



**COLLEGE OF MEDICINE**

**Factors Affecting the Use of Mobile Technology in Patient-Provider Communication in  
Hypertensive Care in Malawi**

**By**

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Health Degree.**

**March, 2020**

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## **Declaration**

I, Allan Chilongo, hereby declare that this dissertation is my original work and has not been presented for any awards at the University of Malawi or any other University.

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I am because we are.

## **Abstract**

**Introduction:** Evidence suggests that Malawi and other developing countries have benefited a lot through increased adoption of mHealth approaches in service delivery. While the benefits of mHealth are widely published, there lacks a holistic approach in identifying factors that can deter or improve patient-provider communication when using SMS mobile technology in hypertensive care.

**Objective:** Examining factors affecting the use of SMS mobile technology in patient-provider communication in hypertensive care in Malawi.

**Methods:** A survey was conducted at Kamuzu Central Hospital and Bwaila Hospital, in the capital of Malawi, Lilongwe. A quantitative approach applying a structured questionnaire was used in this study. A systematic random sampling method was used to obtain its sample of 133 hypertensive patients.

**Results:** A total of 129 participants were interviewed, 89 female (69 %), and with a mean age of 53.2 (SD=8.3). The study has revealed that perception that SMS is a useful tool in communication between the patient and provider (AOR=3.26, 95% CI 1.66 to 6.39), perception that SMS improves quality of care (AOR=5.12, 95% CI 1.57 to 16.71), perception that SMS is easy to use (AOR=4.28, 95% CI 1.35 to 13.50) and perception that the hospital supports the use SMS (AOR=4.11, 95% CI 1.22 to 13.86) were significantly associated with the use of SMS mobile technology. No barrier to the use of SMS among patients in hypertensive care was found.

**Conclusion:** The study has shown that SMS has the potential of improving management of chronic diseases if several factors such as perceived usefulness, perceived ease of use of SMS and social influences are considered when implementing the technology.

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## **List of abbreviations and acronyms**

|          |                                               |
|----------|-----------------------------------------------|
| AOR      | Adjusted Odds Ratio                           |
| CHTs     | Community Health Teams                        |
| CI       | Confidence Interval                           |
| COMREC   | College of Medicine Research Ethics Committee |
| COMREC   | College of Medicine Research Ethics Committee |
| COR      | Crude Odds Ratio                              |
| DALYs    | Disability-Adjusted Life Years                |
| DHO      | District Health Office                        |
| eHealth  | Electronic Health                             |
| GSMA     | Groupe Speciale Mobile Association            |
| JMIR     | Journal of Medical Internet Research          |
| K4Health | Knowledge for Health                          |
| KCH      | Kamuzu Central Hospital                       |
| MEDLINE  | Medical Literature Library of Medicine        |
| mHealth  | Mobile Health                                 |
| MoH      | Ministry of Health                            |

## **Chapter 1: Introduction and Objectives of the study**

### **1.1 Background**

Hypertension also known as high blood pressure, is one of the non-communicable diseases (NCDs) which has emerged to be a public health concern to many countries including Malawi. It is a chronic disease in which blood pressure in arteries is persistently high. If the blood pressure stays high for a long time, it damages the heart, kidneys and other internal organs, thus leading to serious health problems such as stroke, heart failure, kidney failure and other cardiovascular diseases. It is often called a “silent killer” because it may have negligible visible signs and symptoms. Hypertension has been linked to several risk factors; alcohol, obesity and poor diet being the big influencers [1]. High blood pressure affects 1.13 billion people worldwide. It accounts for 57 million disability-adjusted life years (DALYs) [1] . It is estimated that 32.9 % of Malawians aged 25 to 64 years old have high blood pressure [2]. It is more prevalent in males than females (36.9% vs 29.9%), overweight than non-overweight (41.5% vs 30.7%), alcohol drinkers than non-drinkers (40.9% vs 31.6%) ,and increases with age (21.4% in 25–34 years old vs 59.2% in 55–64 years old) [3].

Management of hypertension faces several challenges. Lack of resources such as shortage of essential medical products and technologies, high retention rates for human resources in the health sector, inadequate medical equipment, infrastructure and lack of general knowledge regarding hypertension are some of the challenges [4]. Nonetheless, strides have been made to intervene in these challenges, among which include the use of mobile technology to improve service delivery. This has been as a result of the benefits the telecommunications bring such as improved access to health care services especially for those in distant locations, cost-effectiveness, and improved

quality in patient satisfaction [5,6]. Other services provided through mobile technology include health call centres, data collection, emergencies and disasters services, appointment reminders, health promotion, community mobilization, patient monitoring and treatment compliance [7]. The mobile technology is becoming omnipresent in Malawi. Nearly half of households have mobile phones, but mobile phone ownership varies by area of residence. It is high in the urban areas, about 85% of the households, than in the rural, 40.2% [8]. Access to mobile phone is high between ages 25 to 34, 35 to 49, and 50 to 59 at 51.1%, 52.9% and 46.9% respectively [8]. Only 27.7% of people who are aged 60 years old and above have access to mobile phones. It can be noted that mobile phone access decreases with age while risk of hypertension increases with age. This could have an effect on the implementation of mobile phone interventions among hypertensive patients as many of these patients could not use the mobile interventions due to lack of mobile phones. Therefore, it is worth exploring the effect of age on the use of SMS among hypertensive patients in patient-provider communication. In terms of gender, more males have access to mobile phones over females at 49.9% and 34.5% respectively. On the other hand, there is a positive correlation of access to mobile phones and level of education completed at 24%, 37%, 56%, 81% and 95% for uneducated, primary level, lower secondary, upper secondary, and tertiary education respectively [8].

This widespread ownership of mobile phones in Malawi provides an opportunity to use Short Message Services (SMS) in health care delivery for improving medication compliance, monitoring and self-management of chronic diseases as well as appointment reminders. The Malawi mHealth landscape analysis report by the Ministry of Health and Population has shown that there has been an increase in mHealth studies in Malawi, with 31 active studies registered in 2018 [9]. As the

evidence in this field is consistently growing, several studies have indicated that SMSs and mobile applications are the most commonly used mobile technologies, specifically to improve the rate of attendance at health care appointments [10,11]. In Malawi, many studies have preferred on using SMS-based interventions than mobile applications in health care delivery because SMS technologies are cost-effective in mass communication and do not require sophisticated mobile devices to send messages [9]. However, there is limited evidence with regards to the use of mobile technology in hypertensive care, particularly, the factors that are affecting the use of SMS among patients in patient-provider communication in hypertensive care in Malawi.

## **1.2 Statement of the problem**

Many studies in mHealth have focused on the use of mobile text messages in tobacco cessation, obesity programmes and monitoring of diseases such as diabetes [11]. Studies have also indicated that communication in mHealth is one of the least researched areas [11]. In Malawi, the use of mHealth is rather low as compared to the western countries. For example, there have been 31 registered mHealth projects such as Chipatala Cha pa Foni (health center by phone) by VillageReach, PMTCT training by Medic Mobile and digital village clinic by D-Tree international since 2007 [9,12,13]. Most of these projects focus on maternal and reproductive health, infant and child health, and community health [9]. Nonetheless, the adoption of mHealth systems has been on the rise with the Malawi National Community Health Strategy stating that Community Health Teams (CHTs) should increase the use of mHealth with a set target of 50% use of mHealth by CHTs for integrated service delivery, data collection, and supervision by 2022 [14].

As such, there is need to explore the barriers and opportunities that exist among Malawian healthcare practitioners and patients towards use of mHealth in service delivery. Considering the

disease burden in Malawi and Essential Health Package (EHP), hypertension is one area that has potential for the use of mHealth, specifically the use of SMS in service delivery such as data collection, health promotion, health promotion, patient monitoring, community mobilization, appointment reminders and treatment compliance. This study aimed to assess the factors affecting the use of SMS among hypertensive patients in patient-provider communication in Malawi. This knowledge will inform stakeholders such as the government on how best to implement SMS in the management of hypertension among patients.

### **1.3 Literature review**

There have been many studies with regard to the use of mobile technology in medical studies. As such, it is imperative to review the literature in regards to the use of SMS and related studies that can help shed more light on the subject matter and addressing the research questions. This section, therefore, provides a review of the literature on the subject matter; global perspective of mHealth, status of the mobile/cellular telephone technological landscape in Malawi, studies in mHealth, use of SMS in hypertensive care and an outline of a conceptual framework to inform the study.

The databases accessed were; Medical Literature Library of Medicine (MEDLINE) through PubMed, Cochrane Library, Journal of Medical Internet Research (JMIR) and Google Scholar. The researcher also included reports from several organizations or Government agencies as grey literature. Studies conducted globally, regionally and locally in Malawi were reviewed. Furthermore, only studies and reports written in English language and published between 2009 and 2019 were included. The following keywords were used to search for literature: text message, SMS, mHealth, hypertension, blood pressure, technology acceptance model, TAM, Malawi, sub-Saharan and Africa.

### **1.3.1 Global perspective of mHealth**

The use of mobile and wireless technology has the potential of transforming the face of health service delivery across the globe. A number of factors are contributing to this change of service delivery. These factors include continued growth in coverage of mobile cellular networks, rapid developments in technologies and application, a wide room for integration of mHealth to existing technologies and availability of affordable handsets [7]. The Groupe Speciale Mobile Association (GSMA) reports that there were over 5 billion unique mobile subscribers at the end of 2017, of which over 70% reside in low- and middle-income countries [15]. It is also estimated that commercial wireless signals cover over 66% of the world's population [15].

According to WHO global observatory for eHealth, 83% of member states who completed the survey reported offering at least one type of mHealth service [7]. The most frequently employed mHealth initiatives were health call centre (59%), emergency toll-free telephone services (55%), and mobile telemedicine. Two thirds of the mHealth programmes were reported to be in pilot stage or informal stage. Higher-income countries showed more mHealth activity than lower-income countries. mHealth is most active in Europe while in African countries appear to be the least active. Competing of health system priorities was rated as the greatest barrier to adoption of mHealth. Other barriers include: chronic staff shortages, lack of evaluation and limited budgets [7]. With such information, therefore, there is need to explore more on mHealth in low-income countries.

### **1.3.2 The rise of mHealth in Malawi**

The status of eHealth in Malawi has mainly focused on mHealth. These include usage of SMS, android based applications, web-based studies and phone calls [9]. According to the Ministry of Health (MoH) and Population, the first mHealth study was initiated in 2007, and an average growth

of 2 projects per year. Most projects are estimated to last a cycle of 5 years and to date, there are 31 active projects [9]. Many users (7,772) are estimated to use SMS-based interventions over smartphone applications (2,244) [9]

An mHealth project in Malawi called Chipatala Cha Pa Foni (CCPF) (“Health Center by Phone”), which was piloted by Concern Worldwide’s Innovations for Maternal, Newborn & Child Health (MNCH) initiative in collaboration with VillageReach and the Malawi Ministry of Health (MOH) in 4 rural health centres in Balaka, Malawi, in 2011 aim to address barriers to MNCH information and improve the coverage and quality of MNCH services using toll-free case management hotline and automated, and personalized tips and reminders via SMS or voice messages for pregnant women, guardians of young children and women of childbearing age [12].

Knowledge for Health (K4Health) project used SMS mobile technology to provide access to and promote the use of information among HIV/AIDS health workers, managers, and service providers at the national, district and community level to improve service delivery in Malawi. The project was implemented by Management Sciences for Health (MSH) in Salima and Nkhotakota from January, 2010 to June, 2011 [16].

While it is evident that there is an increase in mHealth studies or projects in Malawi, many concentrates on maternity and reproductive health, infant and child health, and community health, and some studies are unpublished.

### **1.3.3 Studies related to the use of mobile technology in health care delivery**

Significant efforts have been made to use SMS in health service delivery. Studies have shown positive effects of SMS-based interventions, especially to increase appointment attendance,

medication or treatment compliance and smoking cessation. In relation to the objectives of this study, this section highlights and discusses some of the studies that focused on the use of SMS as part of the key tool in mHealth.

With regards to timing and frequency of the SMS, studies have presented varying frequency and timing of the SMS intervention. A meta-analysis done by Boksmati *et al* [17] reported that timing, rate and type of the SMS reminders did not show any significant difference between the intervention group and the control group. However, a study done by Morrison *et al* [18] in United Kingdom suggests that frequency of notifications may encourage greater exposure to intervention content, whereas timing of the notifications has no effect on the use. In Morrison *et al* study [18], participants were provided with daily and occasional notifications with pre-defined time frames. Kauppi *et al* [19] further shows that people in Finland preferred receiving SMSs in the morning than later in the day. McCool *et al* [20] also indicated that participants preferred receiving SMSs at midday and in the evening in a text-based mobile cessation programme.

In terms of the factors associated with the use of SMS in health care, Siedner *et al* [21] suggests that age, gender and socioeconomic characteristics of the participants such as education attainment and estimated household income does not predict any use of SMS among the participants in a study which sought to identify predictors of uptake of an mHealth application for a low-literacy population of people living with HIV in rural Uganda. However, literacy at the time of enrollment was the predictor of SMS use in the study. A study done by Van de Kop *et al* [22] which aimed at investigating factors associated with text messages use, whether responding by indicating a problem or not responding, in Kenya indicated that age, rural residence and higher education level

were found to be associated with the use of SMS. A systematic review done by Opoku and friends [23] also highlighted that age, education level and socio-economic background were influencers to mobile technology use. This review focused on mobile-based interventions for non-communicable disease management in sub-Saharan Africa

Besides patients' demographic determinants to the use of SMS , Agarwal *et al* [24] suggests that patients' satisfaction towards the provider, environmental factors such as communication tactics and value of the tool functionality, and interaction between patient activation and tool empowerment were significantly associated with intention to use the personal health records and secure messaging tool. Positive attitude towards using mobile-based intervention, ability to communicate in comfortable language, patients, trust towards the provider, cultural and social acceptance of mobile technology were found to be associated with the perception that mHealth was more useful than alternative means in the same systematic review done by Opoku *et al* [23]. In terms of perceived ease of use, the study found that being able to understand the language was associated with use of mobile-based intervention.

While all studies show positive support for mHealth, many studies concentrate on wellness or exercises, preventive measures, diagnosis, treatment, monitoring, health worker empowerment, and health systems. Furthermore, many studies are conducted in high-income countries such as the UK on issues of frequency of using texts per certain period of time, mode of communication whether informative, educative or any other approaches have an association with how the patients utilize mHealth initiatives, but similar studies are lacking in low-resource settings.

#### **1.3.4 Use of SMS mobile technology in hypertensive care**

Literature with regards to the use of SMS in the management of hypertension concentrate on treatment compliance, blood pressure control and effectiveness of the SMS intervention. For example, Bobrow *et al* [25] showed that sending daily SMS reminders is effective in reducing systolic blood pressure control in a randomized trial conducted in South Africa. However, the study found no evidence that an SMS interactive intervention increased this effect. A study done by Hanne Jensen *et al* [26] also found positive results by suggesting that SMS campaigns improved healthier lifestyle among deaf South Africans. Furthermore, Leon *et al* [27] attempted to find patients' perception of using SMS intervention to improve treatment adherence in South Africa. SMS content, respect tone, timing of reminders and frequency were highly valued. Despite showing positive outcomes, there is limited literature that highlight the factors affecting utilization of SMS among patients in hypertensive care.

#### **1.3.5 Theoretical framework**

The study employed the Technology Acceptance Model (TAM) 3 in its theoretical framework. The model provides a framework on how users accept and use a technology. According to its early developer, Davis, and subsequent improvements to the model, the model suggests Perceived Usefulness (PU) and Perceived Ease-Of-Use (PEOU) as key determinants in influencing technology use. PU relates to the extent to which a person believes that using a system will improve their performance. On the other hand, PEOU relates to the person's belief on the extent to which using the system will be free of effort. The belief of a person towards a technology may be influenced by external variable [28].

In 2008, Venkatesh and Bala developed TAM 3 by combining TAM2, developed by Venkatesh and Davis in 2000, and the model of the determinants of PEOU. The model comprises four different constructs including the individual differences, system characteristics, social influence, and facilitating conditions which are determinants of PU and PEOU. Furthermore, the PEOU to PU, computer anxiety to PEOU and PEOU to behavior intention were moderated by experience [28].

Several studies worldwide have incorporated this model in mHealth research and subsequently made improvements to include additional theoretical constructs such as social influence and cognitive instrumental processes [29]. Social influence mainly relates to the social forces that might impact acceptance of the system. In addition, several studies have recommended use of TAM in the context of mHealth adoption since it could help government and non-government entities develop mHealth services that align with users' needs [30,31]. For example, a study conducted in China by Deng *et al* showed that trust, PU and PEOU positively correlated with mHealth service adoption [30]. On the other hand, privacy and performance risks negatively correlated with the patients' trust and adoption intention towards mHealth services [30]. A study conducted in South Korea by Kim *et al* [32] showed that perceived threat, perceived usefulness and perceived ease of use statistically affected health consumer's attitude and behavioral intention.

Although the TAM 3 theoretical framework has been successfully applied in many studies elsewhere like China, this study aimed to apply the framework in Malawian context by focusing on the use of SMS mobile technology. The theory helped in answering a research question

pertaining to adoption of technology within the realms of PU, PEOU, social influence and perceived behavioral control or facilitating conditions. The theory helped in the formulation of research tools with emphasis on adoption of using SMS in patient-provider communication between patients and health workers in hypertensive care.

The study employed the TAM 3 conceptual framework. According to the framework, as depicted in Figure 1, external (independent) variables consist of PU, PEOU, social influence and facilitating conditions. These combined impact on attitude toward using a given technology. This is linked to the behavioral intention to use the system and eventually the actual system use.

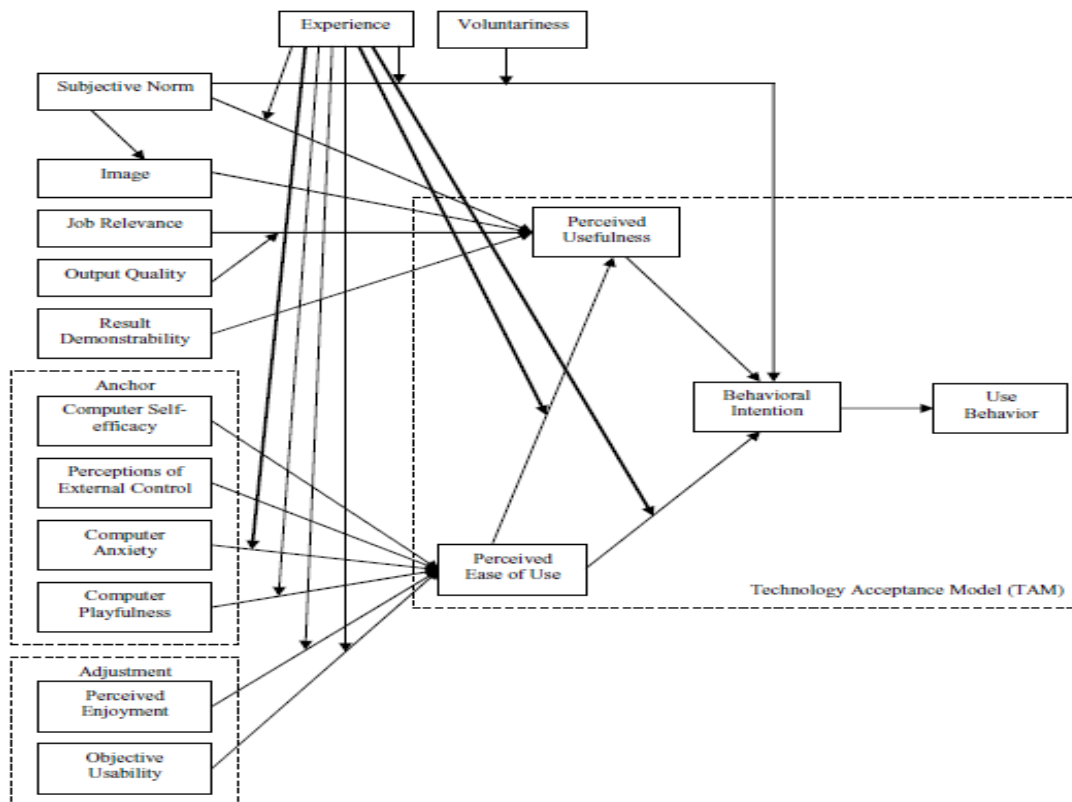


**Figure 1: Technology Acceptance Model (TAM) 3 by Vankatesh and Bala**

## **1.4 Justification of the study**

The study will inform policy decisions on mobile based health interventions in the country and elsewhere applicable by providing useful information on how to effectively implement SMS-based interventions in health care in relation to the factors affecting the use of SMS among patients in patient-provider communication. This is important because elsewhere in low- and middle-income countries such as India and China studies have shown that the use of mHealth, especially SMS-based interventions, has yielded positive results [10,33–36]. However, there is insufficient evidence to support the effectiveness of mHealth for NCDs in sub-Saharan region [35].

The study will also inform the government, non-government organization and donors on the SMS communication approach such as SMS medication reminders, educative, motivational and interactive best preferred by patients in hypertensive care and that would otherwise change health service delivery by focusing on what works best in SMS-based programmes or studies.

Lastly, the study aims at adding to the body of knowledge in research, particularly on communication between patients and health workers when using SMS.

## **1.5 Objectives**

### **1.5.1 Broad Objective of the study**

The main objective of the study was to examine factors affecting the use of SMS mobile technology in patient-provider communication in hypertensive care in Malawi.

### **1.5.2 Specific Objectives**

- i) To determine the frequency of using SMS mobile technology about hypertension at the clinic among patients in hypertensive care.

- ii) To investigate factors affecting the adoption of SMS mobile technology in patient-provider communication among patients in hypertensive care.
- iii) To determine the SMS communication approach (SMS reminders, motivational, educative and interactive) best preferred by patients in hypertensive care.

## **1.6 Chapter summary**

The literature suggests that, globally, the use of mobile technology in health service delivery is becoming ubiquitous. This has been attributed by the continued growth in coverage of mobile cellular networks, rapid developments in technologies and application, a wide room for integration of mHealth to existing eHealth technologies and availability of affordable handsets.

Studies indicate that there is high access to mobile phones, especially among people aged between 25 and 64 years old in Malawi. Reports also show that there has been an increase in mHealth projects in Malawi since 2007.

Researchers across the globe have also conducted research in mHealth with emphasis on wellness, preventive measures, diagnosis, treatment and monitoring. Most studies have shown positive support for mHealth. However, most studies do not highlight ways of improving the delivery of service. Therefore, a gap in the research indicates there is a need to investigate the factors affecting the use of mobile technology in patient-provider communication in hypertensive care in Malawi.

## **Chapter 2: Methods**

### **2.1 Introduction**

This section presents the research methodology employed by the study in order to find the factors affecting the use of SMS among patients in patient-provider communication in hypertensive care in Malawi. Therefore, the methodology used in this study has helped to answer the following questions:

- How many times do patients in hypertensive care in Malawi use SMS to communicate with health workers?
- What factors are affecting adoption of SMS mobile technologies in patient-provider communication in hypertensive care in Malawi?
- Which SMS communication approach is best preferred by patients in hypertensive care in Malawi?

The chapter describes the type of the study employed, setting of the study, targeted population, sample size, data collection tools, data management, data analysis, presentation of results, dissemination of results and ethical considerations.

### **2.2 Study type and design**

The study employed a quantitative research methodology. This research method was appropriate for this study as the outcomes of the specific objectives of the study were used to quantify the factors affecting the use of SMS among patients in patient-provider communication in hypertensive care by way of generating numerical data that was transformed into usable statistics.

To further meet the objectives of this study, a web-based SMS system was developed and deployed by the researcher for the study sites. The system was accessed using a web browser on a laptop

and it contained a dashboard that enabled the researcher to schedule SMSs to be sent automatically to the study participants daily for a month, from 28<sup>th</sup> May to 28<sup>th</sup> June, 2019, reminding the patients to take medication for hypertension. Timing of the SMSs was different for other days; some SMS reminders were sent in the morning, while others in the afternoon or evening. Twice each week, informative or motivational SMSs with regards to hypertension were sent to the participants. Participants were also provided with a phone number to ask questions about hypertension through the SMS feature on their mobile phones.

### **2.3 Study place**

In order to ably address the research objectives, the study required a site that has considerably high number of patients with hypertension. With that in consideration, Kamuzu Central Hospital and Bwaila Hospital in Lilongwe were purposively selected (see Appendix 3: Map of study areas). This was of ideal importance as the hospitals are in a central location which captured a wide range of patients. On average, Bwaila and Kamuzu Central Hospital sees about 160 and 240 hypertension patients every month respectively. Generally, the facilities consider the reading of 120/80-140/90mmHG as a normal range and various treatment options are employed to in order to bring the blood pressure reading within this range. The SMSs might help the clients not to miss appointments and ensure adherence to treatments which might help improve outcomes. Bwaila Hospital was included because it offers health services to the same population catered by Kamuzu Central Hospital. Furthermore, the hospitals are located conveniently accessible and less costly for the researcher.

### **2.4 Study population**

The study population consisted of those people who are patients from Kamuzu Central Hospital and Bwaila Hospital with a diagnosis of hypertension.

### **2.4.1 Inclusion criteria**

According to Msyamboza *et al*, hypertension is more prevalent between the ages of 25 and 64 in Malawi [3] and a survey done by National Statistical Office (NSO) of Malawi shows that people aged 25 to 64 years old have more access to mobile phones in Malawi [8]. Therefore, these findings informed the inclusion criteria of this study. Patients with the following characteristics were included in the study:

- aged 25 to 64 years old
- with mobile phone
- receiving treatment for hypertension at Kamuzu Central Hospital or Bwaila Hospital

### **2.4.2 Exclusion criteria**

Excluded from the study were hypertensive patients:

- who were too sick to be interviewed
- who refused to be interviewed

## **2.5 Study period**

This study was conducted over a period of 8 days, from 02<sup>nd</sup> to 09<sup>th</sup> of July, 2019.

## **2.6 Sample size and selection**

The sample size for this study was calculated based on the percentage of picking a choice or response at 33 % and an absolute precision of 8%, and allowing for a 95% confidence to get the real population within this interval. In this study, the sample size was 133 patients. The sample size was calculated using [37] :

$$n = Z_{1-\alpha/2}^2 p (1-p) / d^2$$

$$n = (1.96)^2(0.33) (1-0.33) / (0.08)^2$$

$n = 133$

### **Meaning of symbols**

$n$ = sample size

$Z_{1-\alpha/2}$  = the value of the standard normal value for a given confidence interval. For a 95% confidence interval,  $Z$  takes the value of 1.96

$p$ = expected proportion in the population at 33% based on the previous studies. This proportion has been chosen with reference to a STEP survey done by MoH in collaboration with World Health Organization (WHO), which reported that 32.9% of people aged between 25 and 64 years old are hypertensive in Malawi [2].

$d$ = the acceptable error measured as proportion of the standard deviation, thus the accuracy or standard error of estimate, which was set at 0.08.

A systematic random sampling technique was employed. The first patient was randomly selected and thereafter, a rule to include the last patient from every 2 patients on each visiting day at the hospitals was applied. This sampling approach was adopted to minimize sampling bias. It was also chosen because it does not necessarily require a sampling frame [38].

## **2.7 Data collection**

A formal data collection process was necessary as it ensured that the data gathered was both defined and accurate and that subsequent decisions based on arguments embodied in findings are valid. The data collected has informed the study objectives and was collected using a structured questionnaire administered in person to patients. The questionnaire for hypertensive patients (see Appendix 1: Questionnaire (English version) or Appendix 2: Questionnaire (Chichewa version)) contained five sections. The first section collected demographic data of the patients. Subsequent

sections gathered data about the frequency of using SMS, adoption of SMS and the SMS communication approach preferred by the patients.

Dependent variable: The primary outcome of this study was use of SMS among patients in hypertensive care. The outcome was either using or not using SMS (see Table 6).

Independent variables: Included socio demographic characteristics such as age, gender, marital status, number of children, occupation, and level of education; PU variables such as useful in communication, tasks done quickly, improve quality of care and accuracy of work done; PEOU variables such as easy to learn, ease of using, low mental effort and ease of remembering; social influence variables such as influence from health workers, influence from people who are believed to be important to the participant and support from the hospital; facilitating conditions such as knowledge, compatibility of the SMS, ability of the patient to use SMS and SMS approach (see Table 6).

## **2.8 Data management**

Data was managed starting from the point of collection to the point of reporting the results. The data was collected using an android mobile phone. The phone enhanced cleaning of data because restrictions were set on the data collection application so that completeness and integrity of data was maintained. Data collected was directly sent to and stored on a secure server. Only researchers had access to the database. Data was exported to an excel file and imported into Stata for analysis. This further enhanced confidentiality of the data. This data will be kept and destroyed after two years of completing the study.

## **2.9 Data analysis**

Data was analyzed using Stata version 14.1. This is how data was analyzed depending on the objectives:

- Frequency, mean and standard deviation of using SMS among patients were used to show descriptive statistics.
- In bivariate analysis, chi-square test was used to find whether an association existed between SMS use and explanatory variables. Chi-square test was used because variables in the study are categorical and nominal in nature. The results were statistically significant if the probability (p-value) of finding the observed value was less than 0.05. Variables which showed significant association ( $P < 0.05$ ) were further analyzed in multiple logistic regression model to identify factors that were true association with use of SMS and to control confounders. Age was also retained in the multivariate analysis because it is considered as a potential confounder. Odds ratios are used to show the strength of association between the independent variables and the use of SMS. The primary outcome of this study was dichotomous, hence the use of logistic regression.

## **2.10 Dissemination of results**

The results of the study shall be submitted to the department of Public Health, College of medicine, MoH, Lilongwe district health office (DHO) and Kamuzu Central Hospital. The publication of the findings shall also be done in accordance with peer-reviewed platforms for further dissemination of the results. A copy of the final report and published papers will be submitted to College of Medicine Research Ethics Committee (COMREC), College of Medicine library, the Health Sciences Research Committee and the University Research and Publication Committee (URPC) through the COMREC Secretariat.

## **2.11 Study limitations**

The study was not without limitations. The time available to thoroughly complete the literature review, to investigate the research problem, gather information and interpret the results was much constrained by the due date of the assignment. This has also made it difficult to scale up the research by incorporating many hospitals from different regions within Malawi.

Being a cross-sectional study, data was collected at a single point in time and only associations were used to describe the results as causality could not be determined. The study was also subjected to several biases such as recall and nonresponse bias. However, these biases were minimized by having high quality questionnaire with well formulated questions and the researchers were well trained. Recall bias was also minimized by shortening the period of interviewing the participants after the intervention as well as the period of data reporting.

## **2.12 Ethical considerations**

Ethical considerations entail the responsibility to the research participants, to professional colleagues and to whom the research findings will be presented. An ethical approval was sought from COMREC (see Appendix 4: Certificate of Ethics Approval). Furthermore, permission to conduct the study at Kamuzu Central and Bwaila Hospital was requested from the hospital director and district health officer of Lilongwe respectively (see Appendix 8: Kamuzu Central Hospital permission letter and Appendix 9: Bwaila Hospital permission letter). There are several ethical issues that were anticipated during this study period which included consent from participants, confidentiality, beneficence and autonomy. These, however, were considered in the following ways;

### **2.12.1 Consent and justice**

Consent means that the prospective participants to the research must be fully informed about the procedures and risks involved in the research and must give consent to participate. To ensure justice, this research aimed at seeking consent from the participants to participate in the research. Participation was voluntary. This was achieved by providing an informed consent form to the prospective participants. The participants were fully informed about the nature, and the purpose of the research, expected benefits to the participant or society, the procedures, and the possible risks of the research, and other ethical issues considered. Questions were asked to the participants to assess whether the consent form was understood or not. The informed consent form was available in two versions, English (see Appendix 5: Consent form (English version) ) and Chichewa language (see Appendix 6: Consent form (Chichewa version)). To approve participation, the consent form was signed by the participant. For those that were illiterate, what was written on the consent form was explained to them and a thumb print was used as a signature for approval.

### **2.12.2 Confidentiality, privacy and anonymity**

Confidentiality, privacy and anonymity was maintained throughout the study. The identity of those participating in the research was not shared to anyone other than the researchers or College of Medicine Research Ethics Committee (COMREC). The information collected in this study was kept confidential by putting the data on a place with limited access or locked locations. Confidential records on the computer was protected by a password. Any information about the participants had a number on it instead of their names. Only the researchers knew what their numbers are. No personal or sensitive information about the participants was included in the SMSs. In addition, the SMSs were only sent to designated phone numbers provided by the participants. This means that only the owner of the mobile phone could receive and read the messages. Data

collected will be kept for two years after completing the study, which will eventually be disposed of or deleted properly.

### **2.12.3 Beneficence and non-maleficence**

Minimizing harm in research is a fundamental human right. The probable risks in this study included; psychological stress because time was taken from the participants during data collection. However, this harm was minimized by meeting the participant's convenient time. There was no direct benefit linked to participation of this study. However, the results of this study are beneficial to students, health professionals, institutions, government and policy makers which could help in planning and implementation of SMS in health care delivery.

### **2.12.4 Respect of autonomy**

The respondents' right to autonomy were respected, by notifying them that they can refuse to participate in, or withdraw, from the study at any time with no coercion.

## **2.13 Chapter summary**

This section has outlined the methodology employed in the study. A quantitative study approach was utilized in order to determine the factors affecting the use of SMS among patients in patient-provider communication in hypertensive care in Malawi. The study was conducted at Kamuzu Central Hospital and Bwaila Hospital in Lilongwe, Malawi. The study was designed to collect data from 133 hypertensive patients at the study sites. A systematic random sampling technique was used to select these participants. Only patients who were aged between 25 and 64 years old, with mobile phones and receiving treatment for hypertension at the hospitals were selected. A structured questionnaire was used to collect the data from the study participants (see Appendix 1: Questionnaire (English version) and Appendix 2: Questionnaire (Chichewa version)). The data collected in the study was analyzed using Stata 14.1. The demographic profile of the participants

is presented in Table 1. Tables are used to present the study findings per the study objectives. The results of the study shall be submitted to the department of Public Health, College of Medicine, Ministry of Health, Lilongwe district health office and Kamuzu Central Hospital.

## **Chapter 3: Results**

### **3.1 Introduction**

This chapter presents the study findings from a quantitative study which investigated the factors affecting the use of SMS among patients in hypertensive care. The study used a structured questionnaire to collect data from 133 participants. Demographics of the study participants are presented first, followed by study findings in accordance with the objectives of the study as guided by TAM 3 conceptual model.

### **3.2 Description of the participants**

The study sampled 133 participants from the hypertensive clinics at Kamuzu Central Hospital and Bwaila Hospital and only 97% (n=129) agreed to participate. Of the participants, many (69%, n=89) were female, 81% (n=105) were married, 46% (n=59) had attended primary school education and 32% (n=41) belonged to the Church of Central Africa Presbyterian (CCAP). The mean age of the participants was 53.2 (SD=8.3) years old and many participants, 56% (n=72), were between 55 to 64 years old. The average number of children the participants had was 5 (SD=2.04). Finally, 25% (n=32) were doing business, 13% (n=17) were employed and majority (85%, n=110) of all the participants earned less than MK 50, 000.00 per month. Table 1 summarizes the characteristics of the participants.

**Table 1: Demographic characteristics of the study participants**

| <b>Characteristics</b> | <b>n</b>   | <b>%</b> |
|------------------------|------------|----------|
| <b>Age</b>             | 53.2 (8.3) |          |
| <b>Gender</b>          |            |          |
| Male                   | 40         | 31.0     |
| Female                 | 89         | 69.0     |
| Total                  | 129        | 100      |
| <b>Marital status</b>  |            |          |
| Never married          | 6          | 4.7      |
| Married                | 105        | 81.4     |
| Widowed                | 16         | 12.4     |
| Separated              | 2          | 1.6      |
| Total                  | 129        | 100.1    |
| <b>Education</b>       |            |          |
| None                   | 6          | 4.7      |
| Primary                | 59         | 45.7     |
| Secondary              | 57         | 44.2     |
| Tertiary               | 7          | 5.4      |
| Total                  | 129        | 100      |
| <b>Religion</b>        |            |          |
| Roman Catholic         | 30         | 23.3     |
| CCAP                   | 41         | 31.8     |
| Seventh Day            | 10         | 7.8      |
| Muslim                 | 12         | 9.3      |
| Other                  | 36         | 28.0     |
| Total                  | 129        | 100.2    |
| <b>Occupation</b>      |            |          |
| None                   | 80         | 62.0     |
| Employed               | 17         | 13.2     |
| Business               | 32         | 24.8     |
| Total                  | 129        | 100      |

Mean (SD), n frequency, % percentage

### **3.3 Frequency and usage of SMS mobile technology among patients in hypertensive care**

The study determined the frequencies of the SMS used by hypertensive patients. for patient-provider communication Out of 129 participants, only 79% (n=102) received SMS in relation to hypertension from the SMS system implemented at the study sites. Many (30%, n=39) received between 6 and 9 SMSs per week. Eighty percent (n=71) of the females and 78% (n=31) of the

males received the SMSs. All participants aged between 25 and 34 years old received at least an SMS. While 34% of the participants who were aged 45 to 54 years old did not receive any SMS. All participants who never had any formal of education received at least one SMS. Similarly, all those who were divorced received at least one SMS. Ninety five percent (n=123) of the participants would have loved to receive more SMSs and 92% (n=119) preferred receiving SMSs in the morning, between 6 am and 9 am. Lastly, majority of the participants (54%, n=70) preferred to use between 500 and 999 Malawi Kwacha per month for SMS and 36% (n=46) preferred SMS reminders over other SMS communication approaches such as informative and interactive SMSs.

Among the participants who received the SMSs, 11% (n=11) of the participants read all of the SMSs. While 26% (n=27) did not read any of the SMSs. Majority of the females (76%, n=68) read at least one SMS. Likewise, 72% (n=29) of the males read at least one SMS. Seventy one percent of those who attended any formal of education read at least one SMS. All participants who were aged 25 and 34 years old read at least one SMS. Whether not married, married, widowed or separated at least a participant within these groups read at least one SMS.

### **3.4 Factors affecting SMS mobile technology use in patient-provider communication among patients with hypertension**

Chi-Square test was used to find whether an association existed between the outcome variable and the explanatory variables. The Table 2 shows results of the association between use of SMS in patient-provider communication among patients with hypertension and demographic variables.

**Table 2: Bivariate relationships between demographic characteristics and use of SMS mobile technology**

| <b>Variable</b> | <b>Pearson Chi-square</b> | <b><i>P</i>-value</b> |
|-----------------|---------------------------|-----------------------|
| Age             | 1.3205                    | 0.724                 |
| Gender          | 0.0082                    | 0.548                 |
| No. of children | 14.6969                   | 0.197                 |
| Education       | 2.1503                    | 0.542                 |
| Occupation      | 4.1292                    | 0.127                 |
| Monthly Income  | 2.3021                    | 0.152                 |
| Religion        | 6.3876                    | 0.172                 |

The results from Table 2 show that no demographic variable is associated with use of SMS among patients in patient-provider communication in hypertensive care in Malawi ( $P>0.05$ ).

Table 3 shows results from the chi-square test of association between SMS use and variables within the areas of PU, PEOU, social influence and facilitating conditions.

**Table 3: Bivariate association between SMS mobile technology use and TAM constructs**

| <b>Variable</b>                              | <b>Chi-square</b> | <b>P-value</b> |
|----------------------------------------------|-------------------|----------------|
| <b>Perceived usefulness</b>                  |                   |                |
| Improves communication                       | 49.3251           | <0.001         |
| Improves quality of care                     | 36.4324           | <0.001         |
| Improves accuracy                            | 93.3529           | <0.001         |
| Tasks are done quickly                       | 90.0387           | <0.001         |
| Useful in communication                      | 53.3466           | <0.001         |
| <b>Perceived Ease of use</b>                 |                   |                |
| Easy to learn                                | 36.0562           | <0.001         |
| Easy to use                                  | 43.4360           | <0.001         |
| Low mental effort                            | 14.5456           | 0.002          |
| <b>Social influence</b>                      |                   |                |
| Influence from important people              | 11.8042           | 0.008          |
| Influence form health workers                | 6.4450            | 0.040          |
| Influence from clinical behavioural advisors | 3.6964            | 0.055          |
| Influence from other people                  | 9.9296            | 0.002          |
| Hospital support                             | 12.7817           | 0.002          |
| <b>Facilitating conditions</b>               |                   |                |
| Having necessary resources                   | 4.7182            | 0.095          |
| Ability to use                               | 19.2850           | 0.001          |
| Compatibility                                | 8.4425            | 0.038          |
| Cost                                         | 7.8233            | 0.098          |
| Home use                                     | 5.0625            | 0.080          |

From the Table 3, influence from important people, influence from other people, hospital support, compatibility, ability for the patient to use SMS, perceived usefulness of SMS in communication between the patient and provider, belief that tasks are done quickly with SMS, perception that SMS improves communication between the patient and provider, perception that SMS improves

quality of care, belief that SMS improves accuracy, perception that SMS is easy to learn, perception that SMS is easy to use, perception that SMS requires low mental effort to use and influence from health workers were associated with SMS use with  $P$ -values less than 0.05. On the other hand, influence from people who advise the patient on clinical behaviour, perception that the use of SMS at home is wise, cost and having necessary resources to use SMS were not associated with use of SMS since their  $P$ -values are not less than 0.05.

The variables that showed an existing relationship with SMS use were then incorporated in the multivariate analysis. In the multivariate analysis, logistic regression was used because of the binary nature of the response variable (SMS use) to find the factors that influence use of SMS in patient-provider communication in hypertensive care in Malawi. The first full model also included age ( $P=0.724$ ) even though there was no association found in the bivariate analysis. Age was included in the model because it was considered as a potential confounder.

**Table 4: Full multiple logistic regression model of factors associated with the use of SMS mobile technology**

| Characteristics                              | OR (95% CI)         | P-value |
|----------------------------------------------|---------------------|---------|
| Age                                          | 1.01 (0.92-1.10)    | 0.890   |
| Easy to use                                  | 10.84 (1.15-101.84) | 0.037   |
| Influence form health workers                | 2.18 (0.56-8.39)    | 0.259   |
| Cost                                         | 0.42 (0.15-1.22)    | 0.112   |
| Useful in communications                     | 3.65 (1.66-8.016)   | 0.001   |
| Improves quality of care                     | 5.91 (1.54-22.73)   | 0.010   |
| Easy to learn                                | 1.22 (0.25-5.98)    | 0.807   |
| Influence from clinical behavioural advisors | 0.26 (0.60-1.18)    | 0.081   |
| Hospital support                             | 5.72 (1.13-29.03)   | 0.035   |
| Compatibility                                | 0.24 (0.02-2.87)    | 0.259   |
| Ability to use                               | 3.89 (0.47-31.87)   | 0.206   |

It can be seen from the Table 4 that perception that SMS is easy to use, perceived usefulness of SMS in communication between the patient and provider, perception that SMS improves quality of care and hospital support are significant in explaining the use of SMS ( $P < 0.005$ ) among patients in patient-provider communication in hypertensive care in Malawi.

The model was then reduced using backward elimination technique by removing the variables with large  $P$ -values starting with health worker influence and compatibility. The four variables significant in the first full model were still significant ( $P < 0.05$ ) even after dropping the insignificant ( $P > 0.05$ ) ones. Finally, all insignificant variables were eliminated. Eliminating or including variable age in the final model did not change anything. The results for the reduced model are as shown in the Table 5:

**Table 5: Reduced logistic regression model of factors affecting the use of SMS mobile technology**

| Characteristics          | AOR (95% CI)      | P-value |
|--------------------------|-------------------|---------|
| Age                      | 1.00(0.93-1.08)   | 0.939   |
| Easy to use              | 4.28 (1.35-13.50) | 0.013   |
| Useful in communications | 3.26 (1.66-6.39)  | 0.001   |
| Improves quality of care | 5.12 (1.57-16.71) | 0.007   |
| Hospital support         | 4.11 (1.23-13.86) | 0.023   |

AOR adjusted odds ratio

The final fitted model is given by:

$$Y = -12.78 + .003(age) + 1.45(easy\ to\ use) + 1.45(useful\ in\ communications) \\ + 1.63(improves\ quality\ of\ care) + 1.41(hospital\ support) + error$$

The odds of using SMS among patients for patient-provider communication in hypertensive care in Malawi a (1 time) times higher for an older person as compared to a younger person. However, at 95% confidence interval, there is no significant difference in odds of people using SMS mobile technology for people of different ages since the CI (0.93, 1.08) includes a 1. The variables easy to use, useful in communication, improves quality of care and hospital support are significant in explaining the use of SMS since all their *P*-values are less than 0.05.

The odds of someone using SMS in patient-provider communication in hypertensive care are at least 4 times higher for people who perceive SMS is easy to use than those who do not perceive SMS use as easy. The 95% CI (1.35, 13.50) does not include a 1 which implies that there is a significant difference in the odds of using SMS between the two groups.

The odds of using SMS among hypertensive patients are at least 3 times higher for people who perceive SMS use as a useful communication tool as compared to those people who do not see it as a useful communication tool. The CI (1.66, 6.39) does not include a 1 which shows that there is a statistically significant difference in odds of SMS use between the two groups.

The odds of using SMS among hypertensive patients are at least 5 times higher for people who perceive that SMS improves quality of care than those people who do not perceive that SMS improves quality of care. Similarly, the 95% CI (1.57, 16.71) does not include a 1, which implies that there is a significant difference in odds of using SMS based on the perception that SMS improves quality of care.

The odds of using SMS among hypertensive patients are at least 4 times higher for the patients who perceive that hospital supports the use of SMS compared to those people who do not. The CI does not include a 1 which shows that there is indeed a difference in odds of SMS use between those patients who perceive that hospital supports the use of SMS to those who do not.

Finally, the odds that a patient will use SMS given that all other factors are not present are  $2.42 \times 10^{-6}$ , which is very small. This means that the factors discussed above are indeed significant ( $P < 0.05$ ) in determining whether a person uses SMS. The model itself is very significant as evidenced by the  $P$ -value  $< 0.001$  and about 50% of the use of SMS is being explained by these four variables.

### **3.5 Chapter summary**

This chapter has outlined the findings of this study in which factors affecting the use of SMS among patients in patient-provider communication in hypertensive care have been determined. The study has indicated that many participants received between 6 and 9 SMSs per week and majority preferred to receive SMS in the morning. It was also worth noting that the younger age group among the participants read all the SMSs.

A reduced multivariate logistic regression model found that the perception that SMS is easy to use, the perception that SMS is a useful communication tool, the perception that SMS mobile technology improves quality of care and the perception that hospital supports the use of SMS were significantly ( $P<0.05$ ) associated with the use of SMS mobile technology.

## Chapter 4: Discussion

This study was designed to produce useful knowledge on the factors affecting the use of SMS mobile technology in patient-provider communication in hypertensive care in Malawi. Therefore, this chapter discusses the study findings based on the objectives and constructs of TAM 3 conceptual model.

This study has shown that younger participants, participants who attended any formal of education and participants who were divorced received or read at least one SMS. This is in line with a survey done by NSO Malawi on ICT usage in Malawi which also states that younger people in Malawi have more access to mobile phones than older people. A point to consider is that as access to mobile phone decreases with age, while risk of hypertension increases with age. However, this study did not find age, education and marital status significantly associated with the use of SMS mobile technology. Many studies with regards to the use of mobile technology in health care just highlight the rate at which the SMS are sent per certain period but do not attempt to show usage of mobile technology among users [17–20]. Additionally, this study has shown that participants preferred SMS reminders than other SMS communication approaches such as interactive and informative SMS communication. A previous study done by Kauppi which aimed at examining the relationship between patients' demographic characteristics and the tailored messages they select also found similar results [16]. Contrary to this, findings from a study done by McCool *et al* [20] indicated that participants preferred receiving SMSs at midday and in the evening in a text-based mobile cessation program [20]. Therefore, preference of timing of SMS could be subjected to context or the condition the participant has, of which requires different times to take medication.

However, a study done by Morrison *et al* which found that adaptive tailoring of notification timing does not always enhance the use of mobile technology [18].

In terms of demographic characteristics of the study participants, the study has shown that no demographic characteristic of the participants such as age, gender, marital status and education influences the use of SMS among patients with hypertension. In line with a study done by Siedner and his collaborators [20], which suggests that age, gender and socioeconomic characteristics of the participants such as education attainment and estimated household income does not predict any use of SMS among the participants in a study which sought to identify predictors of uptake of an mHealth application for a low-literacy population of people living with HIV in rural Uganda. However, the same study by Siedner [21], indicated that literacy at the time of enrollment was the predictor of SMS use. Van de Kop *et al* [22] and Opoku *et al* [23] also found age, rural residence, higher education level and socio-economic background to be predictors of use of mobile technology among patients. Possible explanation to this could be that factors effecting use of mobile technology are dependent on the condition or disease of the study group. For example, Seidner *et al* [21] attempted to improve linkage to HIV care, Van de Kop *et al* [22] aimed at improving antiretroviral adherence, whereas Opoku *et al* [23] did a systematic review of studies in relation to the use of mobile technology in health care.

This study used TAM 3 conceptual model which comprised of PU, PEOU, social influence and facilitating conditions constructs. Each construct had several variables included. The results shows that two variables, perception that SMS is a useful tool in communication between the patient and

provider and perception that SMS improves quality of care, within PU construct and perception that SMS is easy to use are significantly associated with the use of SMS which is within the PEOU construct. In addition, perception that the hospital supports the use of SMS influences the use of that technology. However, the study did not find facilitating conditions which influences the use of SMS among patients with hypertension in Malawi. Similarly to this study, Agarwal *et al* [24] added by suggesting that patients' satisfaction towards the provider, communication tactics and value of the tool functionality, and interaction between patient activation and tool empowerment were significantly associated with intention to use the personal health records and secure messaging tool. Another study by Leon *et al* [27] which was conducted in South Africa, suggests that SMS content, respect tone, timing of reminders and frequency were highly valued among patients with hypertension.

## **Chapter 5: Conclusion and recommendations**

### **5.1 Conclusion**

The study has investigated the factors affecting the use of SMS among patients in patient-provider communication in hypertensive care by: explaining the frequency of using SMS among patients in hypertensive care; investigating factors affecting the adoption of SMS among patients in patient-provider communication in hypertensive care; and identifying the SMS communication approach (SMS reminders, motivational, educative and interactive) best preferred by patients in hypertensive care. The study has found positive effects of perception that SMS is a useful tool in communication between the patient and provider, perception that SMS improves quality of care, perception that SMS is easy to use and perception that the hospital supports the use of SMS among patients for patient-provider communication in hypertensive care. The findings further indicated that no demographic characteristic of the participants was associated with the use of SMS.

### **5.2 Recommendations**

Generally, few factors affecting the use of SMS among patients in patient-provider communication in hypertensive care have been found. Therefore, the following recommendations are put forward:

- The Government of Malawi should consider universal implementation of SMS among patients in the management of chronic diseases. Policies and guidelines on the implementation of mobile technologies should be formulated.
- For those that are planning to implement SMS in the country, this study suggests that if SMS is well implemented and managed by considering perceived usefulness, perceived ease of use of the technology and social influence towards SMS use among the patients could be useful to effectively and efficiently manage chronic diseases. Awareness on the importance of SMS should also be part of the implementation process.

- A further study should be conducted to explore the factors affecting the use of SMS from both patients' and providers' perspectives. Further to this, there is also need to apply SMS to patients who have other chronic diseases in Malawi.
- With regards to academics, it very important for academicians to introduce specific programmes with focus on the use of mobile technology in health care.

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## Appendix 1: Questionnaire (English version)

### A. Demographic details

Date of Birth .....

Gender:

male ☐ female ☐

Area of residence .....

Home District .....

Marital Status:

single ☐ married ☐ widowed ☐ divorced ☐ other .....

Number of children .....

Level of education:

primary ☐ secondary ☐ tertiary ☐ none ☐

Occupation .....

Income (per month)

Less than K50, 000 ☐ K50, 000 to K99,999 ☐ K100, 000 to K199, 999

K200,000 to K499,999 ☐ K500,000 or more ☐

Religion:

Roman Catholic ☐ CCAP ☐ Seventh day ☐ Muslim ☐ other .....

### B. Frequency of receiving SMS mobile technology in hypertensive care.

i) How many SMSs about hypertension did you receive per week?

none ☐ 1-2 ☐ 3-5 ☐ 6 – 9 ☐ 10 or more ☐

ii) How many SMSs did you read?

none ☐ about quarter of them ☐ about half of them ☐ about 3 quarters of them ☐  
all of them ☐

iii) Was the time that you received SMS alerts from the doctor convenient for you?

not convenient at all ☐ inconvenient ☐ neutral ☐ convenient ☐  
very convenient ☐

iv) Would you have loved to receive more SMS alerts?

not interested at all ☐ reduce amount of SMS sent ☐ neutral ☐ yes ☐  
very much ☐

v) What for you, was the best time to receive SMS

6 AM to 9 AM ☐ 9 AM to 12 PM ☐ 12 PM to 3 PM ☐ 3 PM to 6 PM ☐  
6 PM to 9 PM ☐

C. The cost of using SMS mobile technology in patient-provider communication in hypertensive care.

What cost per month is reasonable for you if you were to continue receiving health texts?

none ☐ less than K500 ☐ K500 - K999 ☐ K1000 – K4999 ☐ K5000 or more ☐

D. Adoption of using SMS mobile technology as a way of improving patient-provider communication in hypertensive care.

Perceived usefulness

|                                                                                                  | Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
|--------------------------------------------------------------------------------------------------|-------------------|----------|---------|-------|----------------|
| The SMS mobile technology was a useful tool in communication between me and the health provider. |                   |          |         |       |                |
| The SMS mobile technology allowed tasks to be accomplished more quickly                          |                   |          |         |       |                |
| The SMS mobile technology improved communication between me and the health providers             |                   |          |         |       |                |
| The SMS mobile technology increased quality of care.                                             |                   |          |         |       |                |
| The SMS mobile technology allowed tasks to be done more accurately                               |                   |          |         |       |                |

#### Perceived ease of use

|                                                             | Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
|-------------------------------------------------------------|-------------------|----------|---------|-------|----------------|
| The text messages were clear and understandable             |                   |          |         |       |                |
| The SMS mobile technology was easy to learn to operate      |                   |          |         |       |                |
| The SMS mobile technology was easy to use and interact with |                   |          |         |       |                |

|                                                               |  |  |  |  |  |
|---------------------------------------------------------------|--|--|--|--|--|
| To send or receive text messages required low mental effort   |  |  |  |  |  |
| It was easy to remember how to send or receive text messages. |  |  |  |  |  |

#### Social influence / subjective norms

|                                                                                        | Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
|----------------------------------------------------------------------------------------|-------------------|----------|---------|-------|----------------|
| Health workers who influence my behavior think I should use this SMS mobile technology |                   |          |         |       |                |
| People who influence my behavior think I should use SMS mobile technology.             |                   |          |         |       |                |
| People who influence my clinical behavior think I should use the SMS mobile technology |                   |          |         |       |                |
| People who are important to me think I should use SMS mobile technology.               |                   |          |         |       |                |
| Hospital supported use of SMS mobile technology                                        |                   |          |         |       |                |

#### Perceived behavioral control / facilitating conditions

|                                                                  | Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
|------------------------------------------------------------------|-------------------|----------|---------|-------|----------------|
| I have necessary resources to use SMS mobile technology.         |                   |          |         |       |                |
| I have knowledge to use SMS mobile technology.                   |                   |          |         |       |                |
| The SMS mobile technology is compatible with other technologies. |                   |          |         |       |                |
| I was able to use SMS mobile technology                          |                   |          |         |       |                |
| I was able to use system for patient care and management         |                   |          |         |       |                |
| Using SMS mobile technology at home is wise.                     |                   |          |         |       |                |

What cost per month is reasonable for you if you were to continue receiving health texts?

none ☐ less than K500 ☐ K500 - K999 ☐ K1000 – K4999 ☐ K5000 or more ☐

E. The SMS communication approach (e.g. SMS reminders, educative, motivational Texts and interactive) best preferred by patients in hypertensive care.

Which of the following SMS you received do you prefer?

educative texts ☐ text reminders ☐ interactive texts ☐ motivational Texts ☐

none ☐

## Appendix 2: Questionnaire (Chichewa version)

A. Mbiri

Tsiku lobadwa .....

Mwamuna/Mkazi:

mwamuna ☐ mkazi ☐

Malo okhala .....

Kumudzi .....

Banja:

Osakwatira/wa ☐ okwatira/wa ☐ wamasiye ☐ osudzulidwa ☐ zina .....

vi) Ana .....

vii) Maphunziro:

pulayimale ☐ sekondale ☐ maphunziro apamwamba ☐ osapitako ☐

viii) Ntchito .....

Ndalama (pa mwezi):

zochepera K50, 000 ☐ K50, 000 mpaka K99,999 ☐ K100, 000 mpaka K199, 999

K200,000 mpaka K499,999 ☐ K500,000 kapena zambiri ☐

x) Chipembedzo:

Katolika ☐ CCAP ☐ Opemphera pa chiweru ☐ Chisilamu ☐ zina .....

B. Nthawi yogwiritsira mauthenga olemba pa lamyam'anja.

i) Ndi mauthenga olemba pa lamyam'anja angati okhudzidwa ndi matenda othamanga magari omwe mwalandira pa sabata?

palibe ☐ 1-2 ☐ 3-5 ☐ 6 – 9 ☐ 10 kapena zambiri ☐

ii) Kodi munawerenga mauthenga olemba pa lamyam'anja angati?

palibe ☐ pafupifupi theka la theka ☐ pafupifupi theka ☐

pafupifupi theka la theka atatu ☐ onse ☐

iii) Kodi nthawi yomwe munalandira mauthenga olemba pa lamya yam'manja kuchokera kwa dokotala inali yabwino?

Osati bwino ☐ zovuta ☐ kupanda mbali ☐ zosavuta ☐ zosavutitsitsa ☐

iv) Kodi mukanakonda kulandira mauthenga olemba pa lamya yam'manja?

osasangalatsidwa nkomwe ☐ muchepetsa kuchuluka kwa mauthenga olemba pa lamya

yam'manja ☐ kupanda mbali ☐ eya ☐ kwambiri ☐

v) Chofunika kwa inu, inali nthawi yabwino yolandirira mauthenga olemba pa lamya yam'manja?

6 koloko mpaka 9 koloko ☐ 9 koloko mpaka 12 koloko ☐ 12 koloko mpaka 3 koloko

masana ☐ 3 koloko masana mpaka 6 koloko madzulo ☐

6 madzulo mpaka 9 koloko usiku ☐

K5,000 kapena kuchulukirapo ☐

D. Kuvomerezeka kwa kugwiritsa ntchito njira yamakono yotumizirana uthenga olemba pa lamya yammanja ngati njira yowonjezera yothandizira kuyankhulana pakati pa odwala nthenda yothamanga magari ndi ogwira ntchito kuchipatala.

Zofunika zodziwika

|                                                                                                                          | Kutsutsa<br>kwambiri | Kutsutsa | Kupanda<br>mbali | Kuvo<br>mere<br>za | Kuvomereza<br>kwambiri |
|--------------------------------------------------------------------------------------------------------------------------|----------------------|----------|------------------|--------------------|------------------------|
| Njira yamakono yotumizirana uthenga olemba pa lamyammanja yachulukitsa phindu la ntchito yanga.                          |                      |          |                  |                    |                        |
| Njira yamakono yotumizirana uthenga olemba pa lamyammanja yathandizira ntchito kuti igwiridwe mwachangu                  |                      |          |                  |                    |                        |
| Njira yamakono yotumizirana uthenga olemba pa lamyammanja yathandizira kuyankhulana pakati pa ine ndi ogwira kuchipatala |                      |          |                  |                    |                        |
| Njira yamakono yotumizirana uthenga olemba pa lamyammanja yathandizira kuti ntchito igwirike bwino.                      |                      |          |                  |                    |                        |
| Njira yamakono yotumizirana uthenga olemba pa lamyammanja yathandizira chisamaliro ndi chithandizo cha odwala.           |                      |          |                  |                    |                        |
| Njira yamakono yotumizirana uthenga olemba pa lamyammanja yathandiza chisankho kuti chikhale chogwirizana ndi umboni.    |                      |          |                  |                    |                        |
| Njira yamakono yotumizirana uthenga olemba pa lamyammanja yathandiza kuti ntchito izichitika molondola.                  |                      |          |                  |                    |                        |

Kuzindikira mosavuta kwa ntchito

|  | Kutsutsa<br>kwambiri | Kutsutsa | Kupanda<br>mbali | Kuvo<br>mere<br>za | Kuvomereza<br>kwambiri |
|--|----------------------|----------|------------------|--------------------|------------------------|
|  |                      |          |                  |                    |                        |

|                                                                                                                    |  |  |  |  |  |
|--------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|
|                                                                                                                    |  |  |  |  |  |
| Mauthengawa anali olemba bwino komanso omveka bwino                                                                |  |  |  |  |  |
| Njira yamakono yotumizirana uthenga olemba pa lamya yam'manja siinali yovuta kuphunzira                            |  |  |  |  |  |
| Njira yamakono yotumizirana uthenga olemba pa lamya yam'manja siinali yovuta kugwiritsa ntchito ndi kuyanjana nayo |  |  |  |  |  |
| Kutumiza kapena kulandira mauthenga sikumafunika kuganiza kwambiri.                                                |  |  |  |  |  |
| Kunali kosavuta kukumbukira momwe tingatumizire kapena kulandira mauthenga.                                        |  |  |  |  |  |

Kusokoneza chikhalidwe / zikhalidwe

|                                                                                                                                                        | Kutsutsa kwambiri | Kutsutsa | Kupanda mbali | Kuvo mere za | Kuvomereza kwambiri |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------|---------------|--------------|---------------------|
| Ogwira nawo ntchito omwe amakhudza khalidwe langa akuganiza kuti ndidzigwiritsa ntchito njira yamakono yotumizirana uthenga olemba pa lamya yam'manja. |                   |          |               |              |                     |
| Anthu omwe amakhudza khalidwe langa akuganiza kuti ndidzigwiritsa ntchito njira yamakono yotumizirana uthenga olemba pa lamya yam'manja.               |                   |          |               |              |                     |

|                                                                                                                                                                       |  |  |  |  |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|
| Anthu omwe amachititsa khalidwe langa lachipatala akuganiza kuti ndidzigwiritsa ntchito njira yamakono yotumizirana uthenga olemba pa lamya yam'manja.                |  |  |  |  |  |
| Anthu omwe ndi ofunika kwa ine akuganiza kuti ndidzigwiritsa ntchito njira yamakono yotumizirana uthenga olemba pa lamya yam'manja.                                   |  |  |  |  |  |
| Chipatala chikugwirizana nazo zogwiritsa ntchito njira yamakono yotumizirana uthenga olemba pa lamya yam'manja.                                                       |  |  |  |  |  |
| Anthu omwe ali ofunika pofufuza chisamaliro changa<br><br>ogwira amaganiza kuti ndiyenera kugwiritsa ntchito zipangizo zamakono za uthenga olemba pa lamya yam'manja. |  |  |  |  |  |
| Oyang'anira akuluakulu a chipatala akhala othandiza.                                                                                                                  |  |  |  |  |  |

Kuwongolera khalidwe / kusintha

|                                                                                                        | Kutsutsa kwambiri | Kutsutsa | Kupanda mbali | Kuvo mere za | Kuvomereza kwambiri |
|--------------------------------------------------------------------------------------------------------|-------------------|----------|---------------|--------------|---------------------|
| Ndili ndi zofunikira kugwiritsa ntchito njira yamakono yotumizirana uthenga olemba pa lamya yam'manja. |                   |          |               |              |                     |
| Ndikudziwa kagwiritsidwe njira yamakono yotumizirana uthenga olemba pa lamya yam'manja.                |                   |          |               |              |                     |

|                                                                                                                                                   |  |  |  |  |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|
| Njira yamakono yotumizirana uthenga olemba pa lamya yam'manja ikugwirizana ndi njira zina zamakono.                                               |  |  |  |  |  |
| Ndinatha kugwiritsa ntchito njira yamakono yotumizirana uthenga olemba pa lamya yam'manja.                                                        |  |  |  |  |  |
| Ndinkatha kugwiritsa ntchito dongosolo la chisamaliro ndi kusamalira odwala kudzera njira yamakono yotumizirana uthenga olemba pa lamya yam'manja |  |  |  |  |  |
| Thandizo logwiritsa ntchito njira yamakono yotumizirana uthenga olemba pa lamya yam'manja linapezeka.                                             |  |  |  |  |  |
| Kugwiritsa ntchito njira yamakono yotumizirana uthenga olemba pa lamya yam'manja kuntchito ndi luso.                                              |  |  |  |  |  |

Kodi mtengo pa mwezi umene mungasangalare nawo ngati mutapitiriza kulandira mauthenga olemba pa lamya yam'manja ndi uti?

palibe ☐ zochepera K500 ☐ K500 - K999 ☐ K1,000 – K4,999 ☐

E. Njira yoyankhulana ndi mauthenga olemba pa lamya yam'manja (ngati mauthenga ophunzitsa, okumbutsa, olimbikitsa ndi oyanjana) abwino kwambiri ndi odwala komanso ogwira ntchito zaumoyo omwe amasamalidwa

kwambiri.

Ndi mauthenga ati olemba pa lamya yam'manja omwe mwalandira omwe mumakonda?

mauthenga ophunzitsa ☐ mauthenga okumbutsa ☐ mauthenga oyanjana ☐

mauthenga olimbikitsa ☐ palibe ☐

### Appendix 3: Map of study areas



**Figure 2: Map of Kamuzu Central Hospital, Lilongwe, Malawi**



**Figure 3: Map of Bwaila Hospital, Lilongwe, Malawi**

## Appendix 4: Certificate of Ethics Approval



**CERTIFICATE OF ETHICS  
APPROVAL**

This is to certify that the College of Medicine Research and Ethics Committee (COMREC) has reviewed and approved a study entitled:

P.01/19/2561 - Factors affecting the use of mobile technology in patient-provider communication in hypertensive care in Malawi version 1 dated December 2018 by Mr Allan Chilongo

On 28-Jan-19

*As you proceed with the implementation of your study, we would like you to adhere to international ethical guidelines, national guidelines and all requirements by COMREC some of which are indicated on the next page for your study*



28-Jan-19

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Dr. YB. Mlomba - Chairperson (COMREC)

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Date

## **Appendix 5: Consent form (English version)**

**Title:** Factors affecting the use of mobile technology in patient-provider communication in hypertensive care in Malawi.

Principal Investigator: Allan Chilongo  
College of Medicine, University of Malawi  
Self-Sponsorship

### **Introduction**

I am a student at College of Medicine, a constituent college of University of Malawi, pursuing a Master in Public Health. I am doing a research on health service delivery, particularly on the factors associated with use of SMS as a way of improving patient-provider communication in hypertensive care in Malawi. I am going to give you information and invite you to be part of this research. You do not have to decide today whether or not you will participate in the research. Before you decide, you can talk to anyone you feel comfortable with about the research.

There may be some words that you do not understand. Please ask me to stop as we go through the information and I will take time to explain. If you have questions later, you can ask them from me.

### **Purpose of the research**

The use of technology in healthcare delivery has been on the rise in supporting healthcare delivery by healthcare professionals. This has been as a result of its benefits such as improved access of healthcare services especially for those in distant locations, cost effectiveness, and improved quality in patient satisfaction. However, it is not always the case that mHealth is feasible. Therefore, there is a need to explore the barriers and opportunities that exist among Malawian healthcare practitioners and patients towards use of SMS health care service delivery.

### **Type of Research Intervention**

This study will involve sending of SMSs to the participants to remind them about their appointments at the hospital as well as sending SMS that contain educative messages. The participants will also be allowed to communicate with health practitioners at the hospital using SMS mobile technology.

### **Participant selection**

I am inviting people who have been seeking treatment of hypertension at Kamuzu Central Hospital or Bwaila hospital.

### **Voluntary Participation**

Your participation in this research is entirely voluntary. It is your choice whether to participate or not. If you choose not to participate in this study, you will be offered the treatment that is routinely offered in this clinic/hospital for hypertension. You may change your mind later and stop participating even if you agreed earlier.

## **Procedures and Protocol**

You are being invited to take part in the research which aims at investigating the factors affecting the use of SMS mobile technology in patient-provider communication in hypertensive care.

## **Duration**

This study will be done over a period of nineteen days, from 25<sup>th</sup> March to 12<sup>th</sup> April, 2019. A questionnaire will be provided to you which will take about 30 minutes of your time.

## **Risk**

There is a possibility that the text messages to be sent to the participants might be irritating.

## **Benefits**

If you participate in this research, you will have the following benefits: SMS reminders or text message will be sent to you for free of charge. There may not be any further benefits for you but your participation is likely to help us find the answers to the research questions. There may not be any benefit to the society at this stage of the research, but future generations are likely to benefit.

## **Reimbursements**

You will not be provided with any payment to take part in the research.

## **Confidentiality**

I will not share the identity of those participating in the research. The information that I collect from this research project will be kept confidential. Information about you that will be collected during the research will be put away and no-one but the researchers will be able to see it. Any information about you will have a number on it instead of your name. Only the researchers will know what your number is. It will not be shared with or given to anyone except College of Medicine Research Ethics Committee (COMREC).

## **Sharing the Results**

The knowledge that I get from doing this research will be shared with Lilongwe District health office, Kamuzu central hospital, College of Medicine and COMREC. I will also publish the results in order that other interested people may learn from the research. Confidential information will not be shared.

## **Right to Refuse or Withdraw**

You do not have to take part in this research if you do not wish to do so. You may also stop participating in the research at any time you choose. It is your choice and all of your rights will still be respected. You will still have all the benefits that you would otherwise have at this hospital.

## **Who to Contact**

If you have any questions you may ask now or later, even after the study has started. If you wish to ask questions later, you may contact any of the following:

Allan Chilongo, NACIT Lilongwe, P.O. Box 31164, Lilongwe, Phone: 0884568864, Email: [allanchilongo@gmail.com](mailto:allanchilongo@gmail.com)

This proposal has been reviewed and approved by College of Medicine Research Ethics Committee (COMREC), which is a committee whose task it is to make sure that research participants are protected from harm. If you wish to find about more about COMREC, contact: Khama Mita, College of medicine - COMREC, P.O. Box 360, Chichiri, Blantyre, 0885528248, [kmita@medcol.mw](mailto:kmita@medcol.mw). Permission to conduct the research at Kamuzu central hospital and Bwaila hospital has been granted by the hospital director and District Health officer of Lilongwe respectively.

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I consent voluntarily to participate as a participant in this research.

Print Name of Participant \_\_\_\_\_

Signature of Participant \_\_\_\_\_

Date \_\_\_\_\_

Day/month/year

### **If illiterate**

A literate witness must sign (if possible, this person should be selected by the participant and should have no connection to the research team). Participants who are illiterate should include their thumb-print as well.

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Print name of witness \_\_\_\_\_

AND

Thumb print of participant

Signature of witness \_\_\_\_\_

Date \_\_\_\_\_

Day/month/year



### **Statement by the researcher/person taking consent**

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understood.

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this ICF has been provided to the participant.

Print Name of Researcher/person taking the consent \_\_\_\_\_

Signature of Researcher /person taking the consent \_\_\_\_\_

Date \_\_\_\_\_

Day/month/year

## **Appendix 6: Consent form (Chichewa version)**

**Mutu:** Kufufuza zinthu zomwe zogwirizana ndi kugwiritsa ntchito njira yamakono yotumizirana uthenga olemba pa lamya yam'manja ngati njira yothandizira kuyankhulana pakati pa odwala nthenda yothamanga magazi ndi ogwira ntchito kuchipatala ku Malawi.

**Wofufuza Wamkulu Mkulu:** Allan Chilongo  
College of Medicine, University of Malawi

### **Chiyamba**

Ndine wophunzira ku College of Medicine, sukulu imodzi yaukachenjeda ya University of Malawi, ndikutsata zaumoyo wa anthu. Ndikuchita kafukufuku wakandandizidwe ka odwala m'chipatala, makamaka zinthu zomwe zogwirizana ndi kugwiritsa ntchito njira yamakono yotumizirana untheka olemba pa lamya yam'manja ngati njira yothandizira kulankhulana pakati pa odwala matenda othamanga magazi ndi ogwira ntchito kuchipatala ku Malawi.

Ndikufotokozerani zambiri komanso ndikukuitanani kuti mutengepo mbali pa kafukufukuyu. Musanasankhe, mungathe kuyankhula ndi aliyense amene mumakhala naye momasuka pankhani ya kafukufuku. Muli ndi mwai wofunsa ngati mupeza mawu ena achilendo kwa inu. Chonde ndi imitseni, ndipo ine ndizatenga nthawi kuti ndifotokoze. Ngati muli ndi mafunso mtsogolo, mukhoza kuwafunsa kuchokera kwa ine.

### **Cholinga cha kufufuza**

Kugwiritsira ntchito luso lamakono muzinthu zopereka chithandizo chaumoyo kwawonjezeka popereka thandizo lachipatala ndi akatswiri azaumoyo. Izi zakhala chifukwa cha ubwino wake monga mwayi wopeza chithandizo chaumoyo makamaka kwa iwo akutali, kusaononga ndalama, ndi khalidwe lapamwamba mu kukhutira kwa odwala. Komabe, si nthawi zonse kuti kugwiritsira ntchito luso lamakono la lamya m'chipatala kuli ndikuthokera. Choncho, pakufunika kufufuza zolepheretsa ndi mwayi umene ulipo pakati pa ogwira ntchito zachipatala ku Malawi ndi odwala popereka kapena kulandira chithandizo chaumoyo kudzera uthenga olemba pa lamya yam'manja.

### **Mtundu Wopenda Kufufuza**

Kafukufukuyu adzaphatikiza kutumiza ma uthenga olemba pa lamya yam'manja kwa odwala kuti awakumbutse za nthawi yokaonana ndi ogwira ntchito kuchipatala komanso kutumiza mauthenga ophunzitsa. Ophunzirawo adzaloledwa kulankhulana ndi ogwira ku chipatala pogwiritsa ntchito mauthenga olemba pa lamya yam'manja.

### **Kusankhidwa kwa otsogolera**

Ndikupempha anthu omwe akhala akufuna chithandizo cha matenda othamanga magazi ku chipatala chachikulu cha Kamuzu kapena chipatala cha Bwaila.

### **Kutengapo mbali mwakufuna kwanu**

Kutenga nawo mbali mukafukufuyu ndi mwakufuna kwanu. Ndikusankha kwanu kutenga nawo mbali kapena ayi. Ngati musankha kuti musatenge nawo mbali mu kafukufukuyu, mudzapatsidwa chithandizo cha matenda othamanga magari chomwe chimaperekedwa nthawi zonse kuchipatala kapena kuchipatala cha matendawa. Mukhoza kusintha malingaliro anu kenako ndikusiya kutenga nawo mbali ngakhale mutavomereza kale.

### **Ndondomeko**

Mukuyitanidwa kuti mutenge nawo mbali pa kafukufuku omwe akukwaniritsa kufufuza zinthu zomwe zimagwirizane ndi kugwiritsa ntchito njira yamakono yotumizirana untheke olemba pa lamya yam'manja ngati njira yothandizira kulankhulana pakati pa odwala matenda othamanga magari ndi ogwira ntchito kuchipatala.

### **Nthawi**

Kafukufukuyu adzachitika kwa masiku khumi ndi asanu ndi anayi, kuyambira pa 25 mwezi wachitatu mpaka pa 12 mwezi wachinayi mchaka cha 2019. Mafunso ofunsidwa adzaperekedwa kwa inu omwe adzatenge pafupifupi mphindi makumi atatu za nthawi yanu.

### **Chiopsyezo**

Pali kuthekera kuti uthenga olemba pa lamya yam'manja udzatumizidwe ukhoza kukhala okwiitsa.

### **Ubwino wakafukufukuyu**

Ngati mutengapo nawo mbali pa kafukufukuyu, mudzakhala ndi madalitso otsatirawa: mudzakumbutsidwa kuti mukaonane ndi ogwira kuchipala kudzera njira yamakono ya uthenga olemba pa lamya yam'manja mwaule. Palibenso phindu lina limene mungalipeze potengapo mbali pakafukufukuyu kuponsera phindu limene lanenedwa kale koma kutenga nawo mbali kwanu kungatithandizire kupeza mayankho amene ndikufuna kupeza mukafukufukuyu. Ngakhale kuti ubwino wakafukufukuyu kwa anthu ena sungaoneke panopa, koma mibadwo yotsatira idzapindula.

### **Zinthu zozabwezedwa**

Simudzabwezedwa chilichonse kuti mutenge nawo mbali mukafukufukuyu.

### **Chinsinsi**

Zomwe ndikuzisonkhanitsa kuchokera kwa inu zidasungidwa mwachinsinsi. Sindidzagawira maina anu kwa wina aliyense. Zokhudza inu zomwe zidasonkhanitsidwa panthawi yakafukufuku zidzachotsedwa ndipo palibe wina azazione koma ochita kafukufukuyu okha. Zambiri zokhudza inu zidzakhala ndi nambala m'malo mwa dzina lanu. Ofufuza okha ndi omwe angadziwe kuti nambala yanu ndi yani. Sichidzagawidwa kapena kupatsidwa kwa wina aliyense kupatula Komiti ya malamulo ofufuza zaumoyo ya COMREC.

### **Kugawa zotsatira**

Kudziwa komwe ndikupeza pochita kafukufukuyu kudzagawidwa ku ofesi ya zaumoyo ya Lilongwe, kuchipatala chachikulu cha Kamuzu, College of Medicine ndi COMREC. Ndiwonetsanso zotsatira kuti anthu ena achidwi amve kuchokera ku kafukufukuyu. Zomwe zachinsinsi sizidzagawidwa.

### **Ufulu Wokana Kapena Kusiya**

Simuyenera kutenga nawo mbali mukafukufuku ngati simukufuna. Mukhozanso kusiya kutenga nawo mbali mukafukufukuyu nthawi iliyonse imene mungasankhe. Ndiyo kusankha kwanu ndi ufulu wanu wonse udzalemekezedwabe. Mudzakhalabe ndi phindu lonse limene munali nalo kuchipatalachi.

### **Amene mungayankhulane naye**

Muli ndi mwayi ofunsa tsopano kapena m'tsogolo, ngakhale kafukufukuyu atatha. Ngati mukufuna kufunsa mafunso m'tsogolomu, mutha kulankhulana ndi:

**Allan Chilongo, NACIT Lilongwe, P.O. Bokosi 31164, Lilongwe, Telefoni 0884568864**

**Email [allanchilongo@gmail.com](mailto:allanchilongo@gmail.com)**

Kafukufukuyu wafotokozedwa ndi kuvomerezedwa ndi komiti ya College of Medicine Ethics Research Ethics (COMREC), yomwe ndi komiti yomwe ikuyenera kuonetsetsa kuti anthu otengapo mbali mukafukufuku atetezedwa kuti asawonongeke. Ngati mukufuna kudziwa zambiri zakafukufukuyu kapena COMREC, funsani Khama Mita, College of Medicine - COMREC, P.O. Bokosi 360, Chichiri, Blantyre, 0885528248, [kmita@medcol.mw](mailto:kmita@medcol.mw). Chilolezo chochita kafukufuku kuchipatala chachikulu cha Kamuzu ndi chipatala cha Bwaila chavomerezedwa ndi mkulu wa chipatala ndi ofesi ya zaumoyo ya Lilongwe.

Ndawerenga zofunika mukafukufuyu, kapena zawerengedwa kwa ine. Ndakhala ndi mwayi wofunsa mafunso okhudza zakafukufukuyu ndipo mafunso alionse amene ndafunsa ayankhidwa mokhutira. Ndikuvomereza mosakakamizidwa kuti nditenge nawo mbali mukafukufukuyu.

Lembani Dzina la wophunzira \_\_\_\_\_

Chizindikiro cha Wophunzira \_\_\_\_\_

Tsiku \_\_\_\_\_

Tsiku / mwezi / chaka

### **Ngati osatha kuwerenga kapena kulemba**

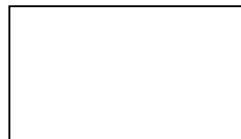
Mlaliki wodziwa kuyenera kulemba (ngati n'kotheke, munthuyu ayenera kusankhidwa ndi wophunzirayo ndipo sayenera kugwirizana ndi gulu lofufuza). Ophunzira omwe sadziwa kuwerenga ayenera kuphatikizapo chidindo cha chala chawo.

Dzina lofalitsa la umboni \_\_\_\_\_ ndi chidindo cha chala chawo

Chizindikiro cha mboni \_\_\_\_\_

Tsiku \_\_\_\_\_

Tsiku / mwezi / Chaka



### **Ndondomeko ya wofufuza / munthu amene amavomereza**

Ndawerenga mosamala zonse zofunika mukafukufuyu kwa munthu amene angathe kutenga nawo mbali, ndipo mwakukhoza kwanga ndikuonetsetsa kuti wophunzirayo wamvetsetsa. Ndikutsimikizira kuti wophunzirayo wapatsidwa mwayi wakufunsa mafunso okhudza kafukufukuyu, ndipo mafunso onse omwe wophunzirayo wafunsa, ayankhidwa molondola komanso mwakukhoza kwanga. Ndikutsimikizira kuti munthuyo sanakakamizidwe kuti apereke chilolezochi, ndipo chilolezochi chaperekedwa momasuka ndi mwaufulu. Momwemonso,

### **Fomuyi yaperekedwa kwa wophunzira.**

Dzina la Wosaka / munthu yemwe atenga chilolezo

Chizindikiro cha mboni \_\_\_\_\_

Tsiku \_\_\_\_\_

Tsiku / mwezi / Chaka

## Appendix 7: Dependent and independent variables

Table 6: Dependent and independent variables

| <b>Dependable Variable</b>          |                                                                                                                              |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| <b>Variable</b>                     | <b>Description</b>                                                                                                           |
| SMS use                             | The use of SMS in hypertensive care among patients. It was either using or not using SMS in hypertensive care by patients.   |
| <b>Independent Variables</b>        |                                                                                                                              |
| Age                                 | The age of the participant on the day of interview.                                                                          |
| Gender                              | The gender of the participant.                                                                                               |
| Marital status                      | Marital status of the participant on the day of interview.                                                                   |
| Number of children                  | The number of children the participant had on the day of                                                                     |
| Occupation                          | The occupation of the participant.                                                                                           |
| Level of education                  | The highest formal level of education obtained by the participant.                                                           |
| <b>Perceived Usefulness (PU)</b>    |                                                                                                                              |
| Useful in communication             | How the participant perceive the use of SMS in hypertensive care with regards to usefulness of SMS.                          |
| Tasks done quickly                  | How the participant perceive the use of SMS in hypertensive care in terms on how SMS improves the speed of completing tasks. |
| Improve quality of care             | How the participant perceive the use of SMS in hypertensive care in terms on how SMS improves the quality of care.           |
| Accuracy of work done               | How the participant perceive the use of SMS in hypertensive care in terms on how SMS improves accuracy of the work done.     |
| <b>Perceived Ease of Use (PEOU)</b> |                                                                                                                              |
| Easy to learn                       | How the participant perceive the use of SMS in hypertensive care as easy to learn.                                           |
| Ease of using                       | How the participant perceive the use of SMS in hypertensive care as easy of learning.                                        |
| Low mental effort                   | How the participant perceive the use of SMS in hypertensive care as SMS technology requires low mental effort to use.        |
| Ease of remembering                 | How the participant perceive the use of SMS in hypertensive care as easy to remember how to use the SMS.                     |
| <b>Social influence</b>             |                                                                                                                              |

|                                                                           |                                                                                                                |
|---------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| Influence from health workers                                             | Health workers' influence on the patient to use SMS in hypertensive care.                                      |
| Influence from people who are believed to be important to the participant | The influence from people who are believed to be important to the participant to use SMS in hypertensive care. |
| Support from the hospital                                                 | The support from the hospital for the use SMS among patients in hypertensive care.                             |
| <b>Facilitating conditions</b>                                            |                                                                                                                |
| Knowledge                                                                 | The knowledge the participant has on the use of SMS.                                                           |
| Compatibility of the SMS                                                  | How the participant perceive that the SMS is compatible with other technologies.                               |
| Ability of the patient to use SMS                                         | The ability for the participant to use SMS.                                                                    |
| SMS approach                                                              | The communication approach such as interactive, informative and reminders used when using SMS                  |

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## Appendix 8: Kamuzu Central Hospital permission letter

TELEPHONE NO: (265) 1.753 555  
TELE FAX NO: (265) 1.756380

PLEASE ADDRESS ALL COMMUNICATIONS TO:  
THE HOSPITAL DIRECTOR



MINISTRY OF HEALTH  
KAMUZU CENTRAL HOSPITAL  
P.O BOX 149  
LILONGWE  
MALAWI

REF/KCH/GA/0.01

Date: 12/02/19

### TO WHOM IT MAY CONCERN

Dear Sir/Madam,

### PERMISSION TO CONDUCT RESEARCH AT KAMUZU CENTRAL HOSPITAL

The bearer of this letter ALLAN CHILONGO  
has been given permission to carry out a study titled;

"FACTORS AFFECTING THE USE OF MOBILE TECHNOLOGY  
IN PATIENT-PROVIDER COMMUNICATION IN  
HYPERTENSIVE CARE IN MALAWI"

at Kamuzu Central Hospital having satisfied the requirements of the  
Hospital Research Committee.

By copy virtue of this letter, the bearer is allowed access to patients,  
staff and medical records for purposes of his/her study.

Yours faithfully,

Research Co-ordinator

for: HOSPITAL DIRECTOR



## Appendix 9: Bwaila Hospital permission letter

Ref. No.:  
Telephone No.: **265 726 466/464**  
Telefax No.: **265 727817**  
Telex No.:  
E-Mail: **lilongwedho@malawi.net**



*In reply please quote NO DZH/MALAWI.*  
Lilongwe District Health Office  
P.O. Box 1274  
Lilongwe  
Malawi

COMMUNICATIONS TO BE ADDRESSED TO:

**11<sup>th</sup> February, 2019**

The In-charge, Bwaila Hospital

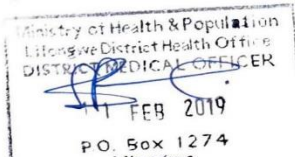
Dear Sir/Madam

**PERMISSION TO CONDUCT A RESEARCH STUDY IN LILONGWE DISTRICT**

Permission has been granted to the bearer of this letter: Allan Chilongo ,  
**Masters of Public Health student** from College of Medicine , to conduct a  
research study at your facility.

**"Factors affecting the use of mobile technology in patient-provider  
communication in hypertensive care in Malawi".**

Any assistance rendered would be appreciated.



Dr. E. Rambila Kajawa

**For: ACTING DIRECTOR OF HEALTH AND SOCIAL SERVICES**