user form, report, exit and help menu.

C. Patient Registration form

Figure 4.11. Patient registration form for the proposed mHealth prototype at Addis Ababa City Administration Health Bureau Owned Hospitals, June, 2013

The form is used to register new patients, save data from the form to the table, delete existing patients, edit existing patient data and search patient from patient table using patient id field.

D. Reminder Form

The screenshot shows a software window titled "frmreminder". At the top, there is a toolbar with icons for "New", "Send", "Delete", and "Close". Below the toolbar, on the left, is a "Reminder" section with three radio buttons: "Appointment" (selected), "Medication", and "Health education". To the right of these is a "Recipients Name" list box containing the text "yyy". Further right is a "Mobile_Phone" text area. Below the "Recipients Name" list are "Add All" and "Add" buttons. Below the "Mobile_Phone" area is a "Remove" button. On the left side, below the "Reminder" section, are fields for "Date", "Cause" (a dropdown menu currently showing "diabetics"), and "Information". Below the "Information" field is a blue hyperlink "Add New Patients". At the bottom center is an "Appointment" button, and at the bottom right is a "Display All" button.

Figure 4.12. Patient reminder form for the proposed mHealth prototype at Addis Ababa City Administration Health Bureau Owned Hospitals, June, 2013

This form used to send appointment, medication, test result and health education messages to patients. It populates the form with list of patients based on the selected causes. Among the listed patients the system can transmitted the desired information for one or more patients at a time. It can also used to delete a patient who is going to receive a message from reminder table using show detail button.

E. User Form

The screenshot shows a software window titled "frmuser". At the top, there is a toolbar with icons for "New", "Save", "Search", "Delete", "Update", and "Close". Below the toolbar, there are five text input fields arranged vertically, each with a label to its left: "UserName", "Pasword", "Confirm Password", "Fname", and "Lname".

Figure 4.13. User registration form for the proposed mHealth prototype at Addis Ababa City Administration Health Bureau Owned Hospitals, June, 2013

Used to create a new user, search existing user using user name, update existing user information and delete existing user from the user table.

F. Report menu

9/20/2012						
cause	patient_id	full_name	information	mobile_phone	date	reminder_type
diabetics	6	System.Data.DataTable		0913437899	9/1/2005	Appointment

9/20/2012						
Cause	Patient_Id			mobile_phone		
diabetics	12			0913437899		
hypertension	05			0911437899		

Figure 4.14. Patient registration and reminder report for the proposed mHealth prototype at Addis Ababa City Administration Health Bureau Owned Hospitals, June, 2013

Used to generate report for the message transmitted (reminder menu) and registered patients (patient registration menu) by grouping in to causes.

G. Exit menu

To exit from the main menu.

H. Help menu

To get helps related to the application.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATION

5.1. Conclusion

The study assessed prospects of mHealth on improving non communicable chronic disease management of public health facilities, covering all internal factors affecting prospects of mHealth. The study has four domain categories: socio demographics, status, knowledge and attitude. A number of factors were addressed under each domain category.

The findings of the study implied that the status, mHealth knowledge level, attitude and perception towards mHealth (particularly for NCCDM) of health professionals and other workers in the health facilities.

The following conclusions were made based on the study findings:

1. Majority of the respondents have not received mHealth training, due to this they have low level of knowledge.
2. Almost all the respondents have positive attitude about the significance of mHealth on improving non communicable chronic disease management.
3. The current condition (infrastructure, budget, policy related to mHealth, inadequate human resources) is not adequate to implement mHealth.
4. There is limited availability and accessibility of Mobile network quality, legal framework, training and Internet.
5. Utilization of mobile phone is low and using it for health related purposes is very low.

5.2. Recommendation

The provision of quality health care is the mission of health care facilities. To get all the benefits of mHealth in the health care facilities the following points are recommended.

- The government and Ministry of Health should allocate adequate budget and other resources for better development, implementation and follow-up mHealth in health facilities at different levels.

- Large scale Infrastructural expansions and associated capacity building interventions of healthcare providers and other professionals should be considered in line with the utilization of e-health in general and mHealth implementation in particular.
- To implement and utilize mHealth first of all, it is important to evaluate the readiness level of health facilities in accepting and implementing this technology to ensure a productive and beneficial implementation.
- Linkage mechanism with different international organizations and NGOs should be developed to establish the collaboration among them.
- Awareness creating programs should be given concerning this technology and the overall mHealth benefits.
- Ethio telecom should invest more on improving network quality and reducing service cost.
- Based on the findings of this study, a more compressive national study should be conducted to get the national picture in terms of prospects of mHealth on improving non communicable chronic disease management.
- Future work could attempt to investigate ways of coordinating different health information systems with mHealth to avoid fragmentation of flow of information through centralization of health data centers.
- This study will be a base to conduct further studies on the implementation of mHealth and its utilization for health data collection, diseases management and control other than non communicable chronic disease.

REFERENCES

1. Istepanian, Robert, Laxminarayan, Swamy, Pattichis, Constantinos S. mHealth: Emerging Mobile Health Systems; 2005. Available at: http://en.wikipedia.org/wiki/mHealth#cite_note-mHealthbook-4 (Accessed: 19 May 2012 at 10:30 PM)
2. Vital Wave Consulting; 2009. Available at: http://en.wikipedia.org/wiki/mHealth#cite_note-mHealthbook-4 (Accessed: 18 May 2012 at 5:30 AM).
3. Germanakos P., Mourlas C., & Samaras G. A Mobile Agent Approach for Ubiquitous and Personalized eHealth Information Systems. Workshop on Personalization for e-Health of the 10th International Conference; 2005; 67–70. Available at: <http://www.vitalwaveconsulting.com/pdf/mHealth.pdf> (Accessed: 20 May, 2012 at 10:30 AM).
4. Darrell West. Issues in technology innovation: How Mobile Devices are Transforming Healthcare and How Mobile Devices is Transforming Healthcare; 2012; 1-6.
5. Farhaan M., Rosemary S., Tony N. Mobile Health and Chronic Disease Management: Moving Towards a Holistic Approach. Institute of Information & Mathematical Sciences. Massey University. Albany, New Zealand; 2008.
6. Ethio telecom; 2012. Available at: <http://www.ethiotelecom.et/support/contact-us.php> (Accessed: 02 January, 2012 at 4:33 AM).
7. WHO. mHealth New horizons for health through mobile technologies. Global Observatory for eHealth series; 2011; 3.
8. WHO. Chronic Disease; 2008. Available at: http://www.who.int/topics/chronic_diseases/en/ (Accessed: December 20, 2012 at 10:15 PM)
9. Ministry of Health. National Health Information System Road Map. Federal Democratic Republic of Ethiopia, Addis Ababa; 2012/13; 2-5. Available at: www.moh.gov.et/English/Resources/Documents/Final_draft_HIS_Road_Map_Ethiopia_October4,2012-Updated_following_NAC_meeting.doc (Accessed: January 3, 2013)
10. Global Burden of Disease; 2008. Available at: <http://en.wikipedia.org/wiki/mHealth#WHO2004GBD> (Accessed: 19 May, 2012 at 10:30 AM).

11. mHealth; N.D., Available at: <http://searchhealthit.techtarget.com/definition/mHealth>
(Accessed: December 24, 2012 at 9:30 PM)
12. U.S. Department of Health and Human Services, Health Information Technology and Quality Improvement; N.D.; 303. Available at: <http://www.hrsa.gov/healthit/mHealth.html>
(Accessed: December 25, 2012 at 3:10 AM)
13. The mHealth Alliance; N.D., Available at: <http://www.mhimss.org/resource/definitions-mHealth> (Accessed: December 25, 2012 at 3:35 AM).
14. Shantanu N. and Edith H. New Technology Needs for Non communicable Diseases in Developing Countries: a landscaping study, Center for Global Health R&D Policy Assessment; 2012; 26-32.
15. WHO, Global Status Report on Non Communicable Diseases; 2010.
16. Anthony O. Mobile devices, the essential medical equipment for the future in Ghana; N.D.; 11-13. Available at:
<http://www.ghanahealthservice.org/includes/upload/publications/Mobile%20Devices.pdf>
(Accessed: December 23 at 3:01 AM).
17. Rifat S., Faizul B., Gourab K., Sheikh A., and Mostofa Ak., Intelligent Mobile Health Monitoring System (IMHMS), Bangladesh University of Engineering & Technology, University of Illinois at Urbana-Champaign, Marquette University; 2009; 2(3): 21- 27.
18. DRA Project, Cell Phones and Reducing Health Disparities. Institute for Alternative Futures; 2006; 3-7.
19. WHO. Preventing chronic diseases: a vital investment; 2005. Available at:
http://www.who.int/chp/chronic_disease_report/en/ (Accessed: January 15, 2013 at 7:16 PM)
20. Muluneh TA, Haileamlak A, Tessema F, et al. Population based survey of chronic non-communicable diseases, southwest Ethiopia. Gilgel Gibe Field Research Center; 2012; 22 (2): 1-4.
21. Feleke Y, Enquselassie F. An assessment of the health care system for diabetes in Addis Ababa, Ethiopia, 2003; 206.

22. A.T. Kearney, Global management consulting firm, Available at: www.atkearney.com (Accessed: January 6, 2013 at 10:33 AM); N.D.
23. Michael Dejene Public Health Consultancy Services, Effectiveness of a Reminder Telephone call in Improving Utilization of Essential Maternal and Child Health Services in Addis Ababa; 2012; 6-9.
24. Mirza, Farhaan, Norris, Tony, Stockdale, Rosemary. Mobile Technologies and the Holistic Management of Chronic Diseases; 2008; 14.
25. Blake H. Mobile phone technology in chronic disease management; 2008; 23, 12, 43-46.
26. Ogundele O. Assessing innovative ICT for health information system in African rural communities. Global HIV/AIDS Initiative. Nigeria (GHAIN); N.D.
27. ISABEL. Experiences in mHealth for Chronic Disease Management in 4 Countries, Barcelona, Spain; 2011; 2-6.
28. United Nation Foundation, mHealth for development: mobile communication for health, Vodafone foundation; 2009; 5-15. Available at: http://www.globalproblemsglobalsolutionsfiles.org/pdf/UNF_tech/UNF_mHealth_for_Development_Brochure.pdf (Accessed: January 23, 2012 at 8:15 PM).
29. Mobile Phone Disease Management, Technology Development and Commercialization, University of Health Network, Toronto General Hospital, Princess Margaret Hospital, Toronto Western Hospital; N.D.
30. Kalam Abu. Current Situation and Future Opportunity of Telemedicine and e-health in Bangladesh; 2011; 26-29.
31. Nunnally JC and Berstein IH. Psychometric Theory. New York: McGraw-Hill; 1994; 17-34.
32. Haile Ab. Challenges AND Opportunities for Health Professionals in using ICT for Health Care: The Case of Government Owned Health Centers in Addis Ababa; Addis Ababa University School of Graduate Studies; 2011; 23.

ANNEXES

Annex I – Preliminary Survey Questionnaire

Name of health institution _____

Date _____ Questionnaire No _____

Hello!

My name is Gashaw Lulie. I am postgraduate student of Addis Ababa University in Health Informatics program. I am studying the prospects of mHealth on improving non communicable chronic disease management on public hospitals owned by Addis Ababa City Administration Health Bureau. This questionnaire is part of a preliminary survey necessary for this study in order to determine the number of study participants available for sampling.

Therefore, I am requesting your kind cooperation in providing the number and quality of health professionals in your health facility. You have the right not to provide the numbers; however, these numbers are of utmost importance to the successful conduct of this study.

If you are willing and able to provide me the numbers, please indicate your consent below.

Yes, I am willing to participate in this study _____

No, I am not willing to participate in this study _____

If you are willing to participate in this study, please provide the number of health professionals required in the space available for your health facility in the following table.

Thank You in Advance!

Health Facility	Specialist	Professional Nurse	General Doctor	Diploma Nurse	Pharmacy	Laboratory	Health Officer	Data Expert
Minilik II Hospital								
Yekatit 12 Hospital								
Zewditu Memorial Hospital								
Ras Desta Memorial Hospital								
Tirunesh Bejing memorial Hospital								

Annex II - Information Sheet

Name of health institution _____

Date _____ Questionnaire No _____

Hello!

My name is Gashaw Lulie. I am postgraduate student of Addis Ababa University in health informatics programme. I want to study the research thesis project titled prospects of mHealth on improving non communicable chronic disease management in Addis Ababa City Administration Health Bureau owned Hospitals.

As we know, we suffered from shortage of medical specialists, in many kinds of chronic disease like diabetics, cancer, hypertension, heart attack, thus to alleviate the shortage of medical specialists and to improve patients self management mHealth is a recommended solution for this issue. Therefore, I want to study the status of mHealth utilization for non communicable chronic diseases management in the hospital. Therefore, I have questions concerning infrastructure of your facility, technological factors, Socio demographic factors, impeding or facilitating mHealth implementation to manage non communicable chronic diseases.

Your name and personal address will not be written on this questionnaire. Your response to this questionnaire will only be used for research purpose and never be used for any other purpose. If you want, you can interrupt at any time during interview or complete self administered questionnaire and you are not obliged to answer every question.

However, your cooperation to respond to each question sounds the level off the study to its direction. I am grateful to your help in responding this questionnaire; it takes 30 minute to complete the questionnaires.

Annex III - Consent form

Would you be willing to participate in the study?

(Indicate by ticking the appropriate response.)

I hereby agree to participate in this study and give my voluntary consent.

Yes _____

Sign _____

No _____

Date _____

Annex IV. Self - administer Questionnaire for Health Professionals

Choose your answer by circle your choice

Section 1: Socio - Demographic Characteristics

SD101. Sex: 1. Male 2. Female

SD102. What is your age?

1. 20-25 2. 26-35 3. 36-45 4. 46-55 5. Above 55

SD103. What is your profession in the health facility?

1. Specialist 2. Professional Nurse 3. General Doctor 4. Diploma Nurse
5. Pharmacy 6. Laboratory 7. Other, please specify _____

SD104. Year of professional service at this facility

1. Less than 1 year 2. One to four years 3. Five or more years

Section 2: Status of mHealth

ST201. Does the facility have clearly articulated mission and vision about mHealth?

1. Yes 2. No 3. Don't know

ST202. Does the facility have a plan to implement mHealth?

1. Yes 2. No 3. Don't know

ST203. Does the institutional policy promote the implementation of mHealth?

1. Yes 2. No 3. Don't know

ST204. Have staffs and stackholders been involved in planning the mHealth project?

1. Yes 2. No 3. Don't know

ST205. Do you know any legal framework of ICT for mHealth?

1. Yes 2. No 3. Don't know

ST206. Are there trainings for health care providers about mHealth and its implementation?

1. Yes 2. No 3. Don't know

ST207. Is there any mHealth service in your facility?

1. Yes 2. No 3. Don't know

ST208. If your answer for Q207 is yes, for what disease do you use?

1. Infectious 2. Non infectious 3. Don't know

ST209. If your answer for Q207 is yes, how does it help?

1. Referral system 2. Appointment and Medication reminder
3. Health Education 4. Consultation 5. Other, _____

ST210. Is there efficient and affordable support from Ethio telecom?

1. Yes 2. No 3. Don't know

ST211. Does the facility have Internet access?

1. Yes 2. No 3. Don't know

If your answer for QST211 is No, go to question QST217

ST212. If your answer is yes for Q211, what is the type of the Internet?

1. Dial up 2. Broadband 3. Satellite 4. CDMA

ST213. Do you think speed and quality of connection is appropriate for the proposed use?

1. Yes 2. No 3. Don't know

ST214. The cost of the Internet connection is?

1. Very high 2. High 3. Sufficient 4. Low 5. Very Low

ST215. Does the health facility have enough budgets for the Internet?

1. Yes 2. No 3. Don't know

ST216. If your answer for Q215 is No, who can cover the cost?

1. Facility 2. NGOs 3. Stakeholders

ST217. Do you have IT department in the facility?

1. Yes 2. No 3. Don't know

ST218. Do you have sufficient IT professionals in your facility?

1. Yes 2. No 3. Don't know

ST219. If your answer is Yes for Q218, are they responsible for mHealth handling?

1. Yes 2. No 3. Don't know

ST220. What is the level of non communicable chronic disease burden in the facility?

1. Very high 2. High 3. Low 4. Very low 5. Don't know

ST221. What are the common non communicable chronic diseases in your facility?

1. Diabetics and hypertension
2. Asthma, Diabetics and hypertension
3. Diabetics, hypertension, Asthma and heart disease
4. Others please specify _____

Section 3: Knowledge of Health Professionals

KD301. Do you know what mHealth is?

1. Yes 2. No 3. Don't know

KD302. If you choose yes for Q301, how?

1. From Internet 2. From Television 3. From Magazine
4. From Education 5. From Training

KD303. Have you taken normal training about mHealth?

1. Yes 2. No

KD304. What is the level of knowledge and skill about mHealth and the related technologies?

1. Very high 2. High 3. Moderate 4. Low 5. Very Low

KD305. For what purpose do you use mHealth?

1. Referral system 2. Appointment and Medication reminder
3. Health Education 4. Consultation
5. Any other, _____

KD306. If you know mHealth, what does it mean?

1. Mobile Clinic 2. Treatment using mobile phone 3. Don't know

KD307. Do you use mHealth for non-communicable chronic disease related activities?

1. Yes 2. No 3. Don't know

KD308. How much mHealth supports the activities related to non-communicable chronic diseases?

1. Very High 2. High 3. Low 4. Very Low

Section 4: Attitudes of Health Professionals

AT401. mHealth application protect patient privacy?

1. Strongly Agree 3. Neither Agree nor Disagree 5. Strongly Disagree
2. Agree 4. Disagree

AT402. mHealth solves the shortage of health care providers?

1. Strongly Agree 3. Neither Agree nor Disagree 5. Strongly Disagree
2. Agree 4. Disagree

AT403. Our culture have influence to accept mHealth technology?

1. Strongly Agree 3. Neither Agree nor Disagree 5. Strongly Disagree
2. Agree 4. Disagree

AT404. mHealth improves non communicable chronic disease management?

1. Strongly Agree 3. Neither Agree nor Disagree 5. Strongly Disagree
2. Agree 4. Disagree

AT405. mHealth provides cost effective services for the patients?

1. Strongly Agree 3. Neither Agree nor Disagree 5. Strongly Disagree
2. Agree 4. Disagree

AT406. mHealth reduces waiting time for patients'?

1. Strongly Agree 3. Neither Agree nor Disagree 5. Strongly Disagree
2. Agree 4. Disagree

AT407. mHealth reduces patient visit to their doctor's office?

- | | | |
|-------------------|-------------------------------|----------------------|
| 1. Strongly Agree | 3. Neither Agree nor Disagree | 5. Strongly Disagree |
| 2. Agree | 4. Disagree | |

AT408. mHealth can remind patients' appointment and medication using SMS?

- | | | |
|-------------------|-------------------------------|----------------------|
| 1. Strongly Agree | 3. Neither Agree nor Disagree | 5. Strongly Disagree |
| 2. Agree | 4. Disagree | |

AT409. It is possible to provide health education through mobile phone?

- | | | |
|-------------------|-------------------------------|----------------------|
| 1. Strongly Agree | 3. Neither Agree nor Disagree | 5. Strongly Disagree |
| 2. Agree | 4. Disagree | |

AT410. mHealth can transmit test results for patients with non communicable Chronic disease?

- | | | |
|-------------------|-------------------------------|----------------------|
| 1. Strongly Agree | 3. Neither Agree nor Disagree | 5. Strongly Disagree |
| 2. Agree | 4. Disagree | |

AT411. mHealth is helpful in collecting data in an electronic format?

- | | | |
|-------------------|-------------------------------|----------------------|
| 1. Strongly Agree | 3. Neither Agree nor Disagree | 5. Strongly Disagree |
| 2. Agree | 4. Disagree | |

General Comments

Please give your opinion/comment about mHealth application for non-communicable chronic diseases management.

Strong Side: _____

Weak Side: _____

This is the end of this questionnaire.

Thank you very much for your patience and co-operation to complete this questionnaire!

Annex V. Self administer questionnaire for Patients

Choose your answer by circle your choice

Section 1: Socio-Demographic Characteristics

SD101. Sex: 1. Male 2. Female

ST102. What is your age?

1. 20-25 2. 26-35 3. 36-45 4. 46-55 5. Above 55

ST103. What is your educational level?

1. Less than grade 6 2. Above grade 6 3. Diploma 4. Degree 5. Above Degree

SD104. What is your occupation?

1. Merchant 2. Public servant 3. Private employee
4. Self employed 5. Student 6. House wife

Section 2: Status of mHealth

ST201. Do you have a mobile phone? 1. Yes 2. No

ST202. What services does it have?

1. Only Voice call
2. Voice call and text message
3. Voice call, text message and internet
4. Voice call, text message, video call and internet

ST203. If your answer is yes for Q201, for what services did you use your mobile?

1. Voice call only 2. Voice call and Message 3. Voice call, video call and text message
4. Internet E. Voice call, video call, text message and internet

ST204. If you choose B in Q203, what is your ability?

1. Only read 2. Read and write 3. Do not Read and write

ST205. Do you use your mobile for health purpose?

1. Yes 2. No

ST206. If your answer for Q205 is yes, how do you use it?

1. Voice call consultation 2. SMS consultation 3. Online consultation

ST207. The cost of mobile service is

1. Very High 2. High 3. Low 4. Very Low 5. Sufficient

Section 3: Knowledge of patients

KD301. Do you know mHealth?

1. Yes 2. No 3. Don't know

KD302. If you say yes for Q301, how do you know it?

1. From internet 2. From television 3. From radio 4. From magazine

Section 4: Attitudes of patients

AT401. The health facility plan to provide health care services using your phone?

1. Strongly Agree 3. Neither Agree nor Disagree 5. Strongly Disagree
2. Agree 4. Disagree

AT402. In your opinion what should be done to implement mHealth?

1. Training 2. Infrastructure building
3. Dedicated Mobile apparatus
4. Training, Infrastructure building and Dedicated Mobile apparatus
5. Don't know

AT403. mHealth technology provides quality health care services?

- | | | |
|-------------------|-------------------------------|----------------------|
| 1. Strongly Agree | 3. Neither Agree nor Disagree | 5. Strongly Disagree |
| 2. Agree | 4. Disagree | |

AT404. mHealth keep on the patient privacy and data from abusing?

- | | | |
|-------------------|-------------------------------|----------------------|
| 1. Strongly Agree | 3. Neither Agree nor Disagree | 5. Strongly Disagree |
| 2. Agree | 4. Disagree | |

AT405. Mobile network connection is reliable and affordable?

- | | | |
|-------------------|-------------------------------|----------------------|
| 1. Strongly Agree | 3. Neither Agree nor Disagree | 5. Strongly Disagree |
| 2. Agree | 4. Disagree | |

AT406. The quality of mobile network connection is appropriate for mHealth services?

- | | | |
|-------------------|-------------------------------|----------------------|
| 1. Strongly Agree | 3. Neither Agree nor Disagree | 5. Strongly Disagree |
| 2. Agree | 4. Disagree | |

AT407. mHealth improve your non communicable chronic disease management?

- | | | |
|-------------------|-------------------------------|----------------------|
| 1. Strongly Agree | 3. Neither Agree nor Disagree | 5. Strongly Disagree |
| 2. Agree | 4. Disagree | |

AT408. mHealth provides you a cost effective services?

- | | | |
|-------------------|-------------------------------|----------------------|
| 1. Strongly Agree | 3. Neither Agree nor Disagree | 5. Strongly Disagree |
| 2. Agree | 4. Disagree | |

AT409. mHealth reduces your waiting time for treatment?

- | | | |
|-------------------|-------------------------------|----------------------|
| 1. Strongly Agree | 3. Neither Agree nor Disagree | 5. Strongly Disagree |
| 2. Agree | 4. Disagree | |

AT410. mHealth reduces patient visit to their doctor's office?

- | | | |
|-------------------|-------------------------------|----------------------|
| 1. Strongly Agree | 3. Neither Agree nor Disagree | 5. Strongly Disagree |
| 2. Agree | 4. Disagree | |

AT411. mHealth reminds your appointment and medication using SMS?

- | | | |
|-------------------|-------------------------------|----------------------|
| 1. Strongly Agree | 3. Neither Agree nor Disagree | 5. Strongly Disagree |
| 2. Agree | 4. Disagree | |

AT412. mHealth provides you health education using SMS?

- | | | |
|-------------------|-------------------------------|----------------------|
| 1. Strongly Agree | 3. Neither Agree nor Disagree | 5. Strongly Disagree |
| 2. Agree | 4. Disagree | |

AT413. mHealth improve yourself health management?

- | | | |
|-------------------|-------------------------------|----------------------|
| 1. Strongly Agree | 3. Neither Agree nor Disagree | 5. Strongly Disagree |
| 2. Agree | 4. Disagree | |

AT414. mHealth transmits your lab test results using SMS?

- | | | |
|-------------------|-------------------------------|----------------------|
| 1. Strongly Agree | 3. Neither Agree nor Disagree | 5. Strongly Disagree |
| 2. Agree | 4. Disagree | |

General Comments

Please give your opinion/comment about mHealth application for non-communicable chronic diseases management.

Strong Side: _____

Weak Side: _____

This is the end of this questionnaire.

Thank you very much for your patience and co-operation to complete this questionnaire!

Annex V. Self administer Questionnaire for Patients

በአዲስ አበባ ዩኒቨርሲቲ

የኢንፎርሜቲክስ ፋኩልቲ እና የህክምና ፋኩልቲ የጋራ

የሄልዝ ኢንፎርሜቲክስ የድህረ ምረቃ ፕሮግራም

የጠየና ማዕከሉ ስም _____ የመጠይቅ ቁጥር _____

ቀን _____

እኔ _____ የተባልኩ የአዲስ አበባ ዩኒቨርሲቲ የሄልዝ ኢንፎርሜቲክስ ተማሪ ለሆኑት ለአቶ ጋሻው ሉሌ የድህረ ምረቃ ፕሮግራም (Research Thesis) መረጃ ለመሰብሰብ የተቀጠርኩ ሲሆን የጥናቱም አላማ በአዲስ አበባ ከተማ መስተዳድር ስር የሚገኙ ሆስፒታሎች ውስጥ የሞባይል ጤና አገልግሎትን የክሮኒክ በሺታን ቁጥጥር ለማሻሻል ያለውን ጠቀሜታ መፈተሽ ነው። በዚህም መሰረት ይህ ሆስፒታል ለዚህ ፕሮግራም ተመርጧል። የእርሴዎም ንቁ ተሳትፎ እና ትክክለኛ መረጃ በመስጠት መተባበር ለጥናቱ አላማ ከግብ መድረስ ከፍተኛ አስተዋፅኦ አለው።

በዚህ መጠይቅ ላይ የሚሰበሰበው መረጃ ለጥናቱ አላማ ብቻ እንደሚውል ላረጋግጥለዎት እወዳለሁ። ምንም አይነት እርስዎን መለያ የሚሆን መረጃ የማይሰበሰብ መሆኑን አረጋግጣለሁ። መመለስ ያልፈለጉትን ማንኛውንም ጥያቄ አለመመለስ እንደሚችሉ አስገነዝባለሁ። እንዲሁም በማንኛውም ጊዜ ይህን መጠይቅ መመላትን መተው ይችላሉ። ሆኖም በዚህ መጠይቅ ላይ የሚሰጡት መረጃ ለዚህ ፕሮግራም መሳካት ከፍተኛ አስተዋፅኦ እንዳለው በድጋሜ አረጋግጣለሁ። ይህን መጠይቅ ለመመላት የሚወስደው አማካይ ጊዜ ከ25 – 30 ደቂቃ ገደማ ነው።

በዚህ ፕሮግራም ለመሳተፍ ይፈልጋሉ; (የ " / " ምልክት በማድረግ ያመልክቱ)

እሳተፋለሁ _____

አልሳተፍም _____

ለታካሚዎች የሚጠየቅ መጠይቅ

ክፍል አንድ፡ አጠቃላይ መረጃዎች ፡፡

መመሪያ፡ ምርጫዎን በማክበብ መልስ ይስጡ ፡፡

1. ጅታ ሀ. ወንድ ለ. ሴት
2. °ÉT@- e”f ”<;
G. Ÿ20-25 K. Ÿ26-35 N. Ÿ36-45 S. Ÿ46-55 W.Ÿ55 ›Sf uLÃ
3. ¾fUI`f Å[í ;
G. Ÿ6— jõM በታች ለ. ከ6ኛ ክፍል በላይ ሐ. ዲፕሎማ መ. ዲግሪ ሠ. ከዲግሪ በላይ
4. ስራዎ ምንድን ነው;
ሀ. ነጋዴ ለ. የመንግስት ሰራተኛ ሐ. የግል መስሪያ ቤት ሰራተኛ
መ. የራስን ስራ በመስራት የሚተዳደር ሠ. ተማሪ ሸ. የቤት እመቤት

ክፍል ሁለት፡ የሞባይል ጤና ሁኔታና የአጠቃቀም ደረጃ

5. ሞባይል ስልክ አለዎት;
ሀ. አዎ ለ. የለኝም
6. ለተራ ቁጥር 5 መልስዎ አዎ ከሆነ ስልክዎ ምን ምን አገልግሎት አለው;
ሀ. የድምጽ ስልክ አገልግሎት
ለ. የድምጽ ስልክ እና የጽሁፍ መልዕክት አገልግሎት
ሐ. የድምጽ ስልክ፣ የጽሁፍ መልዕክት እና የኢንተርኔት አገልግሎት
መ. የድምጽ ስልክ፣ የጽሁፍ መልዕክት፣ የቪዲዮ ስልክ እና የኢንተርኔት አገልግሎት
7. ለተራ ቁጥር 5 መልስዎ አዎ ከሆነ ስልክዎ ለምን ለምን አገልግሎት ይጠቀሙበታል;
ሀ. የድምጽ ስልክ አገልግሎት
ለ. የድምጽ ስልክ እና የጽሁፍ መልዕክት አገልግሎት
ሐ. የድምጽ ስልክ፣ የጽሁፍ መልዕክት እና የኢንተርኔት አገልግሎት
መ. የድምጽ ስልክ፣ የጽሁፍ መልዕክት፣ የቪዲዮ ስልክ እና የኢንተርኔት አገልግሎት
8. ለተራ ቁጥር 7 መልስዎ ለ ከሆነ የእርስዎ ችሎታ ምንድን ነው;
ሀ. ማንበብ ብቻ ለ. ማንበብና መፃፍ ሐ. ማንበብም ሆነ መፃፍ አልችልም
9. ስልክዎን ከጤና ጋር በተያያዘ ጉዳይ ተጠቅመውበት ያውቃሉ;
ሀ. አዎ ለ. አልተጠቀምኩበትም
10. ለተራ ቁጥር 9 መልስዎ አዎ ከሆነ እንዴት ነው የሚጠቀሙበት;
ሀ. በድምፅ ስልክ የምክር አገልግሎት ለ. የፅሁፍ መልዕክት የምክር አገልግሎት
ሐ. የቀጥታ የምክር አገልግሎት

11. የሞባይል ስልክ አገልግሎት ክፍያ;

ሀ. በጣም ከፍተኛ ለ. ከፍተኛ ሐ. ዝቅተኛ መ. በጣም ዝቅተኛ ሠ. ተመጣጣኝ

ክፍል ሶስት፡ የታካሚው የእውቀት ደረጃ

12. የሞባይል ጤና አገልግሎት ምን ማለት እንደሆነ ያውቃሉ; ሀ. አዎ ለ. አላውቅም
13. ለተራ ቁጥር 12 መልስዎ አዎ ከሆነ እንዴት ነው ሊያወቁት የቻሉት;
- ሀ. ከኢንተርኔት ለ. ከቴሌቪዥን ሐ. ሬዲዮ መ. ከጋዜጣ

ክፍል አራት፡ ታካሚዎች ስለ ሞባይል ጤና ያላቸው አመለካከት

14. የጤና ተቋሙ በሞባይል ስልክዎ የጤና አገልግሎት ለመስጠት ዕቅድ ማቀዱን ይስማማሉ;
- ሀ. በጣም እስማማለሁ ለ. እስማማለሁ ሐ. መልስ የለኝም
- መ. አልስማማም ሠ. በጣም አልስማማም
15. በእርስዎ አመለካከት ሞባይል ጤናን ተግባራዊ ለማድረግ ምን መስራት አለበት;
- ሀ. ስልጠና ለ. የመሰረተ ልማት ግንባታ ሐ. ለሞባይል ጤና የተለየ ሞባይል ስልክ
- መ. ስልጠና፣ የመሰረተ ልማት ግንባታ እና ለሞባይል ጤና የተለየ ሞባይል ስልክ
16. የሞባይል ጤና አገልግሎት ቴክኖሎጂ ደረጃው የላቀ የጤና አገልግሎት ይሰጣል;
- ሀ. በጣም እስማማለሁ ለ. እስማማለሁ ሐ. መልስ የለኝም
- መ. አልስማማም ሠ. በጣም አልስማማም
17. የሞባይል ጤና አገልግሎት የታካሚዎችን ደህንነት እና መረጃ ከብክነት ይከላከላል;
- ሀ. በጣም እስማማለሁ ለ. እስማማለሁ ሐ. መልስ የለኝም
- መ. አልስማማም ሠ. በጣም አልስማማም
18. የሞባይል ስልክ ኔትወርክ አስተማማኝና በአቅማችን ልንጠቀመው የሚችል ነው;
- ሀ. በጣም እስማማለሁ ለ. እስማማለሁ ሐ. መልስ የለኝም
- መ. አልስማማም ሠ. በጣም አልስማማም
19. ያለው የሞባይል ኔትወርክ ጥራት የሞባይል ጤና አገልግሎትን ለመጠቀም ያስችላል;
- ሀ. በጣም እስማማለሁ ለ. እስማማለሁ ሐ. መልስ የለኝም
- መ. አልስማማም ሠ. በጣም አልስማማም
20. የሞባይል ጤና አገልግሎት ተላላፊ ያልሆነ ክሮኒክ በሺታ ቁጥጥርዎን ያሻሽላል;
- ሀ. በጣም እስማማለሁ ለ. እስማማለሁ ሐ. መልስ የለኝም
- መ. አልስማማም ሠ. በጣም አልስማማም
21. የሞባይል ጤና አገልግሎት ተመጣጣኝ በሆነ ክፍያ አገልግሎት ይሰጣል;
- ሀ. በጣም እስማማለሁ ለ. እስማማለሁ ሐ. መልስ የለኝም
- መ. አልስማማም ሠ. በጣም አልስማማም
22. የሞባይል ጤና አገልግሎት ህክምና ለማግኘት የምትጠብቁትን ሰዓት ይቀንሳል;

ሀ. በጣም እስማማለሁ ለ. እስማማለሁ ሐ. መልስ የለኝም
 መ. አልስማማም ሠ. በጣም አልስማማም

23. የሞባይል ጤና አገልግሎት ታካሚዎች ህክምና ለማግኘት ወደ ዶክተራቸው ቢሮ የሚያደርጉትን ምልልስ ይቀንሳል ብለው ያስባሉ;

ሀ. በጣም እስማማለሁ ለ. እስማማለሁ ሐ. መልስ የለኝም
 መ. አልስማማም ሠ. በጣም አልስማማም

24. የሞባይል ጤና አገልግሎት የህክምና ቀጠሮ እና መድሃኒት መውሰጃ ጊዜዎን በጽሁፍ መልዕክት ያስታውሰዎት;

ሀ. በጣም እስማማለሁ ለ. እስማማለሁ ሐ. መልስ የለኝም
 መ. አልስማማም ሠ. በጣም አልስማማም

25. የሞባይል ጤና አገልግሎት ከጤና ጋር የተያያዙ ትምህርቶችን በፅሁፍ መልዕክት ያስታውሰዎት;

ሀ. በጣም እስማማለሁ ለ. እስማማለሁ ሐ. መልስ የለኝም
 መ. አልስማማም ሠ. በጣም አልስማማም

26. የሞባይል ጤና አገልግሎት የራስን ጤና ቁጥጥር ያሻሽላል;

ሀ. በጣም እስማማለሁ ለ. እስማማለሁ ሐ. መልስ የለኝም
 መ. አልስማማም ሠ. በጣም አልስማማም

27. የሞባይል ጤና አገልግሎት የምርመራ ውጤትን በጽሁፍ መልዕክት ይልክለዎታል;

ሀ. አዎ ለ. አልስማማም

አጠቃላይ አስተያየት

ስለ ሞይል ጤና በክሮኒክ በሺታዎች ቁጥጥር ላይ ያለዎትን አጠቃላይ አስተያየት ይግለጹ፡፡

ጠንካራ ጎን _____

ደካማ ጎን _____

ይህ የመጠይቁ መጨረሻ ነው ፡፡ ጊዜዎን ወስደው ስለተባበሩኝ እጅግ በጣም አመሰግናለሁ ፡፡፡

Annex VI – Key Informant Interview Guides

To: Minilik Memorial Hospital

Addis Ababa

Key informant Interview (Guide Questions)

Addis Ababa University

Faculty of Informatics and Faculty of Medicine (Joint)

Health Informatics Program

Date _____

Respondents: the participants in these key informant interviews are the designated staff of Minilik Memorial Hospital.

Introduction: My name is Gashaw Lulie. I am a postgraduate student of Health Informatics at Addis Ababa University. I am currently doing research for my thesis entitled

“Prospects of mHealth on Improving Non Communicable Chronic Disease Management: the case of Addis Ababa Health Bureau owned Hospitals”

I am asking your admired organization for your valuable support in responding to the attached guide. The interview guide is designed for collecting data about prospects of mHealth on improving non communicable chronic disease management in the facility.

Consent form

I, the undersigned, am informed that the key informant interview is conducted to gather information concerning the prospects of implementing mHealth in Ethiopia. The responses are to be used as inputs to the research work entitled

“Prospects of mHealth on Improving Non Communicable Chronic Disease Management: the case of Addis Ababa Health Bureau owned Hospitals”

Moreover, confidentiality of the response will be maintained herewith.

Name of the Interviewee: _____

Profession: _____

Designation/role: _____

Date: _____

Signature: _____

To: Zewditu Memorial Hospital

Addis Ababa

Key informant Interview (Guide Questions)

Addis Ababa University

Faculty of Informatics and Faculty of Medicine (Joint)

Health Informatics Program

Date _____

Respondents: the participants in these key informant interviews are the designated staff of Zewditu Memorial Hospital.

Introduction: My name is Gashaw Lulie. I am a postgraduate student of Health Informatics at Addis Ababa University. I am currently doing research for my thesis entitled

“Prospects of mHealth on Improving Non Communicable Chronic Disease Management: the case of Addis Ababa Health Bureau owned Hospitals”

I am asking your admired organization for your valuable support in responding to the attached guide. The interview guide is designed for collecting data about prospects of mHealth on improving non communicable chronic disease management in the facility.

Consent form

I, the undersigned, am informed that the key informant interview is conducted to gather information concerning the prospects of implementing mHealth in Ethiopia. The responses are to be used as inputs to the research work entitled

“Prospects of mHealth on Improving Non Communicable Chronic Disease Management: the case of Addis Ababa Health Bureau owned Hospitals”

Moreover, confidentiality of the response will be maintained herewith.

Name of the Interviewee: _____

Profession: _____

Designation/role: _____

Date: _____

Signature: _____

To: Yekatit 12 Memorial Hospital

Addis Ababa

Key informant Interview (Guide Questions)

Addis Ababa University

Faculty of Informatics and Faculty of Medicine (Joint)

Health Informatics Program

Date _____

Respondents: the participants in these key informant interviews are the designated staff of Yekatit 12 Memorial Hospital.

Introduction: My name is Gashaw Lulie. I am a postgraduate student of Health Informatics at Addis Ababa University. I am currently doing research for my thesis entitled

“Prospects of mHealth on Improving Non Communicable Chronic Disease Management: the case of Addis Ababa Health Bureau owned Hospitals”

I am asking your admired organization for your valuable support in responding to the attached guide. The interview guide is designed for collecting data about prospects of mHealth on improving non communicable chronic disease management in the facility.

Consent form

I, the undersigned, am informed that the key informant interview is conducted to gather information concerning the prospects of implementing mHealth in Ethiopia. The responses are to be used as inputs to the research work entitled

“Prospects of mHealth on Improving Non Communicable Chronic Disease Management: the case of Addis Ababa Health Bureau owned Hospitals”

Moreover, confidentiality of the response will be maintained herewith.

Name of the Interviewee: _____

Profession: _____

Designation/role: _____

Date: _____

Signature: _____

To: Ras Desta Memorial Hospital

Addis Ababa

Key informant Interview (Guide Questions)

Addis Ababa University

Faculty of Informatics and Faculty of Medicine (Joint)

Health Informatics Program

Date _____

Respondents: the participants in these key informant interviews are the designated staff of Ras Desta Memorial Hospital.

Introduction: My name is Gashaw Lulie. I am a postgraduate student of Health Informatics at Addis Ababa University. I am currently doing research for my thesis entitled

“Prospects of mHealth on Improving Non Communicable Chronic Disease Management: the case of Addis Ababa Health Bureau owned Hospitals”

I am asking your admired organization for your valuable support in responding to the attached guide. The interview guide is designed for collecting data about prospects of mHealth on improving non communicable chronic disease management in the facility.

Consent form

I, the undersigned, am informed that the key informant interview is conducted to gather information concerning the prospects of implementing mHealth in Ethiopia. The responses are to be used as inputs to the research work entitled

“Prospects of mHealth on Improving Non Communicable Chronic Disease Management: the case of Addis Ababa Health Bureau owned Hospitals”

Moreover, confidentiality of the response will be maintained herewith.

Name of the Interviewee: _____

Profession: _____

Designation/role: _____

Date: _____

Signature: _____

To: Tirunesh Bejing Memorial Hospital

Addis Ababa

Key informant Interview (Guide Questions)

Addis Ababa University

Faculty of Informatics and Faculty of Medicine (Joint)

Health Informatics Program

Date _____

Respondents: the participants in these key informant interviews are the designated staff of Tirunesh Bejing Memorial Hospital.

Introduction: My name is Gashaw Lulie. I am a postgraduate student of Health Informatics at Addis Ababa University. I am currently doing research for my thesis entitled

“Prospects of mHealth on Improving Non Communicable Chronic Disease Management: the case of Addis Ababa Health Bureau owned Hospitals”

I am asking your admired organization for your valuable support in responding to the attached guide. The interview guide is designed for collecting data about prospects of mHealth on improving non communicable chronic disease management in the facility.

Consent form

I, the undersigned, am informed that the key informant interview is conducted to gather information concerning the prospects of implementing mHealth in Ethiopia. The responses are to be used as inputs to the research work entitled

“Prospects of mHealth on Improving Non Communicable Chronic Disease Management: the case of Addis Ababa Health Bureau owned Hospitals”

Moreover, confidentiality of the response will be maintained herewith.

Name of the Interviewee: _____

Profession: _____

Designation/role: _____

Date: _____

Signature: _____

Questionnaire for Key Informant Interview

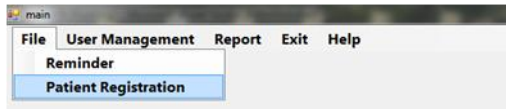
1. Do you know what mHealth is? How?
2. If you know mHealth what does it mean?
3. What do you think about establishment of mHealth in your hospital?
4. What do you need to establish mHealth?
5. Is it possible to get call center? Who can cover the cost?
6. Do you have sufficient IT professional in the facility?
7. Do you have policy framework concerning mHealth? And how do you implement?
8. Do you believe the existing policy promote or inhabit the use of mHealth in your health facility? How?
9. What kinds of ICT infrastructure needed for mHealth introduction are available?
10. What ICT infrastructure for mHealth implementation needs exist in the hospital?
11. Do you believe mHealth would bring about significant change on non communicable chronic disease management? How?
12. How ready are the health care provider and other stake holders to accept mHealth?
13. How do you think mHealth applications affect the patient and health care provider?
14. In your opinion, what are the perceived challenges and opportunities of mHealth implementation?
15. Are you satisfied with the existing situation of health service treatment and availability of health care Providers for non communicable chronic disease? Why?

We have finished the interview. Thank you very much for taking your time to provide such valuable information!!!

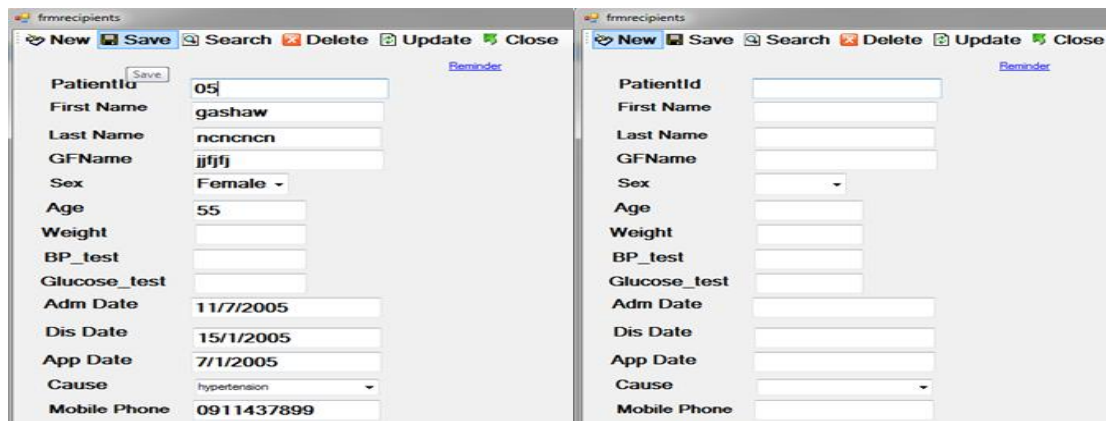
Annex VI: Prototype User Manual

A. To register a new patient:

- Go to file menu
- Select patient registration menu

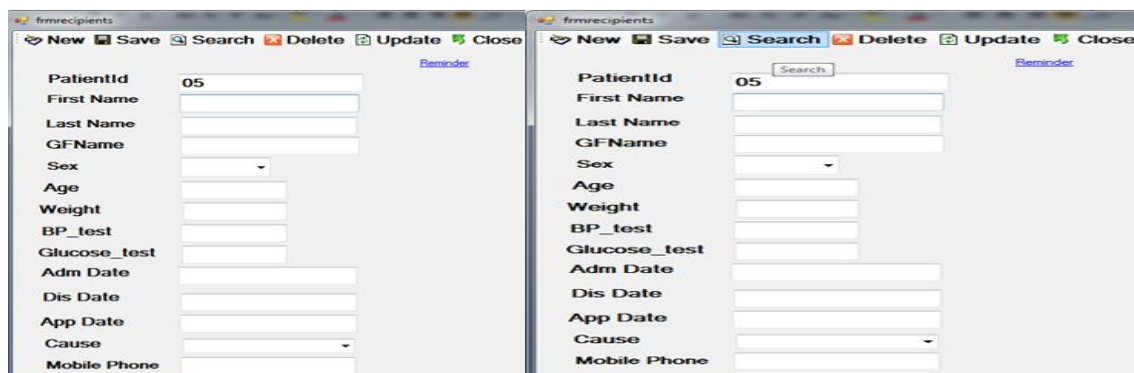


- Enter patient detail
- Click on save menu to save patient information
- To add new patients click on new menu

Two side-by-side screenshots of a form titled 'frmrecipients'. The left screenshot shows the form with data entered: PatientId (05), First Name (gashaw), Last Name (ncncncn), GFName (jijijij), Sex (Female), Age (55), Weight, BP_test, Glucose_test, Adm Date (11/7/2005), Dis Date (15/1/2005), App Date (7/1/2005), Cause (hypertension), and Mobile Phone (0911437899). The right screenshot shows the same form but with all fields empty, except for the PatientId field which contains '05'. Both forms have a toolbar with 'New', 'Save', 'Search', 'Delete', 'Update', and 'Close' buttons, and a 'Reminder' link.

B. To search patient from patient table:

- Open patient registration form
- Enter patient id in patient id box
- Click on search menu

Two side-by-side screenshots of the 'frmrecipients' form. The left screenshot shows the form with '05' entered in the PatientId field. The right screenshot shows the same form with '05' entered in the PatientId field and the 'Search' button in the toolbar highlighted. Both forms have a toolbar with 'New', 'Save', 'Search', 'Delete', 'Update', and 'Close' buttons, and a 'Reminder' link.

- Details of the patient will be displayed in the corresponding text boxes

The screenshot shows a Windows application window titled 'frmrecipients'. It has a menu bar with 'New', 'Save', 'Search', 'Delete', 'Update', and 'Close'. Below the menu bar is a 'Search' button and a 'Reminder' link. The form contains the following fields:

PatientId	05
First Name	gashaw
Last Name	ncncncn
GFName	jjjjj
Sex	Female
Age	55
Weight	
BP_test	
Glucose_test	
Adm Date	11/7/2005
Dis Date	15/1/2005
App Date	7/1/2005
Cause	hypertension
Mobile Phone	0911437899

C. To delete patient from patient table:

- Open patient registration form
- Enter patient id in patient id text box
- Click on search menu
- Patient details will be displayed in the corresponding text boxes
- Click on delete menu
- Click on OK on delete confirmation dialog box
- Click ok

The screenshot shows the 'frmrecipients' form with the 'Delete' menu item highlighted. Overlaid on the form are two dialog boxes:

- Delete confirm:** A dialog box asking 'Are you sure to delete data with patient_id : 05 ?' with 'OK' and 'Cancel' buttons.
- Info Delete patient:** A dialog box showing 'patient With Patient_Id 05 Successfully Deleted' with an 'OK' button.

D. To update patient details:

- Open patient registration form
- Enter patient id in patient id text box
- Click on search menu
- Patient details will be displayed in the corresponding text boxes
- Edit the detail that you want to update
- Click on update menu

- Click on ok on update informing dialog box

The screenshot shows two windows. On the left is the 'frmrecipients' form with the following data: PatientId: 2, First Name: gggg, Last Name: hhhh, GFName: yy, Sex: Male, Age: 55, Weight: (empty), BP_test: (empty), Glucose_test: (empty), Adm Date: 03/03/30, Dis Date: 03/03/2010, App Date: 12/12/2012, Cause: diabetics, Mobile Phone: 0913437899. The 'Update' button is highlighted. On the right is an 'Informing' dialog box with the message 'your Successfully updated' and an 'OK' button.

You can call and send a reminder for a patient (s) by calling a reminder form on patient registration form

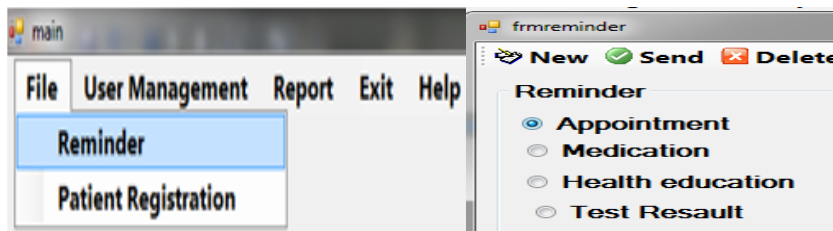
The screenshot shows the 'frmrecipients' form with the same data as before. A 'Reminder' button is now visible next to the 'Update' button in the top right corner of the form.

After you have finished working with the form click on close menu.

The screenshot shows the 'frmrecipients' form with the same data. The 'Close' button in the top right corner is now highlighted, indicating it is the next step to click.

E. To transmit appointment reminder:

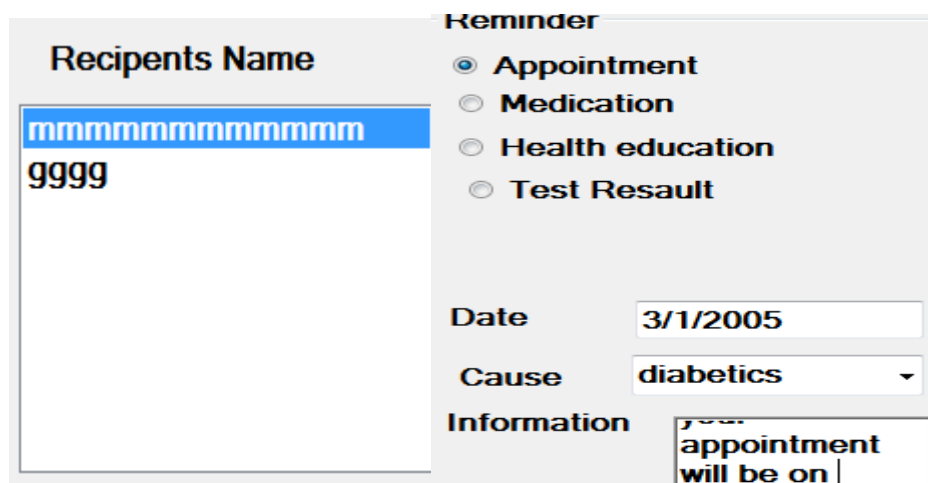
- Go to file menu
- Click on reminder
- Click on appointment button



- Enter the current date in date text box
- Select the cause in the cause combo box



- Patient names who have the selected cause will be displayed in recipients name list box
- Write an appointment information in information box



- Select the patient (s) you want to send an appointment reminder in recipients name list box
- Click on add button to send an appointment reminder for a single/currently selected patient
- Click on add all button to send an appointment reminder for all patients listed in recipients list box
- Phone number of patients added will be listed in mobile phone list box

Recipients Name	Mobile_Phone	Recipients Name	Mobile_Phone
mmmmmmmmmmmm 9999 Add All Add	0911477264	mmmmmmmmmmmm 9999 Add All Add	0911477264 0913437899

- Click on send menu to transmit an appointment reminder for those selected patients
- Click on ok

frmreminder

New **Send** Delete

Reminder

Send

☒ Appointment
☐ Medication
☐ Health education
☐ Test Result

Message is Send

OK

- If you add patient(s) by fault you can remove from the mobile phone list by clicking on remove button.

Recipients Name	Mobile_Phone
mmmmmmmmmmmm 9999 Add All Add	0911477264 0913437899 Remove

- To see list of messages transmitted click on display all button

	cause	information	date	reminder_ty	patient_id	
▶	diabetics	fdfd	9/1/2005	Appoint...	6	
	diabetics	wel come	2/1/2005	Test Res...	7	

F. To send new information:

- Click on new menu

G. To delete information to be transmitted from reminder table:

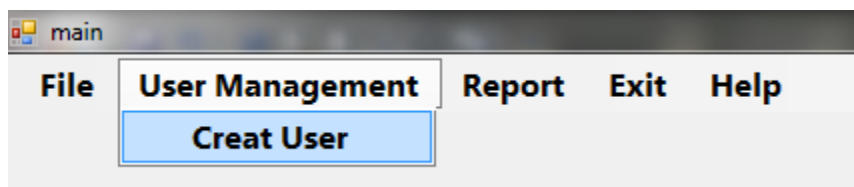
- Select the message you want to delete from display all button list
- Click on delete menu

H. To transmit medication, test result and health education: follow the procedures followed in appointment reminder transmission except the selection of medication, test result and health education correspondingly the type of information going to be transmitted.

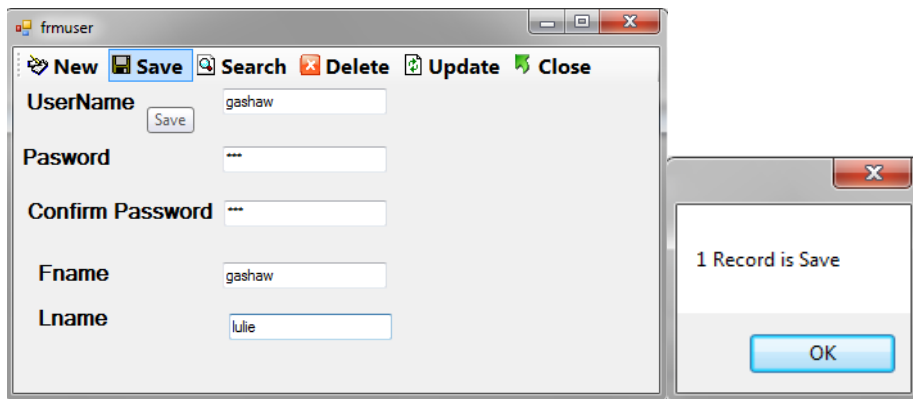
I. To exit the form click on close

J. To create a new user:

- Go to user management menu
- Select create user menu

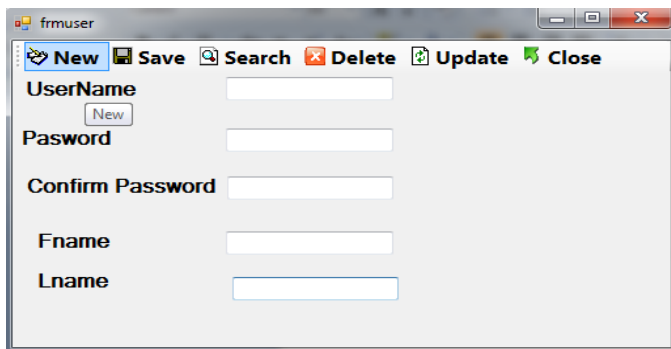


- Enter detail of the new user
- Click on save menu to save the new user
- Click on ok



K. To add more new user:

- Click on new menu



L. To search the existing user:

- Enter username and
- Click on search menu

The screenshot shows the 'frmuser' application window with the 'Search' tab selected. The form contains the following fields:

- UserName:** gashaw
- Pasword:** ***
- Confirm Password:** (empty)
- Fname:** gashaw
- Lname:** lulie

The toolbar at the top includes buttons for New, Save, Search, Delete, Update, and Close.

M. To delete user:

- Search the user using username
- Click on delete

This screenshot is similar to the previous one, but the 'Delete' button in the toolbar is highlighted with a red border, indicating it is the next step in the process.

- Click on ok on delete confirmation dialog box

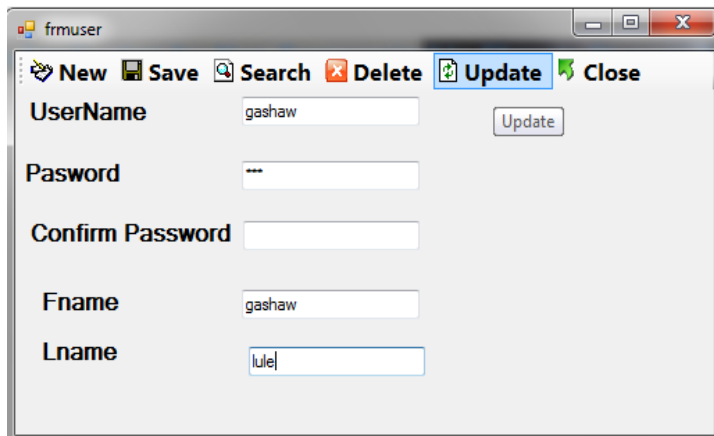
The 'Delete confirm' dialog box displays the message: "Are you sure to delete data with Log_In : gashaw ?". It features two buttons at the bottom: "OK" and "Cancel".

- Click on ok on delete information dialog box

The 'Info Delete Users' dialog box displays the message: "User With UserName gashaw Succesfully Deleted". It includes an "OK" button at the bottom right.

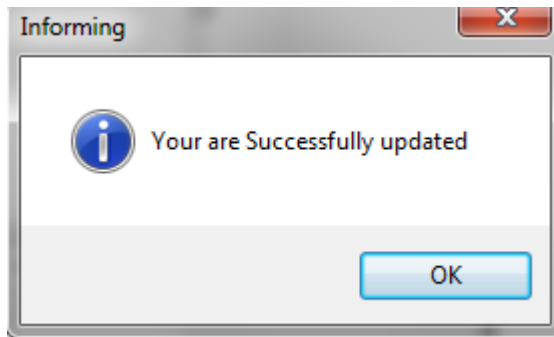
N. To update user information:

- Search user using user name
- Edit the detail you want to update
- Click on update



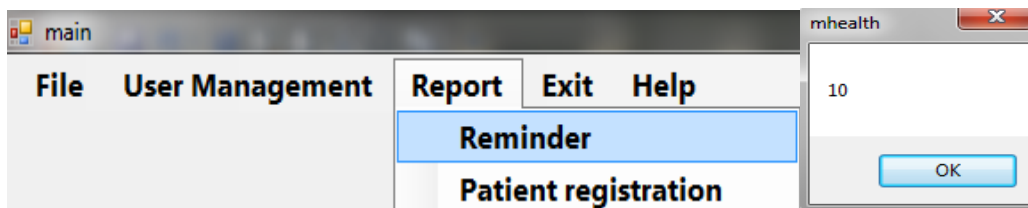
The screenshot shows a window titled 'frmuser' with a menu bar containing 'New', 'Save', 'Search', 'Delete', 'Update', and 'Close'. Below the menu, there are five input fields: 'UserName' (containing 'gashaw'), 'Pasword' (containing '***'), 'Confirm Password' (empty), 'Fname' (containing 'gashaw'), and 'Lname' (containing 'lule'). An 'Update' button is located to the right of the 'UserName' field.

- Click on ok on update confirmation dialog box



O. To generate reports related to reminders transmitted:

- Click on report menu
- Click on reminder menu
- Click on ok on number of records dialog box



- The report will be generated categorized in cause

9/21/2012

<u>cause</u>	<u>patient_id</u>	<u>full_name</u>	<u>information</u>	<u>mobile_phone</u>	<u>date</u>	<u>reminder_type</u>	
diabetics		6	System.Data.Dat	fdfd	0913437899	9/1/2005	Appointment
diabetics		7	System.Data.Dat	wel come	0913437899	2/1/2005	Test Resault
diabetics		8	System.Data.Dat	gsgsgsgsggs	2/1/2005	2/1/2005	Test Resault
diabetics		9	System.Data.Dat	gsgsgsgsggs	15/1/2005	2/1/2005	Test Resault
diabetics		10	System.Data.Dat	hhhhh	0911477264	1/1/2005	Test Resault
diabetics		11	System.Data.Dat	hhhhh	0911437899	1/1/2005	Test Resault
diabetics		12	System.Data.Dat	hhhhh	0911477264	1/1/2005	Test Resault
diabetics		13	System.Data.Dat	hhhhh	0911437899	1/1/2005	Test Resault
diabetics		14	System.Data.Dat	how are you? your appointment will be on	0911477264	3/1/2005	Appointment
diabetics		15	System.Data.Dat	how are you? your appointment will be on	0913437899	3/1/2005	Appointment

P. To generate report related to number of patients:

- Click on report menu
- Select patient registration menu
- Click on ok
- Number of patients registered in the system will be displayed.

Q. To get help:

- Click on help menu

R. To exit from the main form:

- Click on exit menu

Declaration

I, the undersigned, declare that this thesis is my original work in partial fulfillment of the requirement for the Degree of Masters of Science in Health Informatics and has not been presented for a degree in this or any other university. All source of materials used for this thesis and all people and institutions who gave support for this work have been duly acknowledged.

Name: Gashaw Lulie

Signature: _____

Place: Health Informatics Program, Faculty of Informatics, Addis Ababa University

Date of submission: _____

This thesis has been submitted for examination with our approval as the university advisors.

Name and Signature of the advisor

Solomon Terefe (PHD)

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