THE FEASIBILITY OF USING SHORT MESSAGE SERVICE (SMS) TECHNOLOGY IN THE MANAGEMENT OF CHRONIC DISEASES IN 3 PILOT CLINICS IN BUSHBUCKRIDGE, MPUMALANGA

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A research report submitted to the Faculty of Health Sciences, University of Witwatersrand, Johannesburg, in partial fulfilment of the degree of Master of Public Health (Health Systems and Policy)

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DECLARATION

I, Dineo Thupae, declare that this research report is my own, unaided work. It is submitted in partial fulfilment of the requirement for the degree of Master of Public Health (Health Systems and Policy) at the University of the Witwatersrand, Johannesburg, South Africa. It has not submitted before for any degree or examination at this or any other university.

Dineo Thupae

Signed on the 20th day of January 2014

DEDICATION

To my family and friends who supported me throughout the writing of this inquiry.

ABSTRACT

Introduction

Chronic diseases are rapidly escalating and place tremendous burden on health care systems in the developing world. The effectiveness of post-physical examination communication with patients is as crucial as their physical observations. Mobile phones, as one of the innovative technological intervention in the 21st century, have become part of people's lives. Their widespread availability has given them the potential to revolutionise health care communication and improve health services.

The purpose of the present research report was to explore the feasibility of using text messages (SMS) by patients in managing their chronic illnesses in a rural setting in three Bushbuckridge clinics.

Methodology

A cross sectional descriptive study using quantitative methodology was carried out at three intervention clinics, where the electronic Patient Health Information System (PatHIS) was to be installed in the Bushbuck Area, Mpumalanga. A questionnaire was administered by the researcher at a specific clinic situated in rural setting to solicit information from participants. The researcher also used the method of observation, that is, an SMS was sent by the researcher to the participants with cellphones during the interview. Participants were requested to open and read the message or open their phonebook while the researcher was observing them.

Results

A total of 74 participants were interviewed. 74% (55/74) of participants owned cellphones and indicated that they were for personal use. Seventy-eight percent (15/19) of participants who did not own cellphones had access to other people's cellphones, and 87 % (13/15) indicated that they did not mind if other people received SMS on their behalf.

Only 25% of cellphone owners were able to demonstrate how they opened their SMS and read it. Ninety-three percent of cellphone owners who were unable to read their own SMS indicated that their messages were read by either their children and/or grand children. Eighty-eight percent (62/70) of the participants indicated that they would prefer to receive SMS in their own home language.

Ninety-one percent (68/70) indicated that they would like to receive SMS from the clinic in future. Seventy Percent of the participants would prefer to receive appointment reminders via SMS. Fifteen Percent and 13 % would like to receive test results and health information via SMS respectively. Participants also indicated that they would like to be informed about the unavailability of medication at the clinic pharmacy.

Discussion

The study indicated that the use of SMS in the management of chronic diseases is feasible based on the number of participants who would like to receive SMSes from the clinic. However participants were specific in terms of the type of text messages they preferred to, that is, they preferred to receive appointment reminders via SMS. It is recommended that before such an intervention is implemented a balance between privacy, confidentiality as well as comprehension of test messages be established. It is also crucial to focus on patients' preferences in terms of the type of text messages, as well as the language used. This will determine whether patients accept the use of text messages in managing their chronic illnesses.

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- The participants who gave their time to be interviewed and participated in the study, without their unqualified support the research would not have been possible and accomplished.
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NOMENCLATURE

SMS: Short Message Service
PatHIS: Patient Health Information System
NCD's: Noncommunicable diseases

DEFINITION OF TERMS

Access: The fit between the patient's need and the system's ability to meet those needs. It is a function of availability, accessibility, accommodation, affordability and acceptability (Penchasky and Thomas, 1981)

Acceptability: An attribute that is given to health services that respond positively to client's attitude and culture (Obrist et al., 2007)

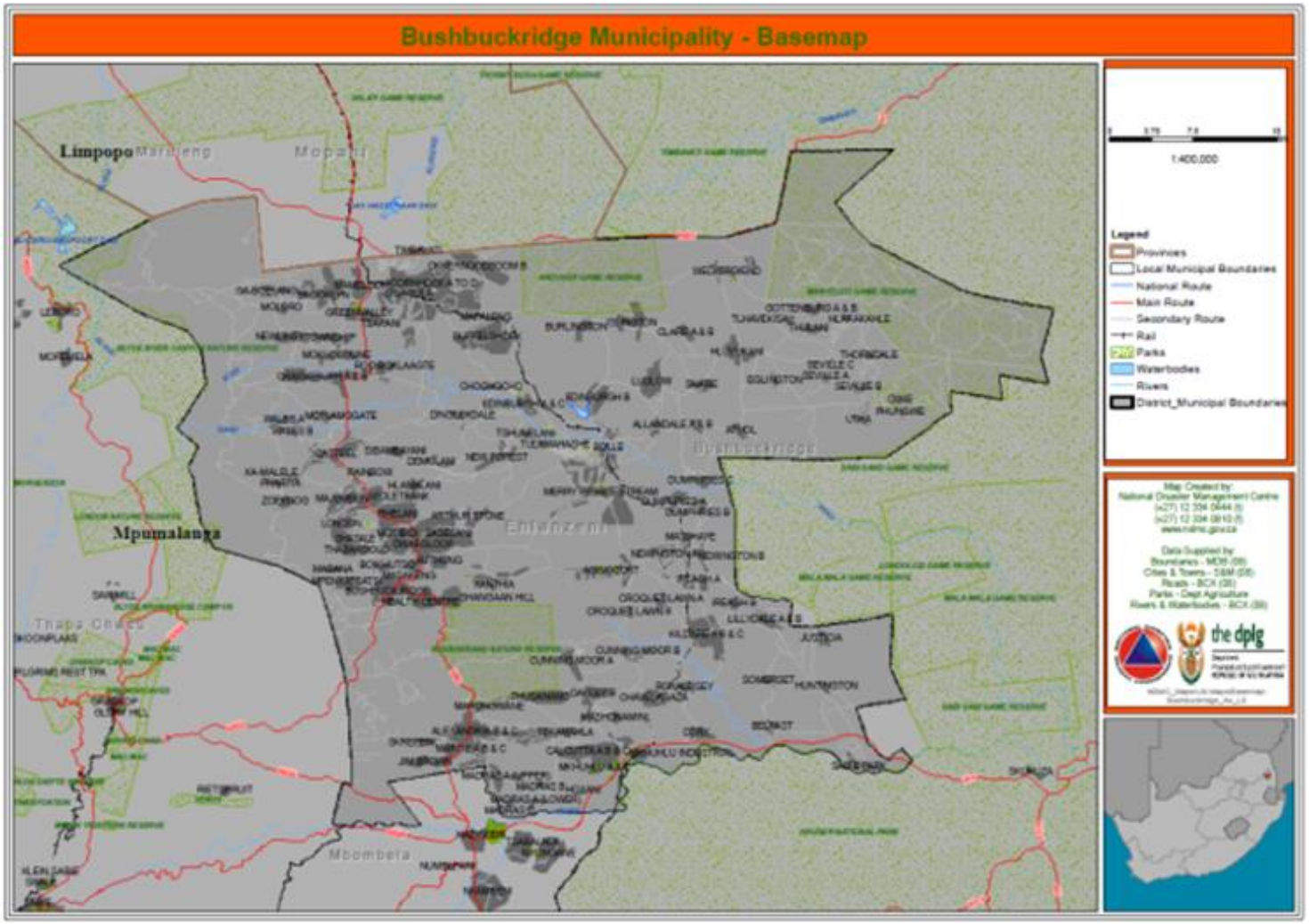
Affordability: Items or expenses believed to be within one's financial means. To be able to do or spare something without incurring financial difficulties or without risk of undesirable consequences. (Source http://dictionary.reference.com/browse/affordability)

"**eHealth**: Using information and communication technology (ICT) such as computers, mobile phones, and satellite communications - for health services and information. (Lester et al., 2008)

Feasibility: The likelihood that something can be achieved.
(Source: http://www.collinsdictionary.com/dictionary/english/feasibility)

Short Message Service (SMS — Short Message Service). A service available on digital networks, typically enabling messages with up to 160 characters to be sent or received via the message centre of a network operator to a subscriber's mobile phone. (Source: ITU, http://www.itu.int/osg/spu/publications/portableinternet/ExecSummFinal2.pdf

Appendix A


Bushbuckridge Municipality - Basemap
Limpopo
Mpumalanga
Mopani
Ehlanzeni
Mbombela
Bushbuckridge
1:400,000
Legend
Provinces
Local Municipal Boundaries
National Route
Main Route
Secondary Route
Rail
Parks
Waterbodies
Rivers
District_Municipal Boundaries
the dplg

CHAPTER 1:

Introduction and Background

1.1 Introduction

Chronic diseases are rapidly escalating and place tremendous burden on the health care systems in the developing world therefore effective management is crucial. In order to address the problem, communication with patients on a regular basis for follow-up, provision of health messages as well as adherence support becomes very important.

Mobile phones (cellphones), as one of the innovative technological intervention in the 21st century, have become part of people's lives. Mobile phone usage in South Africa has increased rapidly and they have become more affordable and available to an increasingly wider population. Their widespread availability has given them the potential to revolutionise health care communication and improve health services.

Short Message Service (SMS) have been used by health care providers for different purposes such as health information, behaviour modification appointment reminders, stock management of medicines and monitoring adherence to treatment. However, uncertainty still exists in literature, in terms of the acceptability and accessibility of using such technology by patients. There is limited research that explores the possibility of using such technology by patients in rural areas. The study explores the feasibility of using SMS in the management of chronic illnesses in a rural setting. The terms text messages and SMS will be used interchangeably as understood by the participants.

For the purposes of the present study, chronic diseases would include communicable as well as non-communicable chronic diseases.

1.2 Background

Management of chronic diseases rely on several features, that is, identification of high risk cases; active case finding; early diagnosis of disease; combination of medical and psychosocial interventions; long-term follow-up with regular monitoring and promotion of adherence to treatment. Monitoring hard to reach patients in remote areas to prevent defaulting will also assist in the effective management of chronic diseases.

Disease control institutions and technology specialists are looking at text messages through the widely available mobile telephones as a way to communicate with and monitor, hard to reach patients in remote areas (Lester et al., 2008). According to the International Telecommunication Union (2012) total mobile-cellular subscriptions had reached almost 6 billion by the end 2011, corresponding to a global penetration (the measurement of access to telecommunications) of 86%. According to Nielsen Southern Africa Report (2011), more Africans have access to mobile phones than to clean water.

According to the ITU (2012) this impressive growth in mobile-cellular subscriptions continues, and has reached very high penetration levels in a number of African countries. Significant increases were noted in Namibia, South Africa and Botswana, where penetration exceeds 100 Percent (ITU, 2012). Africa is in the centre of a technological revolution and nothing illustrates this fact than the rise in number of mobiles phones.

Mapham (2008) stated that mobile phones have penetrated the adult market in South Africa, with two-thirds of all adults having access to a mobile phone. In South Africa, mobile-cellular subscription per 100 inhabitants was 100.5 percent in 2010 and 126.8 percent in 2011 (ITU, 2012). It is a very important development in that access to mobile telephones has transcended class, race and gender lines. In South Africa, mobile phone use has gone from 17% of adults in 2000 to 76% in 2010 (Nielsen, 2011).

South Africa has four licensed mobile operators: MTN, Vodacom, Cell C and 8ta which is a subsidiary of Telkom. The country is competitive when it comes to mobile service providers. Vodacom leads with 41% market share, followed by MTN at 40%, Cell C is at 18% and 8ta is trailing at 1%. Ninety five percent of customers have been with their network for about 4.2 years (Nielsen, 2011).

MTN Group Limited indicated an increase of 16.2 % (164, 5 million) in the number of subscribers for the year that ended 31 December 2012. This rapid growth is mostly registered in North Africa, West Africa and Central Africa; South and East Africa. It signifies an ever increasing footprint of cellphone network as well as utilisation that is ever improving in Africa as well as the developing world. Vodacom has grown its operations to include networks in Tanzania, the Democratic Republic of Congo ('DRC'), Mozambique and Lesotho. In South Africa, with the population of 51 million, Vodacom has about 28.9 million customers with 93.75% shareholding (Vodacom Annual Report, 2012).

According to the Nielsen (2011), 29 million South Africans use mobile phones more than radio (28 million), TV (27 million) or personal computers (6 million). Only 5 million South Africans use landline phones. Pre-paid plans still make up between 82 and 85 Percent of the market.

SMS text messaging is popular amongst South African mobile customers and is used by almost 4.2 times more people than email. Indeed, 69% of customers prefer to send SMS as compared to calling because it is less expensive, and 10% believe texting is a faster way of communicating (Nielsen, 2011). The costs of SMS vary according to service providers. The costs during peak hours range from R0.50 to R 0. 80 whereas off peak ranges from R 0.35 to R 0.80. Customers are not charged for receiving text messages.

Mobile phones are an essential tool for communication. They improve communication for people in their day to day lives far easier, in particular the poor who do not have access and choice to the variety of communication available. As a result, the rural population including those in Mpumalanga have

been afforded an opportunity to enter the global information setting with some measure of ease. The investment by MTN or Vodacom confirms a growing connectivity and investment into network infra-structure. The rural population may not have access to internet as well as other media, but they are able to communicate using mobile phones.

Indeed, communication via mobile phones plays a significant role in businesses and most aspects of personal lives. It is a way of life; for some, business mobile telephones and other electronic technologies are simply indispensable. These trends are emerging in ordinary day-to-day lives of individuals, including the poorest of the poor (Lester et al., 2008).

Studies on the use of mobile phones have been conducted in various countries such as Brazil, China, Kenya, Malaysia, New Zealand, South Africa, South Korea, Tanzania and Uganda. Studies focused on different uses of text messages that include health awareness/promotion, appointment/attendance reminders, compliance/adherence to drug treatment, management and monitor illnesses, communication of laboratory results, data collection tools, behaviour modification, stock management and general communication between health providers and patients. Communication between patients and service providers is a major challenge in resource limited setting with large catchment areas. According to the Economist Online (The Economist Newspaper: A doctor in your pocket April 16, 2009), mobile technology is acknowledged and accepted to be working because many people have personal mobile phones. Personal mobile phones enable multi-directional flows of information even in the most remote parts of the world. Consequently, they possess latent power to transform society and health care systems in particular.

1.3 Statement of the Problem

Chronic diseases place tremendous burden on health care systems globally and are not confined and restricted to the developed world. Over 66% of the world's diabetic population lives in developing countries (WHO, 2005). The rise of

communicable disease deaths in the developing countries can be reduced by prioritizing multi-pronged integrated strategies to reverse the situation. The condition warrants integrated approach to management of chronic diseases at primary health care levels.

The shortage of human resources in rural areas poses a challenge on the health care systems and has the capacity to compromise the quality of care. For this reason, other methods of improving management of diseases that can assist health care professionals in the management of chronic illnesses should be investigated.

There is a need to improve the effectiveness of health service delivery with the fastest and furthest possible outreach to patients. Innovative electronic solutions responding to the current health challenges are not only a basic necessity but are also important. Currently, interventions that are effective in practice, that appeal to the public at large, and can be rapidly adopted by practitioners are required.

Studies in resource rich areas have demonstrated the efficacy of SMS text messaging to motivate positive health behavior, including smoking cessation (Rogers et al., 2005), improved glucose control in diabetics (Kim et al., 2008), and weight loss in obese patients (Patrick et al., 2009).

Early studies of cellphone use to improve HIV-related communication in resource limited settings have shown benefits in reducing missed clinic visits and improving medication adherence (Lester et al., 2010). Despite these positive findings, little or no data exists on the acceptability and viability of cell phone text messaging for health communications in a resource limited setting (Crankshaw et al., 2010; Curioso, 2007).

1.4 Justification for the study

This research sought to assess the feasibility of using Short Message Services (SMS) in the management of chronic diseases. Evidence based public health research improves the quality of health practice as it provides information about

tested intervention strategies to health practitioners. The findings of the study will hopefully bring understanding to the practices of patients who use SMS. It will assist health practitioners to improve the management of chronic non-communicable diseases especially cardiovascular diseases and diabetes Mellitus, as well as the management of the newer chronic communicable disease epidemics of HIV and TB.

According to Kaplan (2006), aside from recent work in South Africa, there is almost no literature on using mobile phones as a healthcare intervention for chronic diseases, for both non-communicable and communicable diseases.

In this study, the focus is on the use of SMS as the entry point to effective and efficient use of technological tools such as personal mobile phone. Most importantly, swift communication via SMS technologies would reduce the number of patients skipping their treatment regimes.
It will assess the extent to which the use of SMS could assist in assessing patient needs in terms of information and assistance with appointment reminders, tracing defaulters and treatment follow-ups which forms an important part in the management of chronic diseases.

Research focusing on the use of cellphones as a healthcare intervention will minimize the scarcity of information, and knowledge in the area. Information gathered in the study could be used to inform service provision and motivate for appropriate, cost-effective and efficient service development.

In addition, improved communication models using current technologies would ease the complexities or burdens associated with administration and management of these fatal diseases.

1.5 Literature Review

1.5.1 Introduction to chronic diseases

Chronic diseases are rapidly escalating and have become a major contributor to the burden of diseases (Puoane et al., 2008). According to WHO (2011) of 57 million global deaths in 2008, 36 million, or 63%, were due to Noncommunicable diseases (NCD's). The four main NCDs are cardiovascular diseases, cancers, diabetes and chronic lung diseases (WHO, 2011). The burden of chronic disease, in the long term, would have dire consequences to social capital development, thus impacting negatively on socio-economic development of any country.

Burden of Chronic Diseases

The increased burden of chronic diseases in countries with high infectious disease burden is straining the health service and depleting financial resources. It undermines the return on investment in health assets. Certain combinations of diseases such as diabetes mellitus, hypertension or obesity have been found to be more detrimental to health outcomes than either one condition alone or in combination with other co-morbidities (Puoane et al., 2008).

According to the WHO (2005) the total number of people dying from chronic diseases is double that of all infectious diseases together. Minimal resources, shortage of skills, and lack of equipment are not the only contributing factors, other aspects include the general management in terms of communication with patients during the course of their of their illness.

TB and HIV/AIDS are increasingly becoming chronic disorders. Key to the care of people living with HIV is effective data on use of ARVs, their responses to the medication and additional needs (Donald et al., 2007). Adherence which is a key issue in the rollout of antiretroviral medication is challenged by management and support of HIV-positive people. According to Donald et al. (2007) the provision of

medication is complicated by poverty, geography, the distribution of patients and an underdeveloped healthcare system.

These unacceptable as well as unnecessary high death rates are avoidable because some of them are caused by communication breakdown between health institutions communication systems, health practitioners not tracking patients as well as negligence by patients. Such mortality rate can be controlled or drastically decreased, inter alia, by interventions means such as improved communication using technologies such as SMSes in the administration or management of communicable or non-communicable diseases.

Statistics on Chronic Diseases

According to WHO (2011), the leading causes of Non-Communicable Diseases (NCDs) deaths in 2008 were cardiovascular diseases (17 million deaths, or 48% of all NCD deaths), cancers (7.6 million, or 21% of all NCD deaths), and respiratory diseases, including asthma and chronic obstructive pulmonary disease (4.2 million). Diabetes caused another 1.3 million deaths (WHO, 2011).

WHO (2011) claims that the burden of these diseases is rising disproportionately among lower income countries and populations. In 2008, nearly 80% of noncommunicable disease deaths, 29 million occurred in low- and middle-income countries with about 29% of deaths occurring before the age of 60 in these countries. Despite growing evidence of epidemiological and economic impact, the global response to the problem remains inadequate (Yach et al., 2004).

According to WHO (2011) in South Africa, NCDs are estimated to account for 29% of all deaths; cardiovascular diseases accounted for 11%, cancers 7%, respiratory disease 3%, diabetes 3% and other NCDs 4% . According to WHO, 39.7% males deaths and 28.7 female deaths under the age of 60 were due to NCD (WHO, 2011).

As stated by Bradshaw et aI. (2000), the burden of disease for South Africa, measured in Disability-adjusted life years (DALYs)/100 000 population is high

relative to all other regions of the world except in the African region. South Africa has a higher overall burden of disease measured by DALYs/100 000, arising from the high burdens due to HIV/AIDS, injuries and respiratory diseases when it is compared with other regions of the world. The burden due to diabetes mellitus in South Africa is higher than for any of the regions, except in the American region (Bradshaw et al., 2000).

According to Bradshaw et al. (2000) South Africa has similar DALYs/100 000 rates for HIV/AIDs but lower rates for other communicable, maternal, perinatal and nutritional conditions when compared with the rest of Africa. It has higher burdens due to cardiovascular diseases, respiratory diseases and diabetes mellitus than the rest of Africa but a comparable burden due to non-communicable diseases overall (Bradshaw et aI., 2000). The number of deaths due to diabetes mellitus and HIV disease increased by 3.8% and 30% respectively (Stats SA, 2013).

When compared with other provinces in South Africa, the top ten leading single causes of death were the same for Mpumalanga as they were nationally (Stats SA, 2013). The leading cause of death in both males and females in the province was Tuberculosis, 14.6% and 12.1% respectively (Stats SA, 2013). Cerebrovascular diseases, diabetes mellitus, hypertensive diseases as well as HIV were amongst the other disease categories which ranked in the top ten causes of death (Stats SA, 2013).

The impact of chronic diseases on socio-economic

According to WHO (2011), the costs to health-care from NCDs are high and are projected to increase. Significantly costs to individuals, families, businesses, governments and health systems add up to major macroeconomic impacts. Heart disease, stroke and diabetes contribute to huge losses of national income each year in the world's most densely populated nations. Economic analysis suggests that each 10% rise in NCDs is associated with 0.5% lower rates of annual economic growth (WHO, 2011).

Since in poorer countries health-care costs must be paid by patients out-of-pocket, the cost of health care for NCDs creates a strain on household budgets, particularly for lower-income families (WHO, 2011). Treatment for chronic diseases is prolonged and becomes subsequently extremely expensive. Such costs can force families into disastrous spending and impoverishment. Household spending on treatment depletes money for basic supplies such as food and shelter, and ultimately education (Puoane et al., 2008).

Chronic disease deaths occur at much earlier ages in low and middle income countries than in high income countries (WHO, 2005). In most instances, in the developing world, low and middle income groups constitute the majority of the economically active population. Bradshaw et al. (2000), maintains that Chronic Disease of Lifestyle (CDL) accounted for 24.5% of the reported deaths of all ages and 28.5% in the 35-64-year age group. Since chronic diseases affect the young who are people in their productive years, they reduce productive labour and earning capacity at a household level (Puoane et al., 2008). Half are significantly women who, in many instances, are responsible for running households and families. Women are custodians of procreation in all societies. Any disease that immensely impacts on the well being should be contained at almost all material times and costs.

Management of Chronic Diseases

The quadruple burden of diseases in South Africa has serious consequences for the prevention and cost-effective management of chronic diseases, the unhealthy lifestyles and risk factors that precede them (Steyn et al., 2006). Steyn et al. (2006), observes that the disease patterns are characterised by a combination of poverty-related diseases together with the emerging chronic diseases associated with urbanisation, industrialisation and a westernised lifestyle. The HIV/AIDS epidemic also aggravates this double burden of diseases.

The disease burden places a huge demand on the already limited resources the South African health services, a burden that is beyond what has been experienced in developed countries. Steyn et al. (2006), claims that little

recognition is given to the extent of the burden of chronic diseases lifestyle (CDL) in South Africa, and the prevention of unhealthy lifestyles. Early diagnosis and cost-effective management of CDL risk factors are low on the list of priorities in relation to competing diseases. It has therefore become critical that South Africa utilise its limited resources optimally and implement cost-effective health-promotion interventions to prevent the predicted epidemic of CDL in the face of all the other health needs in this region (Steyn et al., 2006).

There is strong evidence suggesting that chronic disease can be prevented and controlled through comprehensive and integrated actions. These include policy actions, laws and regulations, tax and price interventions, improving the built environment, advocacy, and community-based, school-based, workplace screening and clinical interventions at health facility levels (WHO, 2005). According to WHO (2011), South Africa has the capacity to address and respond to NCDs, that is, integrated policy, programs and action plan in place.

According to Puoane et al. (2008), the current South African response to the non-communicable diseases epidemic includes the implementation of policies to reduce tobacco and alcohol use, as well as to introduce community-based interventions and initiatives focusing on children, adults and adolescents. There has been initiatives to educate the public about risk factors, such as the South African food-based dietary guidelines, has been used widely to educate the public about healthy living (Puoane et al., 2008). Secondary prevention approaches include identification of personal risk factors, individual management of risk, early diagnosis and appropriate management of disease (Puoane et al. 2008). Despite these initiatives, a range of improvements are needed for the overall control and management of non-communicable diseases in South Africa to impact on the burden of disease (Puoane et al., 2008).

In 2005 the World Health Organization (WHO) proposed the use of low-cost technology (e-Health) to improve the quality of health care delivery particularly at the primary healthcare (PHC) level, as well as build health worker capacity in resource-poor countries (Lester at al., 2008). The proposal is long overdue as

the escalation in disease continued to accelerate rapidly, distressing health care systems in the developing world.

It is therefore common course that one of the underlying complexities associated with dealing with chronic diseases is the enhancement of maximal forms of communication utilising current technologies such as SMS. Patients may graduate to other sophisticated technologies or tools such as twitter or face-book, but the most primary accessible technology is the SMS.

1.5.2 The Use of communication technology

The use of cellphone as a health care intervention in developing countries has tremendous value. It is untapped due to technical, structural, financial and regulatory barriers (Kaplan, 2006). Governments' attitudes are ever-changing; they are realising the significance mobile communication holds in building their societies and economies. There is greater commitment to expand and install infra-structure networks for widening communication (MTN Annual Report, 2010).

There is ongoing debate on the use of communication technology in promoting health outcomes. Kaplan (2006) conducted a web-based and library database search for intervention studies in developing countries looking for evidence to support or refute the idea that fixed and mobile telephones could be an effective health care intervention. The study found that there was evidence to support as well as refute the proposition that fixed and mobile telephones could be an effective health care intervention in developing countries. Chen et al. (2008) also pointed out that further work is needed to explore the use of SMS text messages to other areas including chronic disease intervention.

Subjective experience, in the South African context and statistics of personal cellular phone ownership shows that the expansion of the cellular phone infra-structure has reached far rural areas where the poorest of the poor are located. Whether the growth and expansion of such infra-structure specifically improves the use of SMS is a matter of on-going research.

According to Kaplan (2006), it is difficult to generalise on the use of SMS because of the different outcomes measurements and the small number of controlled studies. SMSes have been used for various purposes in the health sector. Studies below illustrate how text messages have been used in various settings.

Prevention Message

Rogers et al. (2005) conducted a randomised control trial in New Zealand to determine the effectiveness of a mobile text messages in smoking cessation programme. The results of the study showed that more participants had quit smoking in the intervention group when compared to the control group. The study concluded that the programme offered potential for a new way to help young smokers to quit smoking, being affordable, personalised, age appropriate and not location dependent.

Similarly a randomised controlled trial looking at the development and evaluation of text message based intervention designed to help individuals lose or maintain weight over a period of 4 months was conducted by Patrick et.al (2009) in California. At the end of the 4 months, the intervention group had lost more weight than the comparison group. The study concluded that text messages may be a productive channel of communication to promote behaviours that support weight loss in overweight adults.

Armstrong et al. (2009) conducted a randomised control trial of the effects of an electronic text-message reminder system on adherence to sunscreen application. Participants were recruited from the general community in California. The results indicated that participants who received daily text messages reminders had an adherence rate of 56.1% when compared to the control group which had an adherence rate of 30%.

Health Promotion

Curioso et al. (2007) conducted a qualitative study using in-depth interviews among people living with HIV in 2 community-based clinics in Peru. The study found that health promotion interventions using information and communication technology tools amongst people living with HIV in a resource-constrained setting may be acceptable and feasible, and that it can build on existing patterns of use.

Treatment adherence

Haberer et al. 2010) studied the challenges experienced by patients for collection of antiretroviral therapy adherence data in a resource-limited setting in Mbarara, Uganda. The study employed qualitative interviews to assess participants' impressions of interactive voice response and short message services. It indicated that although participant's interest and participation rates were high, weekly completion rates for adherence queries were low due to misunderstanding of personal identification numbers. This study highlighted the importance of training to ensure proper use of the technology.

Lester et al. (2010) conducted a study which confirmed that patients who received SMS support had significantly improved ART adherence in a randomised clinical trial of HIV-infected adults initiating antiretroviral therapy (ART) in three clinics in Kenya. The aim of the study was to assess whether mobile phone communication between health-care workers and patients starting antiretroviral therapy improved drug adherence and suppression of plasma HIV-1 RNA load. The study found that patients who received SMS support had significantly improved ART adherence and rates of viral suppression compared with the control individuals. The study concluded that mobile phones might be effective tools to improve patient outcome in resource-limited settings.

A study by Wessels et al. (2007) in Gugulethu, SA highlighted the potential of simple electronic technologies to monitor treatment adherence at primary health care level. It went on to indicate that the introduction of cellphone appears to

have improved adherence to antiretroviral treatment. Another study by Donald et al. (2007) in Gugulethu Hospital, Cape Town showed that the use of cellphones assisted with communication for health care providers to provide support for adherence to medication. In the study, an adaptation of cellphone technology provided an easy-to-use data capturing device for use by therapeutic counselors (home based carers). The findings showed that the technology was easy to use, especially for those who had previously used a cellphone.

Self Management

The widespread availability of mobile phones and new electronic disease management programs has opened potentially new avenues to enhance self-management of chronic disease. Diabetes Mellitus, with its complex treatment requirements, is a prime disease that could benefit from a mobile phone health (mHealth) strategy.

Kim et al. (2008) conducted a quasi-experimental design study with pre and follow-up tests with participants from the endocrinology outpatient department in South Korea. The study evaluated whether an intervention using the SMS by personal cellular phone and internet would improve levels of plasma glucose of obese type 2 diabetes. The study showed that the intervention using SMS of personal cellular phone and internet improved glycosylated haemoglobin and 2-h post-prandial test in patients with obese Type 2 diabetes.

According Katz et al. (2012), to date there have been several small cellphone based diabetes studies using either text messaging or web-based ‘smart phones’ with results showing reduction in HbA1c, hospitalizations, emergency room visits and increased achievement of diabetes standard of care goals.

Katz et al. (2012) conducted a Cell Phone Diabetes Project which enrolled 32 patients with Type 2 diabetes from a community clinic in Columbia. The study used patients' cell phones which were connected to the Well Doc Diabetes Manager System monitored by case managers, with monthly reports given to

primary care providers. The study showed that despite cellphone rebates, dropout rate was high (50%), due to lack of use or un-affordability of low-cost cellphone service. Active patients had sustained system use with improved diabetes standard-of-care goals and reduced hospitalizations and emergency department visits. The study indicated that cellphone assisted self-management of diabetes offers a new approach to improving chronic care; however, introducing this new technology would present many challenges to a health care team.

According to Katz et al. (2012) there are multiple linkages in the chain which affects the success of mobile health to chronic care strategy such as patients, primary care providers, support staff, medical record systems, disease management software and cellphones. Introducing cell phones with disease management applications has great potential to improve chronic care of diabetes, but the cellphone alone is not sufficient to make a difference. A successful mHealth home management health system requires attention to all of the many 'links in the chain' of chronic care (Katz et al., 2012).

Management diaries

In their study on the feasibility of collecting diary data from asthma patients through mobile phones and SMS at Denmark, Anhoj and Moldrup (2004) combined both quantitative and qualitative methodologies using response rate and traditional focus group respectfully. The median response rate per patient was 0.69 (range: 0.03 – 0.98), that is, half the participants reported more than about two thirds of the requested diary data. The focus group interview with 9 users indicated that participants were enthusiastic about the SMS diary and that it became an integrated part of their everyday life. However, participants wished for a simpler diary with only one SMS message to respond to (Anhoj and Moldrup, 2004). The findings introduced the need to customise SMS or diaries in order to meet the basic patients' needs. Messages need not be complicated; the diary requires simplicity for patients to use, but importantly content that is easily comprehended.

Appointment reminders and attendance rates

Non-attendance results in administrative problems and disruption in patient care. Several interventions have been used to reduce non-attendance, with varying degree of success. Earlier, researchers such as Koshy et al. (2008) pointed out that “there is paucity of research in relation to the use of mobile phones SMS text messages reminders for outpatient hospital appointments”. A relatively new intervention, text messaging, has been shown to be as effective as telephone reminders in reducing non-attendance (Battistotti et al., 2006; Downer et al., 2006; Geraghty et al., 2007; Leong et al., 2006; Milne et al., 2006, cited in Chen et al., 2008:34).

Chen et al. (2008) conducted a randomized control trial with the objective to compare the efficacy SMS text messaging and phone reminder to improve attendance rates at a health promotion center in China. Participants with scheduled appointments from April 2007 to May 2007 were enrolled in the study and randomly assigned into 3 groups: control (no reminder) group, SMS text messaging reminder group and telephone reminder group. Attendance rates and costs of interventions were collected. Attendance rates of control, SMS and telephone groups were 80.5%, 87.5% and 88.3%, respectively. The attendance rates were significantly higher in SMS and telephone groups than that in the control group. The cost effectiveness analysis showed that the cost per attendance for the SMS group was significantly lower than that for the telephone group. The study concluded that SMS and telephone are effective reminders for improving attendance rate at a health promotion center. SMS reminder may be more cost-effective compared with the telephone reminder.

Koshy et al. (2008) conducted a study on the effectiveness of mobile-phone short message service (SMS) reminders for ophthalmology outpatients’ appointment in London. The use of SMS reminders for ophthalmology outpatient appointments was associated with a reduction of 38% in the likelihood of patients not attending their appointments compared to no appointment reminder. The study indicated

that SMS text reminders have the potential to reduce non-attendance rates in outpatient department. Evidence above indicate that the use of SMS is effective in improving attendance rate

Liew et al. (2009) conducted a randomised controlled trial with three arms: text messaging reminder; telephone reminder and control in two primary care clinics in Malaysia. The objective was to determine whether text messaging would be effective in reducing non-attendance in patients on long-term follow-up, compared with telephone reminders and no reminder. The non-attendance rates in the text messaging group and the telephone reminder group were significantly lower than the control group. Text messaging was found to be as effective as telephone reminder in reducing non-attendance in patients who required long-term follow-up for their chronic illnesses in this study. It could be used as an alternative to conventional reminder systems.

Guy et al. (2012) undertook a review of studies that assessed the effectiveness of SMS reminders at increasing the uptake of appointments in health care settings. The review was on studies which involved a comparison of appointment attendance rates between patients who did and did not receive SMS reminders published prior to June 2010. Across all studies, there was significant heterogeneity in the estimated effect measure of the relationship between use of SMS reminders and clinic attendance. The study concluded that SMS reminders in health care settings substantially increase the likelihood of attending clinic appointments.

Lin et al. (2012) conducted a randomized control trial which included 258 parent-child pairs involved in the Childhood Cataract Program of the Chinese Ministry of Health. The study's objective was to assess whether SMS service for parents of children with cataract could improve follow-up adherence and the proportion of procedures performed in timely fashion. Attendance rates for the SMS group were significantly higher than those for the control group. The SMS reminders significantly improved follow-up adherence in paediatric cataract treatment. The study concluded that using readily available mobile phone resources may be an

effective economic strategy to improve management of childhood cataract in China.

Crankshaw et al. (2010) explored the dynamics and patterns of cellphones use among patients at an antiretroviral treatment clinic in Durban, South Africa. The study aimed to ascertain whether clinic contact via patients' cellular phones was a feasible and acceptable modality for appointment reminders and adherence messages. The study concluded that the use of cellular phones for intervention purposes is feasible and should be further investigated.

SMS reminders appear to be a simple and efficient option for health services to use in order to improve service delivery. In addition they result in health benefits for the patients who receive such reminders (Guy et al., 2012). SMS access to healthcare services may be one way of reaching those sections of society with unmet medical need but who, for reasons of geography, poverty, low literacy or lack of technical proficiency, find it difficult to access medical care in an efficient and effective manner (Neville et al., 2008). Once introduced to benefit patients in following up their clinic appointments and reminded via SMS, patients would become familiar with the need to continue checking their appointments. In future they would take full responsibility for their recovery from chronic communicable as well as non-communicable diseases.

Patterns of use and ownership

In a study by Crankshaw et al. (2010) in Durban, adults who where over 18 were recruited and a structured questionnaire was administered including questions surrounding socio-demographics, cellular phone availability, patterns of use, and acceptability of clinic contact for the purpose of clinic appointment reminders and adherence support. Cell phone ownership amongst participants was high at 81 with 95% utilizing a prepaid airtime service. The study found that more females than male switched their cellphones off during the day ($p = 0.002$) and that they were more likely not to take calls in certain social environment ($p \leq 0.0001$). Females were more likely to share their cellphone with others ($p = 0.002$) or leave it in a place where someone could access it ($p = 0.005$). The findings highlighted

the value of gender-based analyses in informing interventions. Most of the participants were willing to have clinic contact via their cellular phones, either verbally (99%) or via text messages (96%).

Laboratory results

Siedner et al. (2012) conducted structured interviews of fifty patients at the Immune Suppression Syndrome clinic in Mbarara, Uganda. The study assessed four domains of health-related communication: cell phone use practices and literacy; preferences for laboratory results communication; privacy and confidentiality as well as acceptability of and preferences for text messaging to notify patients of abnormal test results. All participants expressed interest in a service to receive information about laboratory results by cell phone text message, stating benefits of increased awareness of their health and decreased transportation costs. Participants expressed a strong desire for direct messages to limit misinterpretation of information. The study concluded that cellphone text messaging for communication of abnormal laboratory results is highly acceptable in this cohort of HIV-infected patients in rural Uganda.

Data collection tool

Another study which looked at the use of mobile phones as a data collection tool was conducted by Tomlinson et al. (2009) in Umlazi, a peri-urban settlement close to Durban (South Africa). The study investigated the feasibility; the ease of implementation; the extent to which Community Health Workers (CHW) could be trained and successfully be supervised to collect data using mobile phones in a survey. The results of the study showed that web-based interface permitted comprehensive daily real-time supervision of CHW performance with no data loss. The study concluded that mobile phones are a feasible method of data collection that however still needs to be investigated.

Stock Management/Control

Barrington et al. (2010) conducted a 21-week pilot study, 'SMS for Life', during 2009-2010 in three rural districts of Tanzania. The study involved 129 health facilities. SMS for Life used mobile telephones, SMS messages and electronic mapping technology to facilitate provision of comprehensive and accurate stock counts from all health facilities to each district management team on a weekly basis. Stock count data was provided in 95% of cases. A high response rate (≥ 93%) was maintained throughout the pilot. The study concluded that The SMS for Life pilot provided visibility of anti-malarial stock levels to support more efficient stock management using simple and widely available SMS technology. The researchers went on to state that SMS for Life system has the potential to alleviate restricted availability of anti-malarial drugs or other medicines in rural or under-resourced areas.

1.5.3 Characteristics of SMS

As mobile phone ownership continues to increase in many countries worldwide, there is a potential to increase the effectiveness of health care delivery (Koshy et al., 2008). SMSes have characteristics that make them appropriate for use in a health setting, including: direct patient communication; privacy; confidentiality; swift delivery of messages and receipt of responses and convenience for health providers and patients. The benefits are vast.

Living in resource poor environment is not a barrier to the use of wireless technology for several cultural and economic reasons. The social value of mobile phones is massive even in resource poor areas. Functionally, mobile phones are easier to use for people with lower level of skill than those needed for computers or the internet. Utilisation of personal cellular telephones with respect to adherence to medicine in chronic care models is its ability to create a multi-pronged way interaction between patient and providers, thus facilitating the dynamic nature of their relationship (Kaplan, 2006).

According to Neville et al. (2008), SMSes cost less than voice messaging and can reach people whose phones are switched off. Also, communication from the clinic with patients via SMS will be cheaper when compared to making phone calls. According to Koshy et al. (2008) the use of SMS reminders appears more cost-effective than the traditional appointment reminders and requires less labour. This was the case in a study by Chen et al. (2008). It showed that the cost per attendance for the SMS group was significantly lower than that for the telephone group. The study concluded that SMS reminder may be more cost-effective compared with the telephone reminder. Armstrong et al. (2009) also reported that cellular telephone text-messages technology offers an innovative, low cost and effective method of improving adherence to sunscreen application and that such technology has implications for large-scale public health initiatives.

SMS messaging is less intrusive. Beneficially, it means that messages can be sent and received in places where it may not be practical to have a conversation. Messages can be re-read for someone with low literacy levels. It does not matter whether the person can read and write; as long as there is support around the recipient of the message, the message will indeed reach the target, unless there is a technical glitch or delay in the message reaching patients. Other advantages of using cellphones as a means of support include the fact that in many resource constraint settings cellphone communication infrastructure is already in place at a population level scale and would not need to be built separately to support persons with HIV or other chronic diseases (Curioso, 2007).

According to Curioso et al. (2007) cellphones may be useful and culturally relevant as a way to support medication adherence among people living with HIV. The finding further accentuates the need for cellphones to be used in health care systems as there is growing compatibility with cultural practices. It is common knowledge that such community adherence to their cultural practices is important for their lives. Rural communities in many instances stick to their traditional and cultural practices more than urban communities.

Anhoj and Moldrup (2004) suggest that SMS collection of asthma diary data is feasible, and that SMS may be a tool for supporting the self-management of asthma (and possibly other chronic diseases) in motivated and self-efficacious patients because mobile phones are a part of people's everyday lives and enable active requests for data wherever the patient is.

The abundance of these positive perspectives on the use of personal cellphones confirm the significance as well as benefits that would accrue as a result of factoring cellphone use in dealing with systemic electronic communication with patients of different ailments. This system does not even require to be confined only to chronic diseases; other pervasive ailments could be integrated with a view of holistically curbing illnesses of other forms. Seasonal illnesses such as flu, which bring about absenteeism by economically active members of society, may be reduced by the use of SMS by warning the latter group about the best ways of averting influenza attack.

1.5.4 Potential Weaknesses of SMS

There are a number of potential weaknesses identified in the use of SMSes. Patients may not receive the SMS reminders due to incorrect data entry (Koshy et al., 2008). Koshy et al. (2008) went on to indicate that elderly people have lower ownership of mobile phones and may not be able to use SMS facilities. According to Kaplan (2006), the combination of illiteracy and indigenous languages may have huge effects on the use of SMS messages. Participants in a study by Siedner et al. (2012) expressed concerns about difficulty interpreting messages. Such data should be presented in a simple manner for patients to be able to use in their management of their condition. It has to be packaged in a customer user-friendly manner.

Anhoj and Moldrup (2004) stated that the down side of SMS communication is that it sometimes delays in reaching the targeted recipients. The delay may have negative effect on patients because prescription regimes may be confined to specific times. Their non-adherence as a result of delayed text messages may

undermine the goal of the use of SMS to manage as well as to administer prescription regimes.

The turnaround time to receive messages as a result of technical glitches from service providers constitutes a major threat to the intervention, in particular delays in messages reaching patients. This was also reported as a concern by participants in a study by Siedner et al., (2012). In addition, Kaplan (2006) reported that text messages leave a record and the ability to retrieve old SMS text may compromise the privacy of health care information for TB or HIV infected persons where the threat of being stigmatised is present.

Duncan (2013) conducted a study on the impact of affordability on cell phone usage in the impoverished community of Grahamstown East. The findings indicated that the usage of cell phones is significantly constrained by a lack of affordability. The research points to the fact that the positive benefits of cell phones cannot be realized in a circumstance where cell phone usage is survivalist in nature and in fact cell phones are highly extractive in this resource-poor context, diverting income away from more productive uses. The research was used to raise a series of questions about the power of technology and its contribution to social transformation for an impoverished community such as that of Grahamstown East, and whether it is appropriate to base accounts of social change largely on middle-class experiences with cellphone usage.

There are, indeed, benefits and functions associated with mobile phone use and health management that have been identified in various studies. Mobile phones can be used to provide appointments, reminders, facilitate treatment adherence systems, record patient diaries, provide information and even conduct research. The literature review indicates a number of studies relating to the use of SMS text messages in most developed countries. However, further research is need in developing countries such as South Africa.

1.6 Research Question

How feasible is it for patients to use SMS in the management of their chronic illnesses?

1.7 Study Aims

The aim of the study was to evaluate the feasibility of using SMS technology by patients in the management of chronic diseases in 3 pilot clinics namely Agincourt, Xanthia and Thokozani located in Bushbuckridge, Mpumalanga.

1.8 Specific objectives:

1. To describe patterns of cellphone use by eligible patients.
2. To describe patients' ability to access text messages from their cellphones.
3. To describe the language used in the text SMS sent to eligible patients.
4. To describe the acceptability of receiving text messages by eligible patients.

CHAPTER 2:

RESEARCH METHODOLOGY

2.1 Overview

The present research project was part of an existing project in the School of Public Health. Background information on the overall project will be provided to contextualise the research before introducing the student's research study.

The School of Public Health University of Witwatersrand in partnership with the Systems Applications and Products (SAP) research team (an international software company) in Pretoria and the Mpumalanga Department of Health started a project in three (3) clinics in Bushbuckridge (BBR) sub-district, Mpumalanga. The project started in Jan 2008 and continued until January 2010.

Aim:
To develop an electronic Patient Health Information System (PatHIS) for the management of chronic diseases.

Goal:
To improve the quality and efficiency of primary healthcare systems in rural primary health care clinics.

The specific objectives for the PatHIS project were as follows:

1. To design an electronic patient health information system that stores information on patients with chronic diseases and makes it easily available to health care providers, specifically to HT, DM, TB and HIV patients.

2. To improve the management of patients with chronic diseases at clinic level; enhance collection and quality of health information; increase patients' adherence to treatment, and to get the patients to comply with follow-up appointments and trace defaulters.

The next section will focus on the student research.

2.2 Introduction

This chapter describes the research design and procedure of collecting data through the use of a questionnaire as well as the analysis. For the objectives of the study see *Section 1.8.*

The chapter will describe the study setting, population, study sample, sampling strategy and the study variables. The process followed during data entry and analysis is summarised. The chapter concludes by deliberating on the ethical considerations taken into account during the study.

2.3 Study Setting

The study took place in Bushbuckridge Local Municipality in Mpumalanga. The Bushbuckridge local municipality falls under the Ehlanzeni Health District. The municipality is almost entirely rural with a predominantly black population. The total population of Bushbuckridge is 509,970 with 124, 595 households (Stats SA, Community Survey, 2007). The home languages spoken in the area are Xitsonga (57.5%), Sepedi (26.5%), SiSwati (7.6%), Sesotho (4.4%), Isizulu (3.5%) and the remaining official languages constitute only 0.1% (Gaffney,2000). The highest education level achieved by the majority of the population over 21 years is secondary schooling without Matric at 32.8%, followed by 21.3% with Primary schooling (Gaffney, 2000). Only 8.1 % have Matric whereas 2.6 % have a diploma/certificate without Matric. Those with degrees constitute 1.2 % and with post-Matric diploma/certificate they are 0.4%, while 22.4% do not have formal schooling (Gaffney, 2000).

According to Gaffney (2000) poverty levels are high due to unemployment. Only 55.6% of the population constitutes the labour force (15-64 year olds) with 17.73% employed and 23.49% unemployed. Those who are not economically

active constitute 57.08%. A quarter of those employed are involved in unskilled labour, and 24.94% of the population receives child support grants, 6.12% receives old age pension, 1.67% is dependent on disability grants and 76% of the population have no income.

According to Gaffney (2000) most community members in the municipality have access to health care services through 57 clinics, 2 health care centres and 7 hospitals. Modes of transport used for travelling varies: 43 % of the population travel on foot, 2.0% travel by minibus/taxi, 1.3% by car as passenger, 1.2% by bus, 0.9% by car as driver and others use other alternative means of transport (Gaffney, 2000).

According to Stats SA, Community Survey (2007) 90% of the population use electricity for lighting, 27.7 % use it for heating and 66 % use wood households (Stats SA, Community Survey, 2007). Also, 57.2 % use wood for cooking and 36% use electricity (Stats SA, Community Survey, 2007).

In collaboration with the Bushbuckridge Department of Health's (DoH) district office, three intervention clinics were chosen where the electronic patient health information system is installed. Three similar clinics were chosen to act as control clinics when the research project is evaluated.

Table 1: Intervention facilities

Type of Facility	**Intervention Facilities**
CHC	Agincourt
PHC	Xanthia
PHC	Thokozani

The researcher interviewed patients with chronic illnesses who were from the catchment areas and made use of the services of the three (3) intervention facilities.

2.4 Study Population

The study population was made up of patients diagnosed with the following chronic diseases: diabetes mellitus, hypertension, TB and HIV. The study included patients aged 20 years and above who attend Agincourt, Xanthia and Thokozani clinics situated in Bushbuckridge, Mpumalanga.

2.5 Study Design

The study was a cross-sectional descriptive study that utilised quantitative methods to evaluate the feasibility of using SMS by patients in the management of chronic illnesses in a rural setting. A questionnaire was administered to solicit information from participants to evaluate the feasibility of using SMS as a form of electronic communication to manage patients' illnesses. The study also employed the qualitative method of observation. Participants were observed while opening either their text message or their phonebook.

2.6 Sampling Strategy

In consultation with the clinic nurses, the researcher was informed that patients come for follow-up on specific weekdays according to the date they were provided with during their last clinic visit and not according to their diagnosis. Some of the weekdays were overlapping and subsequently each clinic was allocated a day for data collection. The researcher went to each clinic according the specific date allocated for patients with chronic illnesses from morning till the clinic close at knock-off time. This was to ensure that all eligible patients who came to the clinic on that specific day were recruited. Participants who met the inclusion criteria were recruited during their clinic visits while waiting to be attended by a health care provider.

Due to time constraints and limited days allocated for consultation by eligible patients, the sample size was conveniently selected based on the patient's

willingness to participate in the study. All participants who agree and consent to participate in the study were included.

2.7 Study Sample

A non-probability, convenience sampling was used in the study. A sample of eligible patients with chronic conditions attending three (3) intervention clinics were conveniently selected during their follow-up clinic visits. The sample was to be recruited such that equal numbers of participants (30) attending at each of the three clinics were recruited to add up to a sample size of 90. The sampling method was chosen due to limited resources and time. The age of participants ranged from age 20 and above. This was to enable the researcher to determine the patterns of using cellphones amongst the different age groups.

2.8 Inclusion and Exclusion Criteria

Inclusion Criteria:

a) Patients diagnosed with the following chronic diseases: Hypertension, Diabetes Mellitus, TB and HIV (Eligible patients).
b) Patients aged 20 years and above.
c) Patients attending one of the 3 clinics: Agincourt, Thokozani and Xanthia.

Exclusion Criteria:

a) Patients who were visiting the area and subsequently had to go to the clinic to collect their medication as a once-off.
b) Patients below the age of 20 years.
c) Patients who were not diagnosed with the above mentioned chronic diseases.

2.9 Study Variables

The following variables were incorporated in the questionnaire administered:

a) Demographic information:

i. Age: participants were requested to indicate their ages based on categories provided on the questionnaires (i.e. 20-29, 30-39, 40-49, 50-59, 60-69, >70).
ii. Gender: Male and female.
iii. Home language: Participants were provided with 5 options from the local languages to select from, together with an alternative to specify their language if the options provided were not applicable.
iv. Level of education: Participants were provided with options to indicate their education level.
v. Employment status.

b) Ability of using cellphone: A checklist with 5 steps was used to tick all the correct steps/actions that the participant followed to get to the text message received. Each correct step was allocated 1 point.
c) Patterns of using cellphone: Likert Scale was used to describe the patterns of cellphone use.
d) Language use: Participants were requested to name the language of preference when receiving text SMS.
e) Comprehension of text messages: An SMS was sent by the researcher requesting the participant to open the SMS/phonebook for purposes of demonstration.
f) Acceptability of receiving message: Participants were requested to select the type of text messages they preferred to receive via the cellphone.

2.10 Data Collection Tool and Method

The research instrument consisted of a face-to-face interview schedule developed by the researcher. The questionnaire was utilised to collect data. While waiting to be attended to by the health care provider, eligible participants were recruited and presented with the information sheet. The information sheet was explained and issued to all participants. Participants were requested to indicate their willingness to participate in the study by signing the consent form or by putting a thumb print or writing an X on the consent form.

The questionnaire was administered at the clinic/facility by the researcher. The questionnaire was written in English. Depending on the participant's home language the researcher would administer the questionnaire and where there is a language barrier, a translator was used. The translator was used with participants who spoke Xhi-Tsonga only; the researcher could communicate in other local languages, namely Isi-Zulu, Sepedi and Sesotho. The administration of the questionnaire through face-to-face interviews with individuals was beneficial in collecting data from illiterate participants because they could not neither read nor write. The questionnaire was not translated to suit participant's home language as it was administered verbally. It was also useful in that questions could be explained and clarified to ensure complete understanding; this allowed for appropriate responses.

Observations were also used as part of the data collection tool. During the interview, participants were sent a text message by the researcher and then requested to open and read it (where applicable). Participants were observed opening their text message/phonebook. Those who were unable to open a text message were requested to demonstrate to the researcher how they open a phone/address book in their cellphone while the researcher observed. .

2.11 Data Processing Methods and Data Analysis

Data set was initially checked and cleaned to identify any errors which might have occurred in the original source documents during data entry. The questionnaire template was designed in Epi Information (Epi Info) for data capturing and management. Data was then exported to Excell spreadsheet in order to ensure that variables are arranged by columns and cases by rows. Data was then transfer to STATA which was used for analysing the data in order to answer the research question. The main variable of the study were divided into categorical and numerical variables.

Descriptive analysis was used to quantitatively describe the main features of data, with the aim of summarizing the sample size, demographic information.

Frequency tables and cross tabulation were used to analyse categorical data. Cross tabulation were used to provide a basic picture of the interrelation between two variables and their interactions. Bar graphs and pie charts were also used to represent categorical variables. Side by side bars were used to show numerical values describing sample results.

2.12 Ethical Considerations

The research protocol was submitted to the University of Witwatersrand Committee for Research on Human Subject (Medical) for approval. Ethical clearance to carry out this study was granted by the University of Witwatersrand Ethics Committee for Research on the 30-11-2009, Ethical Clearance No: M091162. A copy of the ethical clearance certificate is attached — *Appendix D*. The study commenced after approval and authorization has been obtained.

Approval from University of Witwatersrand and the Mpumalanga provincial ethics had already been received for the overall project. Permission was requested from the Department of Health, Mpumalanga to carry out the study.
An invitation to participate in the study was made to eligible participants together with the information sheet. Their informed consent to participate in the study was obtained prior to commencing with the study.

Participants were informed that their participation was voluntary and confidential, that is, their names were not going to be used in the report. Only the researcher has access to the data that was anonymously analysed. The questionnaires will be destroyed once the research report is completed. The research report will be compiled and recommendations made to the University of Witwatersrand's School of Public Health, SAP project team and the Mpumalanga Department of Health.

2.13 Reliability and Validity

Reliability refers to the degree of similarity of the results obtained when the measurement is repeated on the same subjects or the same group (Ehrlich and Joubert, 2007). Validity refers to the extent to which a measurement instrument actually measures what it is meant to measure (Ehrlich and Joubert, 2007). Poor reliability was reduced by standardising the questionnaire, that is, all participants were asked the same questions. Face validity was used to improve validity, it refers to the extent to which the measure or questions make sense to those knowledgeable about the subject and are familiar with the language and culture of the participants (Ehrlich and Joubert, 2007).

In order to establish content validity of the questionnaire, existing literature on the subject matter was reviewed together with existing questionnaires exploring similar construct. The draft questionnaire was given to three Nursing Sisters at the clinic to verify relevance, clarity and significance of the questions since they are familiar with the culture of the participants and they were previously involved in the implementation of the PatHIS project. Revisions to the questionnaire were made in order to ensure content validity based on the feedback provided.

CHAPTER THREE

Results

3.1 Introduction

This chapter presents the results with specific reference to the study objectives. The result will be presented for the total study sample. Percentages, frequencies and p-values will be used to present data extracted from the participants. The data will be presented in this order:

- The demographic information
- Patterns of cellphone use
- Acceptability of receiving SMS from the clinic.
- Text Message preference by participants

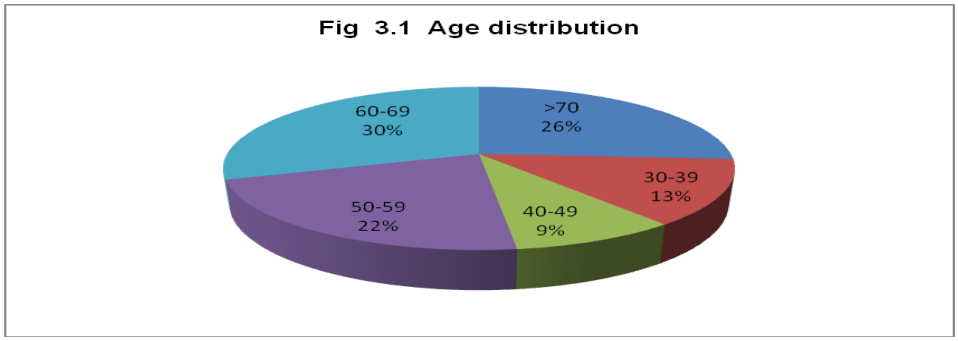
3.2 Description of the Sample

Hundred eligible candidates were approached and recruited, only 75 agreed to participate in the study. One participant who agreed to the interview was excluded from the study as she was not originally from the catchment area of the three clinics in the Bushbuckridge area. Poor or non-attendance at different facilities during the recruitment period resulted in an unequal number of participants per clinic during the research period. A total of 74 patients who met the inclusion criteria agreed to participate in the study. This total sample size (n) was seventy four (74) of which 36 from Agincourt, 27 from Thokozani and 11 from Xanthia. There were no missing variables as all study variables were answered.

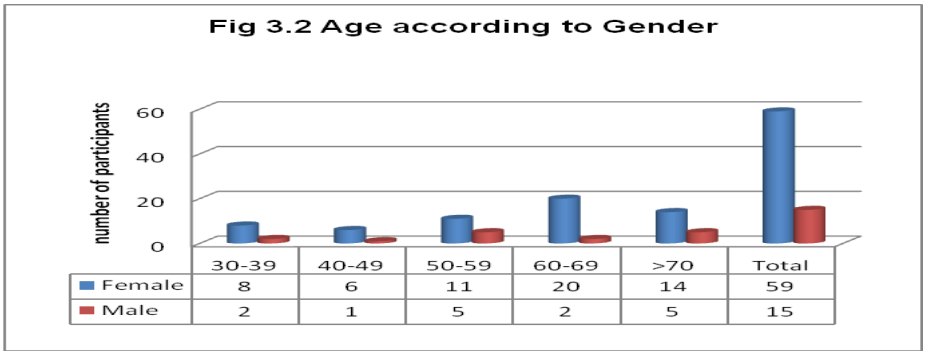
3.3 Demographic Information

3.3.1 Age

Fig 3.1: Age distribution of sample



Participants aged 30-39 years constituted 13% of the sample as compared to those aged 40-49 years at 9%.



Seventy-six percent of women and 80% of males in the sample were older than 50 years. Women were the majority in all age groups across participants.

3.3.2 Home Language

Table 3.1: Home Language

Home Language	Number	Percent
Xitsonga	45	61
IsiSwati	8	11
IsiZulu	7	9
Sepulana	7	9
Sepedi	4	6
Other	3	4
Total	**74**	**100**

Sixty-one (61) percent of the participant speaks Xitsonga, followed by SiSwati and IsiZulu at 11% and 9% respectively.

3.3.3 Level of Education

Table 3.2 Level of Education

Level of education	Number	Percent
No formal Schooling	40	54
Primary education	23	31
High school	6	8
Matric	5	7
Total	**74**	**100**

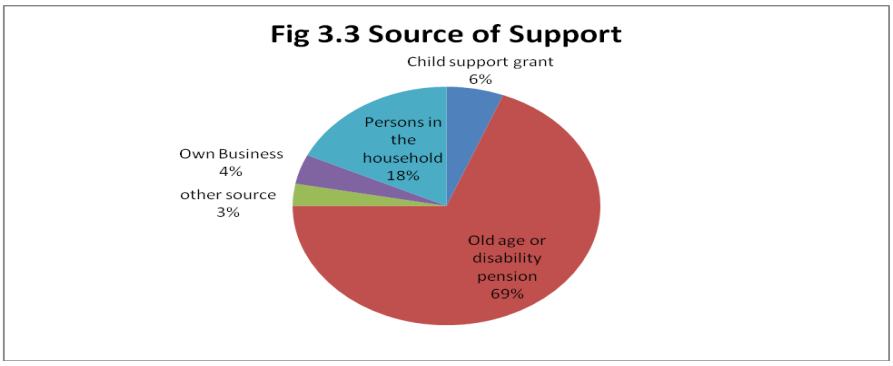
Fifty-four (54) percent of the participants had no formal education; 31% had completed primary school; 8% high school and only 7% had completed matric.

3.3.4 Employment Status

Table 3.3 Employment Status

Employed	Number	Percent
No	71	96
Yes	3	4
Total	**74**	**100**

Ninety-six percent (n=71) of the participants were unemployed.



Sixty-nine percent of the participants rely either on an old age pension or disability grant. Eighteen (18) percent reported to be supported by someone in the household and 4% run their own small businesses.

3.3.5 Clinic Attendance

Table 3.4 Frequency of Clinic Attendance

Clinic attendance for last 3 months?	Number	Percent
3 visits	70	95
4 visits	4	5
Total	**74**	**100**

In the last three months, 95% of the sample visited the clinic on a monthly basis.

3.4 Diagnosis

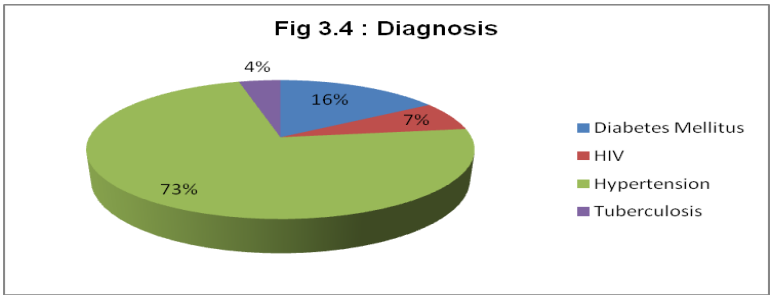
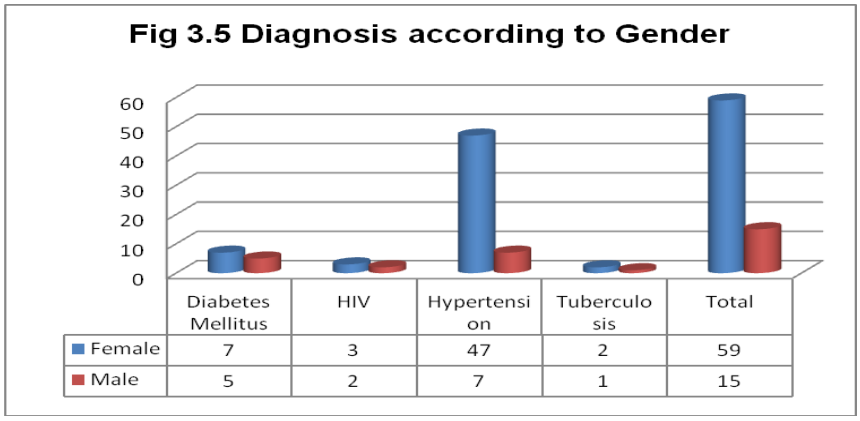


Figure 3.4 gives a breakdown on the chronic disease diagnosis in the sample, seventy-three (73) percent of the participants have hypertension, followed by diabetes mellitus at sixteen (16); HIV/Aids at seven (7) percent and tuberculosis at four (4) percent.

Table 3.5 Diagnosis according to Age

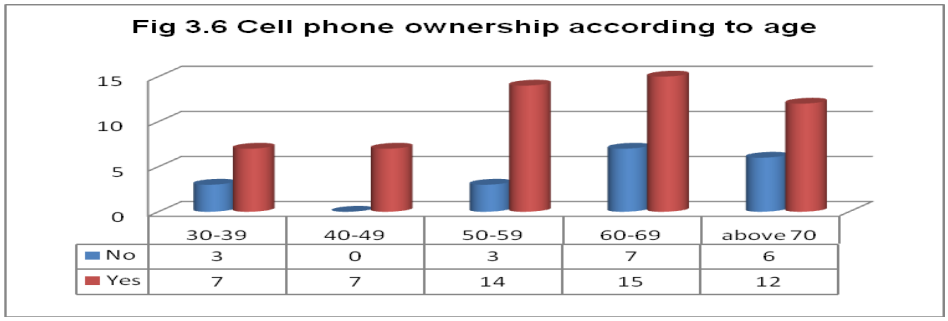
	Hypertension Nr (%)	Diabetes Mellitus Nr (%)	HIV Nr (%)	Tuberculosis Nr (%)
30-39	5 (9)	1 (8.3)	1 (20)	2 (67)
40-49	4(8).	1 (8.3)	2 (40)	1(33)
50-59	12 (22)	2 (16.6)	2 (40)	0
60-69	18 (33)	4 (33.3)	0	0
>70	15 (28)	4 (33.3)	0	0
TOTAL	**54 (100)**	**12 (100)**	**5 (100)**	**3 (100)**

All the patients diagnosed with HIV and TB were between the ages of 30 to 59. Hypertension was the most common diagnosis amongst all the age groups.



Hypertension was the most common diagnosis in women when compared to other diagnosis.

3.5 Cellphone Ownership



Fifty-five (55/74) of the participants, which was 74 percent of the total study sample owned a cellphone. Cellphone ownership according to age groups were reported as follows: 30-39 at 9.5% (7/74); 40-49 at 9.5 %(7/74); 50-59 at 19% (14/74); 60-69 at 20% (15/74) and above 70 at 16 %(12/74).

Table 3.6 Cellphone ownership according to Gender

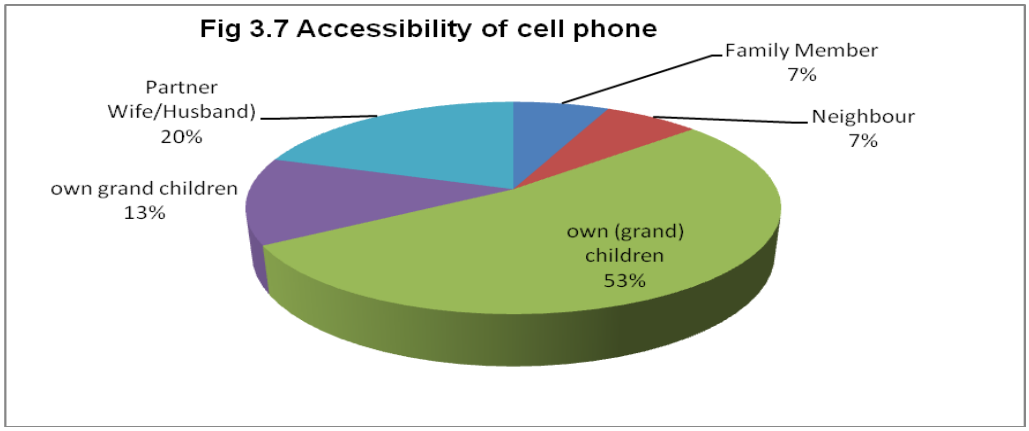
Own a cellphone	Gender of respondent		Total
	Female Nr (%)	**Male Nr (%)**	**Total**
No	16 (27)	3 (20)	19(26)
Yes	43(73)	12(80)	55(74)
Total	59(100)	15(100)	74(100)

Slightly more males than females owned a cellphone but the P-value was not significant (P-value: 0.573). Amongst the female participants, 73 % owned cellphones.

Table 3.7 Cellphone ownership according to Employment

Own a cellphone	Employed		Total
	No Nr (%)	Yes Nr (%)	
No	19 (27)	0(0)	19
Yes	52 (73)	3 (100)	55
Total	**71**	**3**	**74**

The majority (73%) of the participants owning cellphones were unemployed. There was no significant difference between the employed and un-employed participants when it came to cellphone ownership (P-value: 0.299). Amongst cell phone owners, 65% (n=36) owned only one cellphone, whereas 35% (n=19) owned more than one cellphone.



It was noted that for 19 participants who did not own cellphones, 78% (15/19) had access to other people's cellphones and 21% (4/19) did not have access to any cellphone. Amongst those with access to other people's cellphones, 53% had access to their own children's phones, followed by their partners at 20% and then grandchildren at 13%.

3.6 Patterns of Cellphone use

Table 3.8: Number of hours the cellphone is switched on

Switched on for :	Number	Percent
4-6 hours	17	31
7-9 hours	5	9
More than 9 hours	33	60
Total	**55**	**100**

All participants with their own cellphones indicated that their cellphones were for personal use. Cellphones were kept switched on for more than 9 hours by 60 %(33/55) of cellphone owners.

Table 3.9: Regularity of Charging Cellphones

Charging :	Number	Percent
Every 2-3 days	12	22
Every 4-5 days	19	34
Once a week	24	44
Total	55	100

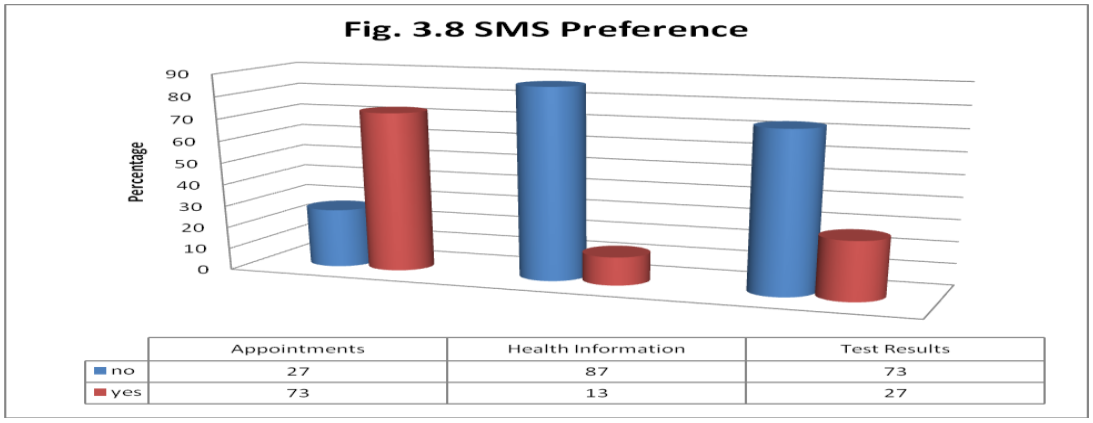
Forty-four percent of cellphone owners charged their cellphones once a week and 22% every 2-3 days. All (n=55) participants owning cellphones charged their cellphones in their own homes.

Knowledge of Short Message Service (SMS)

Fifty-one (51%) percent of the participants knew what an SMS is. This is inclusive of both owners and non-owners with access to cellphones (38/74). Fifty-eight percent of cellphone owners indicated that they had received an SMS from somebody else or cellphone network companies. Only 7% of those with access to other people's cellphones (1/15) had received an SMS.

Preference for message received

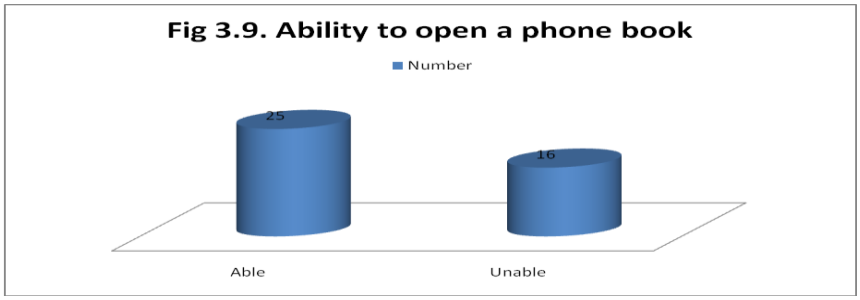
Ninety-three percent (14/15) of the participants who did not own cellphones but had access to somebody else's phone indicated that they did not think the owners of those cellphones would mind if they received SMS on behalf of the participants. Eighty-seven percent (13/15) of participants with access to other people's cellphones indicated that they would not mind if other people received an SMS on their behalf.



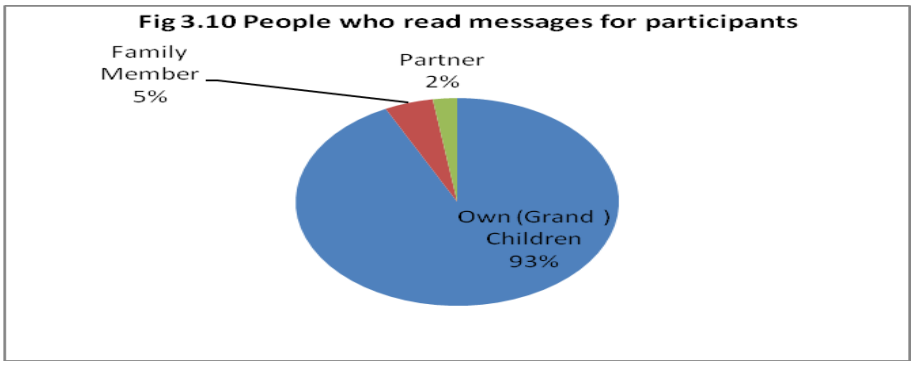
Participants with access to other people's cellphones indicated that they would prefer other people to receive SMS on their behalf as outlined in *Figure 3.8*. Eighty (80) percent (12/15) specified that they wanted to be informed about the unavailability of medication at the clinic.

Ability to access SMS from cellphone

Twenty-five percent (14/55) of cellphone owners answered yes to being able to open their SMS. It was observed that cellphone owners who answered yes (14/55) could get all the steps correct when asked to demonstrate how to text and read messages. Eighty-one (81) percent of the participants owning cellphones (45/55) could tell when a new SMS was received on their cellphones, either by a tone alert or a symbol of an envelope being displayed on their screen.



Sixty percent (25/41) of the participants owning cellphones who could not open an SMS were able to open their phone book on their cellphones.



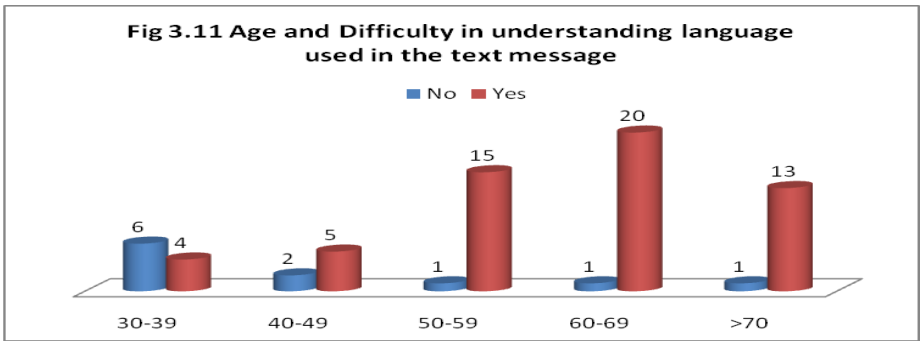
Ninety-three percent (38/41) of the messages were either read by the participants' own children or grandchildren. Partners constituted 5 %(2/41) when it comes to reading messages for the participants

3.7 Acceptability of Receiving SMS from the clinic

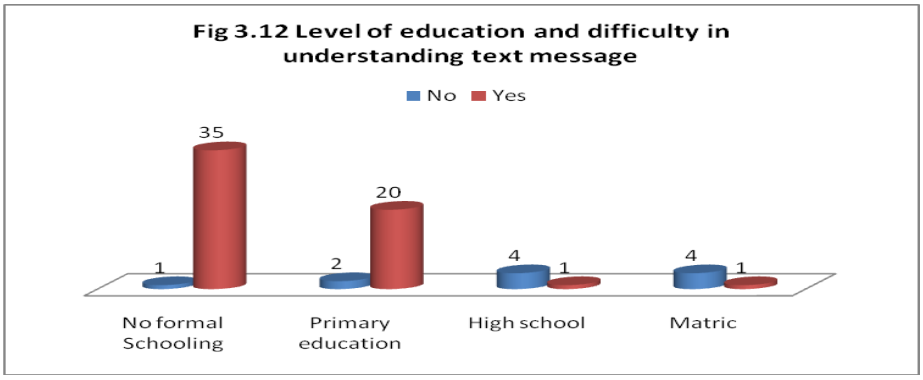
English was the language often used in the SMS received from service providers. 88% (62/70) of the participants both owners and those with access to other people's phones indicated that they would prefer to receive SMS in their own home language. Participants who did not own cellphones and/or had no access to other people's cellphones were not asked to indicate which language they preferred as some had never received an SMS.

Table 3.10: Tabulation of home language by language preferred

	Language Preferred							
	English	IsiSwati	IsiZulu	Other	Sepedi	Sepulana	Xitsonga	Total
Home Language								
IsiSwati	1	5	1	0	0	0	1	8
IsiZulu	0	0	7	0	0	0	0	7
Other	1	0	0	2	0	0	0	3
Sepedi	0	0	0	0	3	0	1	4
Sepulana	0	0	0	0	0	7	0	7
Xitsonga	1	0	0	0	0	0	40	41
Total	3	5	8	2	3	7	42	70



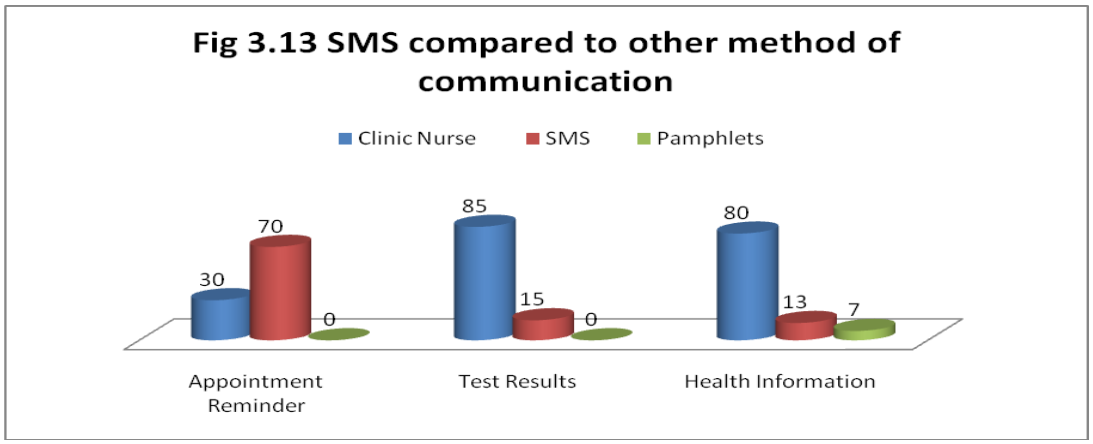
The age group that reported difficulty in understanding the language used in text messages was ages older than 50.



Difficulty in understanding SMS was reported by 77 %(57/74) of the participants. Those without formal education constituted the highest percentage at 47%, followed by those with primary education at 27%.

3.8 Participants' Text Messages Preference from the Clinic

Ninety-one percent of all participants (68/74) indicated that they would like to receive SMSes from the clinic in future. The reasons given by the remaining 9% who did not want to receive SMSes were confidentiality, privacy, illiteracy and the fact that they will never buy a cellphone.



Seventy percent (52/74) indicated that they would prefer to receive appointment reminders via an SMS and 30% preferred to receive appointments from a nurse. Eighty-five (85%) preferred to receive their test result from a nurse, and 15% did not mind an SMS. Eighty percent preferred to receive health information from a nurse rather than the other two means of communication.

Table 3.11: SMS Preference according to Diagnosis: Appointment reminders

	Hypertension Nr (%)	Diabetes Mellitus Nr (%)	Tuberculosis Nr (%)	HIV Nr (%)	HIV & Diabetes Mellitus/ Hypertension Nr (%)
SMS	37(68)	1(25)	1(34)	4(100)	6(66)
Clinic Nurse	17(32)	3(75)	3(66)	0	3(34)
Pamphlet	0	0	0	0	0
Total	**54**	**4**	**3**	**4**	**9**

The majority of participants with Hypertension, HIV and a combination of HIV and Diabetes Mellitus or Hypertension indicated that they would prefer to receive

appointment reminders via SMSes across the different diagnosis, that is, 68%, 100% and 66% respectively. Participants with Diabetes Mellitus (75%) and Tuberculosis (66 %) prefer to receive appointment reminders via a Clinic Nurse.

Table 3.12: SMS Preference according to Diagnosis: Test Results

	Hypertension Nr (%)	Diabetes Mellitus Nr (%)	Tuberculosis Nr (%)	HIV Nr (%)	HIV & Diabetes Mellitus/ Hypertension Nr (%)
SMS	7(13)	0	0	0	3(23)
Clinic Nurse	47(87)	4(100)	3(100)	4(100)	6(66)
Pamphlet	0	0	0	0	0
Total	**54**	**4**	**3**	**4**	**9**

The Clinic Nurse was the preferred method of receiving test result across all the diagnosis. Only 13% (Hypertension) and 23% (combination of HIV and Diabetes Mellitus) prefer to receive test results via SMS respectively.

Table 3.13: SMS Preference according to Diagnosis: Health Information

	Hypertension Nr (%)	Diabetes Mellitus Nr (%)	Tuberculosis Nr (%)	HIV Nr (%)	HIV & Diabetes Mellitus/ Hypertension Nr (%)
SMS	7(12)	0	1(33)	1(25)	1(11.5)
Clinic Nurse	43(79)	4(100)	1(33)	2(50)	7(77)
Pamphlet	4 (7)	0	1(33)	1(25)	1(11.5)
Total	**54**	**4**	**3**	**4**	**9**

All participants with Diabetes Mellitus prefer to receive Health Information from the Clinic Nurse. However preference varied amongst the different diagnosis with the Clinic Nurse being the most preferred**.**

3.9 Summary of Findings

The purpose of this study was to evaluate the feasibility of using SMS in the management of chronic diseases in a rural setting. The findings of the study are presented in Chapter 3 and will be discussed in this chapter according to the research objectives as indicated in Chapter 1. The findings were analysed and compared to the trends discussed in the literature. Reasons underlying the findings are explored and contextualised in the South African context.

A sample of 74 respondents with chronic illnesses of varying age, socio-economic status and level of educational level was interviewed. The sample consisted of patients with the following chronic illnesses: Diabetes Mellitus, HIV, Hypertension and Tuberculosis who attended at three rural public health clinics. The sample was small compared to larger international studies and therefore the findings cannot be credibly generalised to other contexts. The sample was drawn from a “serviced population”, that is, patients who have access to health services at the clinics.

Mostly women use the health care services as compared to their male counterparts. This could be due to the fact that the majority of males are working or generally do not make use of the available health care services. Hypertension was the most common chronic illness affecting the majority of the participants. Only 31% of participants have up to a primary school level of education and 94% go to the clinic on a monthly basis.

Cellphone ownership amongst the participants is high at 74% with the majority of owners older than 50 years. Most cellphone owners are unemployed. Females constituted 80% of participants. 78% of participants who do not own a cellphone had access to other people’s cellphones. Cellphones are mainly used for personal use by the participants, and are kept switched on for more than 9 hours in a day.

Participants are able to charge their phones in the comfort of their homes. 51% of the participants knew what an SMS is and 58% of cellphone owners had at least received an SMS. Eighty percent of the participants indicated that they had difficulty understanding the SMS that were sent to them due to illiteracy as well as the language that was used in the SMS. 88% of the participants preferred to receive SMS in their own language as compared to English, which was commonly used in most of the SMS already received by the participants.

The participants who did not have cellphones but had access to other people's cellphones indicated that they would not mind if others received SMS on their behalf. They, however, preferred to receive appointment reminders but not test results and health information. They preferred to receive the latter from the clinic's nurse. The study showed that 91% of the participants would like to receive SMS from the clinic, however were selective on the type of messages they would prefer to receive. Confidentiality and privacy were mentioned as reasons for this preference.

CHAPTER 4

Discussion

4.1 Introduction

During the literature review, it was found that most of the studies conducted concerning the use of SMS technology where specific to a certain intervention, for instance, appointments reminders, adherence to treatment schedules, behaviour modification and health information. This made it difficult to compare this study with the findings of those in the literature review.

A sample of 74 respondents was interviewed. The sample consisted of the following chronic illnesses: Diabetes Mellitus, HIV, Hypertension and Tuberculosis. Thirty-one percent (31%) of participants have up to a primary school level of education. Seventy-four percent (74%) of participants owned cellphones and majority of owners were older than 50 years.

Most cellphone owners are unemployed. Seventy-eight percent (78%) of participants who do not own a cellphone had access to other people's cellphones. Fifty-one percent (51%) of the participants knew what an SMS is and 58% of cellphone owners had at least received an SMS. Twenty-five percent (25%) of cell phone owners were able to open and read their text messages and 60% were able to open their phonebook.

Eighty percent (80%) of the participants indicated that they had difficulty understanding the SMS that were sent to them due to illiteracy as well as the language that was used in the SMS. Eighty-eight percent (88%) of the participants preferred to receive SMS in their own language. The participants who did not have cellphones but had access to other people's cellphones indicated that they would not mind if others received SMS on their behalf. They, however, preferred to receive appointment reminders but not test results and health information. They preferred to receive the latter from the clinic's nurse.

The study showed that 91% of the participants would like to receive SMS from the clinic, however were selective on the type of messages they would prefer to receive. Confidentiality and privacy were mentioned as reasons for this preference.

The sample size was small as the participants were regular chronic disease patients who were at the rural clinics for follow-up visits. Women constituted most of the sample (80%) and 78% of them had an average age of more than 50 years. Given this scenario, the study gives more information on cellphone usage by rural older women.

4.2 Patterns of Cellphone Use

Cellphone ownership constitutes 74% amongst the participants with the majority owners' age being 60-69 and 50-59 years at 20% and 19% respectively. Those above 70 constituted 16%. Similarly to this study, a high percentage of cellphone ownership by participants was also found by Crankshaw et al. (2010) in a study in Durban. According to Koshy et al. (2008), 2001 and 2003, saw the largest increase in cellphone ownership amongst those aged 75 years and above, with the proportions almost doubling. Participants owning cellphones are unemployed at 73%. This is an indication that cellphones are valued by participants. The high rate of ownership of cellphones is good for the anticipated sustenance of the electronic SMS mode of communication. This is in congruent with Kaplan (2006) who reasons that socially mobile phones are highly valued in even resource poor areas.

Agreeing with Kaplan, Donald et al. (2007), states that cellphones are viewed as a status item. Unemployment does not necessarily prevent participants from owning a cellphone. In his review, Kaplan (2006) indicated that living in a resource poor environment is not a barrier to ownership and use of wireless telephone for several cultural and economic reasons. He maintained that there is evidence that the existence of the so-called digital divide along the socio-economic gradient is less pronounced in mobile phones than in any technologies

such as the internet. High unemployment rates may have positive or negative consequences depending on how it is looked at, namely, accessibility as opposed to lack of income to purchase cellphones, that is, those unemployed will be in a position to relay messages to the intended family member who do not own cellphones in time if they are receiving messages on their behalf. More than half of the older participants own cellphones and this dispels the perception about older patients being electro-phobic. It is also contrary to popular belief that the older generation is weary and uncomfortable with using electronic equipment as indicated by Koshy et al. (2008).

Amongst participants who do not own cellphones (n=15), it was noted that 78% had access to other people's cellphones, mainly from their family members. Family members were willing to share their cellphones with the participants. This was also found to be the case in a study by Akpan (2006) and Crankshaw et al. (2010) which found that the informal sharing of mobile phones between people increased accessibility in rural communities. The scenario makes it far easier to have near and far transfer of messages with SMS as a source.

Verbal communication is also linked to such an electronic form of communication as owners have to relay messages to non-owners. However, shared use in some locations could be an important limitation if mobile phones were to be used to convey health information. In support of this position, Anhoj and Moldrup (2004) showed that SMS communication may be delayed in reaching targeted recipients, which may have a negative effect on prescription regimes confined to specific times. Text messages if not deleted can be read by subsequent users. A study by Curioso et al. (2007) on access, use and perceptions regarding Internet, cellphones and PDA's as a means for health promotion for people living with HIV in Peru indicated that people preferred to use their own cellphones. This was contrary to this study where participants indicated that they did not mind if other people received text messages on their behalf for certain functions e.g. appointment reminders, availability of medication but not for other purposes.

Relative to their rural location, 35% ownership of more than one cellphone is an unexpectedly high percentage. It is positive in that in an event that one cellphone is not functional, the other would always be an alternative. Patients are usually asked for one phone number, a clinic system that allows inclusion of multiple phone numbers in order of preference might increase the rates of successful patient communication by overcoming challenges related to network reliability, phone battery charge as well as technical glitches. The study however did not establish how long the participants had particular cellphone numbers as people change their cell phone number regularly. Cellphone owners receive SMS free on their cellphones; consequently, they do not incur any additional costs for merely receiving SMS thus making it ideal for communication by the clinic.

All cellphone owners indicated that their cellphones were mainly for personal use. This indicates that cellphones have become part of their lives as reported by Anhoj et al. (2004). Cellphones were kept switched on for more than 9 hours by 60% of owners implying the owners are accessible during the day. Contrary to these findings, Crankshaw et al. (2010) found that females in their study were more likely to switch their cellphones off during the day and were more likely not to take calls in certain social environments compared to their male counterparts.

Cellphones were charged invariably at different times depending on usage at participants' own homes. The frequency of charging cellphones is satisfactory, it is a combined 58% percent that charged their phone at least once a week. This indicates that patients are conscious of the importance of their cellphone. This advantage denotes that the use of SMS for managing chronic illnesses may prove beneficial as participants have readily integrated the use of cellphones into their daily routine. In addition, charging cellphone batteries was not a problem for the participants as they had electricity in their homes. As indicated by Stats SA, Community Survey (2007), 90% of the population in the Bushbuckridge local municipality had access to electricity. Contrary to Kaplan's (2006) findings that lack of electricity will be a problem; this was not found to be a limiting factor in the area.

Fifty-one percent of the participants knew what an SMS was — including owners and non-owners of cellphones. Twenty-five percent (25%) of cell phone owners were able to open and read their text messages. Sixty percent (60%) of participants who owned cellphones and were unable to open an SMS could open their phonebook. These participants could be trained to access their SMS independently. Functionally, mobile phones are easier to use for people with lower level skills than those needed for computers or the internet. This was found to be the case in the study conducted by Donald et al. (2007) with councillors who indicated that operating cellphones are easy to learn, especially for those who have had them before. In support of Donald et al. (2007), Tomlinson et al. (2009) found that Community Health Workers could be trained to use mobile phones even those who had no prior knowledge of using it as a data collection tool. This supports the need to continue with the exploration of the utilisation of SMS to manage chronic ailments.

Sixty-five percent (65%) of the participants owning cellphones together with those that have access to other people's cellphones reported that they had received SMS from either family or friends and/or from their network provider. Only 25% of cellphone owners were able to open an SMS when asked to demonstrate how they opened their messages and read them. This is an impediment for the remaining 75% in accessing messages from their cellphones.

Eighty-one percent (81%) of cellphone owners could tell when a new SMS was received on their cellphones either by a tone alert or a symbol of an envelope being displayed on the screen. Although a low percentage could follow all the steps to retrieve messages, it is something that can be easily improved through repetitive use as well as being shown how it has to be done. The majority (81%) could detect a new SMS. This was a measure of some understanding of how the SMS technology works.

Among the reasons that were stated for the inability to read text messages were illiteracy and language used in the SMSes received. In this study more than thirty-nine (39%) percent have no formal education, whereas twenty-three

percent (23%) have primary education. It translates into more than sixty percent (60%) of the participants who no formal secondary education.

Ninety-three percent (93%) of the text messages were either read by the participants' own children or grandchildren. It is interesting to note that partners constituted only 2% when it comes to reading messages for the participants. The former, where grandchildren as well as children are able to assist is a satisfactory result, which will go a long way in counter balancing other weaknesses as a result of high levels of illiteracy. Neville (2008) confirms this by indicating that it does not matter whether a person can read or write as long as there is support around the recipient of the message.

English was the language that is often used in the SMSes received. The basic aim of communication is undermined by the use of a language, English, that participants do not comprehend. If the situation is left unchanged, it will defeat the purpose of communication. There has to be a way of packaging these messages in the language understood as well as spoken by most of the patients. Participants with cellphones as well as those with access to other people's cellphones (88%) prefer SMS in their home language. Anhoj and Moldrup (2004) found that participants wished for simpler uncomplicated SMSes whose content is easily comprehended. Siedner et al. (2010) agrees that participants expressed strong desire for direct messages to limit distortion of information.

Difficulty in understanding the SMS was reported by 77% of the participants. Those without formal education constituting the highest percentage at 47%, followed by those with primary education at 27%. The age group that reported difficulty was the 60-69 years. Fifty-two percent of the participants indicated that they would prefer to receive SMSes in their own home language. In support of this, Kaplan (2006) also found that the combination of illiteracy and indigenous languages may have huge effects on the use of SMSes.

Underlying the high levels of lack of understanding of SMS is the issue of functional illiteracy. The high figures on illiteracy introduce what may be a serious impediment to the cellphone electronic communication model. Numeracy as well as literacy is crucial for the successful electronic management of diseases in that patients are requested to read or interpret a simple message. This was congruent with Kaplan (2006) study which also found that pervasive illiteracy may be the limiting step on the use of SMS text messaging.

4.3 Acceptability of Receiving SMS from the Clinic

Ninety-three percent (93%) of the participants with access to other people's phone indicated that they did not think the owners of those cellphones would mind if they received SMSes on their behalf. The value of sharing information is enhanced by the indication of others' readiness to relay communicated information as well as their preparedness to be recipients of such help. Crankshaw et al. (2010) also found that females were more likely to share their cellphones with other people or leave it in a place where someone else can access it. Reciprocity associated with such exchange is a positive development that enhances communication from SMS as a source.

The same 93% of the participants with access to other people's cellphones indicated some reservations about their health information being conveyed to other people via SMS. The main concern raised was around privacy and confidentiality depending on the type of information sent. Naturally, not all messages may be for "public consumption" or third party interest. Privacy as well as confidentiality is central to such reservations. This was also found in the study by Curioso et al. (2007) on access, use and perceptions regarding Internet, cellphones and PDA's as a means for health promotion for people living with HIV in Peru that people perceived cellphones as confidential but also voiced concerns about privacy. Text messages may be a problem for couples who have not disclosed their HIV status to each other as this might cause conflict when the other partner sees the message. As a solution for those who have not made such disclosure, text messages may be deleted after being read. Another option may

be the use of Personal Identity Number (PIN) to protect health related messages however this may present a challenge as well as an inconvenience if it is forgotten. A study by Lester et al. (2010) indicated that patient's completion rates for ART adherence data were affected by misunderstanding of PIN. It may be necessary to block or categorise messages from the source, including repackaging them as generic prescriptions or private or confidential messages which may not be sent via a third party.

Participants with TB, Diabetes Mellitus and Hypertension with access to other people's cellphones indicated that they do not mind if other people received messages on their behalf. They explicitly indicated that they want other people to receive appointment reminders and information on availability or not of medication at the clinic as compared to health information and test results. All participants with HIV owned cellphone, but the study could not determine whether they mind if other people received SMSes on their behalf due to the small sample size.

The low level of participants confiding on matters of their health with their partners is extremely alarming with 20% of participants having access to their partner's cellphones. This aspect may require further separate research or investigation.

4.4 Text Messages Preferences from the clinic

Ninety one percent of all the participants indicated that they would like to receive SMS from the clinic in future. This was also found to be the case in studies by Crankshaw et al. (2010) and Siedner et al. (2012). The reasons given by the remaining 9% who do not want to receive SMS were confidentiality, privacy, illiteracy and the fact that they will never buy a cellphone in their life-time. However the fact that 70 % of participants in the study answered yes to receiving appointment reminders from the clinic is at least a starting point.

Participants were very specific in terms of the type information they would like to receive via SMS from the clinic. Eighty-five percent and 80% prefer to receive their test results and health information from a clinic nurse respectively. Kaplan (2006) also found that some patients preferred face-to-face contact rather than text message contact. This contradicted Siedner et al's. (2012) findings, in Uganda, that near universal acceptability of communication of laboratory results via text messages.

Participants went on to specify that they would prefer to receive appointment reminders from the clinic via SMS. Koshy et al. (2008) also found that SMS text reminders have great potential to reduce non-attendance rates in out-patient department. Mapham (2008) stated that an automated SMS service that reminds people of their next appointment helps to reduce loss of follow-up and adherence. This indicates that the use of SMS reminders may contribute positively in reducing non-attendance rates for patients with chronic illness.

All participants with TB, Diabetes Mellitus and HIV (100%) indicated that they would prefer to receive their test results from a Clinic Nurse. There seemed to be consistency in relation to messages which require privacy or confidentiality, specifically, test results and health status information. Contrary to this, in a study by Siedner et al. (2012), 90% of the participants at the Immune Suppression Syndrome Clinic in Uganda reported that they were not concerned about the unintended disclosure of their status when receiving information regarding their laboratory results. Fifty percent of participants with HIV indicated that they would like to receive health information from a Clinic Nurse. Kaplan (2006) also stated that SMS leaves a record and the ability to retrieve old SMS may compromise the privacy of health care information for TB and HIV infected persons where there is a threat of being stigmatised. However Curioso et al. (2007) found that participants with HIV indicated that SMS provided greater confidentiality as compared to face-to-face interaction when it came to providing health information.

The findings of this study were similar to others who have researched patient acceptance of cellphone communications in resource poor settings. A survey of 300 patients in Durban found nearly universal acceptance (96%) of text message communications from HIV providers (Crankshaw et al. 2010). Another survey of approximately 30 HIV-infected patients in Peru indicated that the majority of HIV-infected patients (74%) were interested in receiving text message reminders about HIV medication use (Curioso et al. 2007).

Participants indicated that it would be beneficial if they were informed of the availability or unavailability of medication in the clinic's pharmacy prior to their appointment dates to avoid unnecessary trips in case there was no medication. The management of chronic illnesses is prolonged and requires adherence to medication which involves frequent follow-up to the clinic. The frequency of attendance and costs (both direct and indirect costs) associated with seeking health care services by participants who mostly are unemployed are high. Ninety Percent of participants in this study were unemployed and cannot afford unnecessary trips to the clinic. Some even indicated that they had to walk to the clinic to get medication as they did not have money to pay bus fare. Siedner et al. (2012) study confirmed that participants preferred to receive their test results via text message to reduce transport costs. In a study by Barrington et al. (2010) participant also indicated that they would like to know about the unavailability of medication at facilities prior to appointment dates. Receiving information of the availability of medication at the clinic would mitigate costs incurred by patients during follow-up. It will encourage participants to return to the clinic when they are sure they will receive their medication.

Multiple integrated communication strategies are required to reach out to as many chronic patients as possible. However patient's preferences need to be taken into account to ensure that such strategies suite the participant's requirements. There was consistency in what participants indicated as their preferred modes of communication when it comes to the type of text messages to be sent from the clinic. This indicates how the message for different chronic diseases should be packaged.

It is the case that mobile network infrastructure is already in place within the community. There is no need to build a new one. This makes mobile technology a promising medium to improve health related communication especially in rural areas. The benefit of such a system would improve communication between health care providers and patients especially where it involves sharing urgent health information as well as overall clinical care.

4.5 Study Limitations

The sample was not large enough to be generalizable to the larger population.. The sampling method may have introduced bias as participation was selected from clinics and might not reflect the characteristics of the whole population.
The interviewer and interpreter could have been a source of bias as participants may have altered information given in order to seek the interviewer's approval. The language used in the questionnaire could have introduced bias as it was not the participants' home language but had to be translated by the researcher or interpreter. This could have affected the participant's understanding and comprehension of the content. The interviewer's own opinions may also bias the recording of information. The interviewer attempted to control for this bias by reading the answers back to the participant to ensure that they were correctly recorded. The difference between the participants and interviewer's age may have created biased responses. Anonymity was controlled for by not recording any personal detail; participants were assigned anonymous codes.

CHAPTER 5

Conclusion and Recommendations

5.1 Introduction

This chapter discusses the conclusion and recommendations of this study.

5.2 Conclusion

The study concludes that the use of SMSes in the management of chronic illnesses is feasible because the majority of the participants own cellphones and would like to receive SMS from the clinic. Most who do not own cellphones have access to family members' cellphone. Participants who are unable to access their SMSes either due to illiteracy or language used in the text rely on family members for assistance.

The primacy of the availability of network as well as cellphones as a tool of communication is acknowledged and accepted. For the integrated intervention to succeed, the availability of signals without disruption becomes central over and above the availability of the primary tool, namely, a cellphone. Services should be driven by the need as identified by the patients. It is important to regard patients as individuals with specific needs. A high level of customisation is needed upon implementation of new services.

The present research has helped to highlight some of the needs and the key difficulties patients with chronic illnesses continue to experience when accessing text messages from their cellphones. It also indicated their preference in terms of the type of text messages to be received. If these measures are not taken into consideration when implementing the service, most patients with chronic illnesses will not accept the service as it will compromise their privacy. The findings could not be extended as well as specified for individual diagnosis because of the low sample size in the different disease categories.

5.3 Recommendations

It is proposed that the service be introduced in phases, initially with text messages for appointment reminders, as preferred by seventy-three (73) percent. Categories of services that could be considered, would be reminders of appointments, unavailability of medication at the clinic, followed by test results and health information.

5.3.1 Cellphone Ownership

Although they formed the majority in the study population, only 73% of females from the total number of participants owned cellphones. This fact necessitates a strategy to increase the number of cellphone ownership for women through partnerships with service providers at reasonably discounted costs as a social responsibility contribution.

5.3.2 Use of Cellphone

The use of cellphone will, as a tool, enhance the management, assessment and monitoring of chronic diseases. A similar study should be conducted focusing on one chronic illness at a time to get in-depth knowledge for each illness. Outcomes have to be measured and documented on using SMS as a health care intervention in rural areas for HIV, TB, Diabetes Mellitus and Hypertension.

5.3.3 Language Preference

Text messages are currently sent to patients in the English language. A serious consideration should be made to use Xitsonga on SMS messages in the study setting. Sixty (60) percent of the participants preferred the use of their indigenous language for communication. The need for change in the language is further enhanced by the levels of literacy and numeracy.

5.3.4 Trust and Privacy

Most patients did not prefer their test results as well as health information texted to them. Confidentiality and privacy are central to their not wanting their test results and health information relayed through SMSes. The low level of participants confiding on matters of their health with their partners should be noted for further research to unpack the reasons.

Only patients with personal cellphones may be considered for direct text messages with their confirmation that their cellphones are not used or shared with other members of their family or friends.

There is also a need to evaluate the acceptability and feasibility of methods to optimize confidentiality of health messages such as the use of a PIN/password.

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Appendix B: Participant Information Sheet

Good day

My name is Dineo Thupae, a student at the University of Witwatersrand, School of Public Health. As part of my degree I have to do a research study. The purpose of the study I have chosen is to see how people use phone SMS messages and if they are happy to receive SMS from the clinic to help them manage their illnesses better. In future, we would like to use SMS messages to help patients with chronic diseases.

I would like to invite you to take part in the study. It is your choice to take part or not to take part in the study without prejudicing your treatment at the clinic. I will ask you questions and it will take 30 minutes to answer. You will not lose your place on the queue to go and see the nurse or doctor. There are no risks involved in the study.

You are free to withdraw your participation in the study at any time without losing benefits of treatment from the clinics. All the information collected will be kept confidential in a safe office. No names will be used in the research report. The questionnaires will be destroyed once the research report is completed. The information collected form the study will be given to the project team and the Department of Health in Mpumalanga to help chronic patients in the future.

Is there anything you would like me to explain more or are there any questions you wish to ask me?

Are you willing to take part in the study? □ Yes □ No

If yes, please sign the consent form. You may also have a copy of the information sheet regarding the study.

Thank you

Appendix C: Consent Form

I hereby confirm that I have been informed by the researcher about the study. The study has been explained to me and I have received and understood the participant information sheet regarding the study. I understand that the results of the study will be anonymously written into a study report and that I may choose not to continue with the study at any stage without being treated unfairly.

_____ _____

_____

Print Name and Surname Signature Date

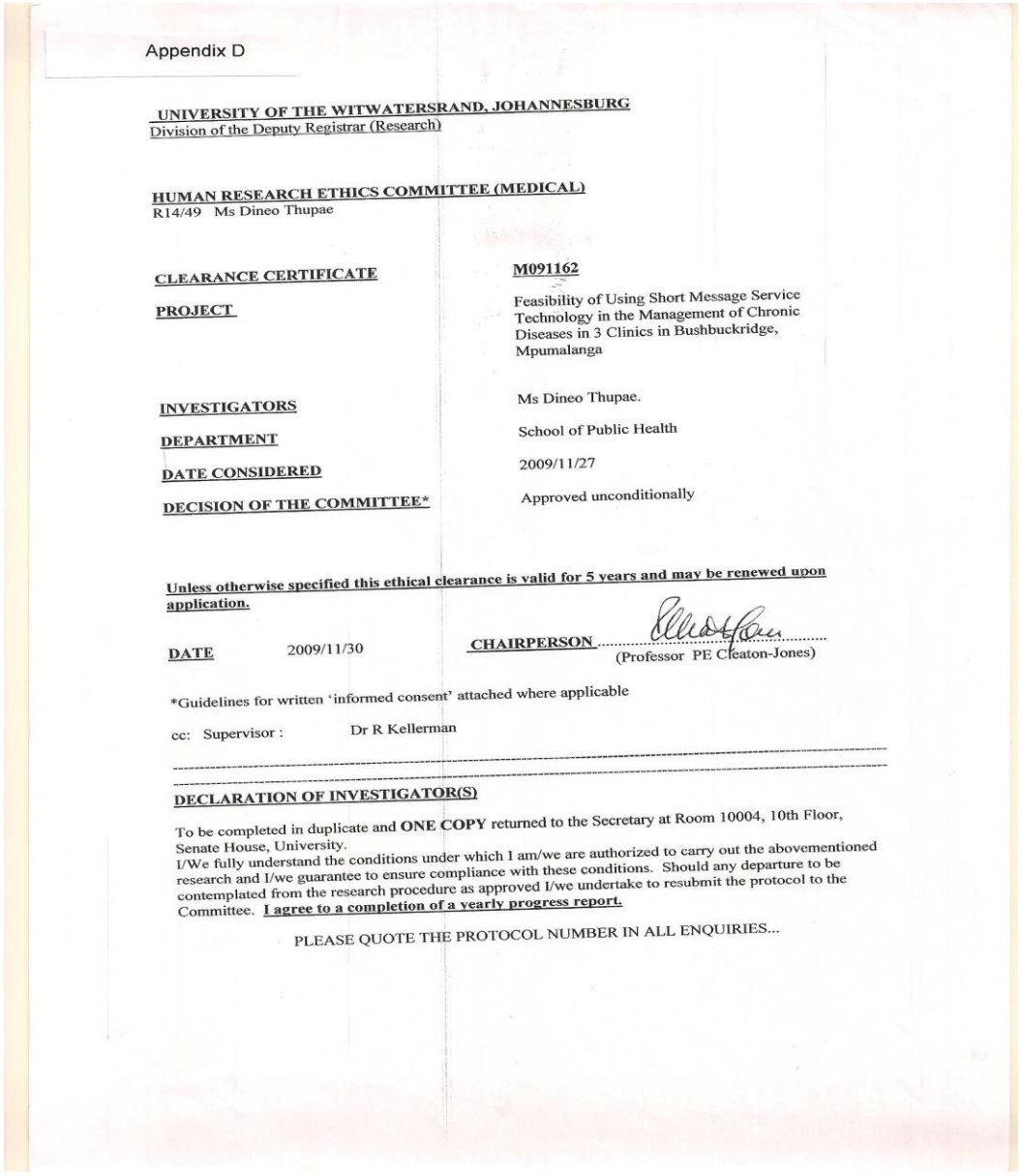
I, Dineo Thupae, confirm that the above participant has been informed about the nature and conduct of the study.

_____ _____

_____

Print Name and Surname Signature Date

Appendix D



Appendix D

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG
Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Ms Dineo Thupae

CLEARANCE CERTIFICATE	**M091162**
PROJECT	Feasibility of Using Short Message Service Technology in the Management of Chronic Diseases in 3 Clinics in Bushbuckridge, Mpumalanga
INVESTIGATORS	Ms Dineo Thupae.
DEPARTMENT	School of Public Health
DATE CONSIDERED	2009/11/27
DECISION OF THE COMMITTEE*	Approved unconditionally

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

DATE 2009/11/30 **CHAIRPERSON** .....
(Professor PE Cleaton-Jones)

*Guidelines for written 'informed consent' attached where applicable

cc: Supervisor : Dr R Kellerman

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES...

Appendix E: Questionnaire

The Feasibility of Using Short Message Service (SMS) Technology in the Management of Chronic Diseases in 3 Pilot Clinics in Bushbuckridge, Mpumalanga.

Questionnaire Number	

Address of Respondent	
(or physical location)	
Telephone Numbers	

Selected respondent refused	

Reason for refusal _____

Date	

1. Demographic Information

1.1 Age

20-29 yrs	30-39 yrs	40-49 yrs	50-59 yrs	60-69 yrs	>70

1.2 Gender of respondent

Female		Male	

1.3 DIAGNOSIS

Hypertension	Diabetes Mellitus	Tuberculosis	HIV

1.4 Home language

Xitsonga	IsiSwati	Sepedi	IsiZulu	Sepulana	Other (specify below)

1.5 What is the highest level of education you have achieved?

No formal schooling	Primary education	High School	Matric	Diploma	Degree

2 Socio-economic aspects

2.1 Are you employed?

Yes		No	

2.2 If No, How do you support yourself financially?

Supported by persons in the household		Child support grant	
Supported by persons not in the household		Savings or money previously earned	
Unemployment insurance fund		Running own business	
Old age or disability pension		Other sources	

2.3 Which is the nearest clinic to you?

Agincourt	Xanthia	Thokozani	Other

2.4 How long does it take you to reach the nearest clinic?

Time	Foot	Public transport	Car	Other specify)
0 – 15 minutes				
16 – 30 minutes				
31 minutes – 1 hour				
1+ – 2 hours				
More than 2 hours (specify)				

2.5 How many times did you come to the clinic in the last 3 months?

0-1	2-3	3-4	4-5	More, specify

3 Cellphone use

3.1 Do you own a cellphone?

Yes		No	

a. If Yes to 3.1, how many cellphones do you own?

1	2	3	More, specify

What do you use each cellphone for?

Personal	Business	Other (Specify)

How long do you keep your phone switched on in a day?

1-3 Hrs	4-6 Hrs	7-9 Hrs	More than 9 Hrs

How often do you charge your phone?

Daily	Every 2-3 days	Every 4-5 days	Once a week

Where do you charge your phone?

Home	Family member's place	At a neighbour's place	Other (Specify

(continue to 3.2)

b. If No to 3.1, do you have access to a cellphone i.e. can you use somebody else's phone?

Yes		No	

If Yes to 3.1b, who does the cellphone belong to?

Partner(wife/husband)	Parents	Own (grand)children	Family member	Neighbour	Other specify

If Yes to 3.1b continue to 3.2 , if No to 3.1b, continue to 3.12

3.2 Do you know what an SMS is?

Yes		No	

3.3 Have you received an SMS from any of the following: friends/family/colleague/network company?

Yes		No	

3.4 Do you think the people/person you mentioned in 3.1b will mind receiving sms on your behalf?

Yes		No	

3.5 Do you mind if they receive sms on your behalf?

Yes		No	

If yes, explain why_____

3.6 What kind of sms would you like them to receive? *(State each option and indicate answer by Yes or No)*

	Y	N
Appointment reminders		
Health information		

	Y	N
Test results		
Other, (Specify)		

3.7 Are you able to open the sms? *(Researcher sends an sms to participants owning a cellphone)*

Yes		No	

3.7a. If yes to 3.7, Show me how you open the text message to read it. (Allocate a point for each step completed correctly) Continue to 3.9

Check list: steps	
Detect new text message received in the cellphone	
Able to open the new text message	
Able to read the message out loud	
Able to interpret the test message to the researcher	

3.7b . If No to 3.7, who reads the sms for you? (continue to 3.8)

Partner(wife/husband)	Parents	Own (grand)children	Family member	Neighbour	Other specify

3.8 Please show me how you open your phone/address book. *(applicable to participants who are unable to open their sms)*

Able		Unable	

3.9 What language was used in the sms mentioned in 3.3 ?

Xitsonga	I siSwati	Sepedi	IsiZulu	Sepulana	Other (specify below)

3.10 Which language would you prefer?

Xitsonga	I siSwati	Sepedi	IsiZulu	Sepulana	Other (specify below)

3.11 Have you had difficulty understanding the text message on the SMS?

Yes		No	

If yes, please explain:

_____

3.12 Would you like to receive SMS from the clinic in future?

Yes		No	

If No, please explain: _____

3.13 In order of priority 1-4 (1=first priority and 4= last priority), where will you prefer to receive the following?

	Clinic nurse	SMS	Not to receive	Radio (only applies to health information	Pamphlets (only applies to health information
Appointment reminder					
Test results					
Health information					

Appendix F

FREQUENCY TABLES

Age

Age	Frequency	Percent
30-39	10	13
40-49	7	9
50-59	16	22
60-69	22	30
>70	19	26
Total	**74**	**100**

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	59	79.7	79.7	79.7
	Male	15	20.3	20.3	100.0
	Total	74	100.0	100.0	

Age vs. gender of respondent = Female

Age	Frequency	Percent	Cumulative
30-39	8	13.79	13.79
40-49	6	10.34	24.14
50-59	11	18.97	43.10
60-69	20	34.48	77.59
>70	14	22.41	100.0
Total	59	100.0	

Age vs. gender of respondent = Male

Age	Frequency	Percent	Cumulative
30-39	2	13.33	13.33
40-49	1	6.67	20.00
50-59	5	33.33	53.33
60-69	2	13.33	66.67
>70	5	33.33	100.00
Total	15	100.0	

Diagnosis

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Diabetes Mellitus	12	16.2	16.2	16.2
	HIV	5	6.8	6.8	23.0
	Hypertension	54	73.0	73.0	95.9
	Tuberculosis	3	4.1	4.1	100.0
	Total	74	100.0	100.0	

Diagnosis vs. gender of respondent = Female

Diagnosis	Frequency	Percent	Valid Percent	Cumulative Percent
Diabetes Mellitus	7	11.86	11.86	11.86
HIV	3	5.08	5.08	16.95
Hypertension	47	79.66	79.66	96.61
Tuberculosis	2	3.39	3.39	100.0
Total	59	100.0	100.0	

Diagnosis vs. Gender of respondent = Male

Diagnosis	Frequency	Percent	Cumulative Percent
Diabetes Mellitus	5	33.33	33.33
HIV	2	13.33	46.67
Hypertension	7	46.67	93.33
Tuberculosis	1	6.67	100.0
Total	15	100.0	

Diagnosis vs. gender of respondent Summary

Diagnosis	Female	Male
Diabetes Mellitus	7	5
HIV	3	2
Hypertension	47	7
Tuberculosis	2	1
Total	59	15

Home Language

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		1	1.4	1.4	1.4
	IsiSwati	8	10.8	10.8	12.2
	IsiZulu	7	9.5	9.5	21.6
	Other	2	2.7	2.7	24.3
	Sepedi	4	5.4	5.4	29.7
	Sepulana	7	9.5	9.5	39.2
	Xitsonga	45	60.8	60.8	100.0
	Total	74	100.0	100.0	

Highest Level of Education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	High school	6	8.1	8.1	8.1
	Matric	5	6.8	6.8	14.9
	No formal Schooling	40	54.1	54.1	68.9
	Primary education	23	31.1	31.1	100.0
	Total	74	100.0	100.0	

Employed

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	71	95.9	95.9	95.9
	Yes	3	4.1	4.1	100.0
	Total	74	100.0	100.0	

If No, how do you support yourself?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		3	4.1	4.1	4.1
	Child support grant	4	5.4	5.4	9.5
	Old age or disability pension	49	66.2	66.2	75.7
	other source	2	2.7	2.7	78.4
	Own Business	3	4.1	4.1	82.4
	Persons in the household	13	17.6	17.6	100.0
	Total	74	100.0	100.0	

Frequency of Clinic Attendance in the Last 3 Months

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2-3	70	94.6	94.6	94.6
	3-4	4	5.4	5.4	100.0
	Total	74	100.0	100.0	

Cellphone Ownership

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	19	25.7	25.7	25.7
	Yes	55	74.3	74.3	100.0
	Total	74	100.0	100.0	

Own a Cellphone * Age Cross Tabulation

Count

Own a cellphone	Age					Total
	>70	30-39	40-49	50-59	60-69	
No	6	3	0	2	7	19
Yes	12	7	7	14	15	55
Total	18	10	7	16	22	74

Own a Cellphone * Gender of Respondent Cross Tabulation

		Gender of respondent		Total
		Female	Male	
Own a cellphone	No	16	3	19
	Yes	43	12	55
	total	59	15	74

Own a Cellphone * Employed Cross Tabulation

		Employed		Total
		No	Yes	
Own a cellphone	Yes	19	0	19
	No	52	3	55
	Total	71	3	74

What do you use your cellphone for?

	Frequency	Percent	Cumulative Percent
Personal	**55**	**100**	**100.0**
Total	**55**	**100.0**	

How long do you keep your cellphone switched on?

	Frequency	Percent	Valid Percent
4-6 hours	17	31	31
7-9 hours	5	9	9
More than 9 hours	33	60	60
Total	55	100.0	100.0

How often do you charge your cellphone?

	Frequency	Percent	Valid Percent
Every 2-3 days	12	22	22
Every 4-5 days	19	34	34
Once a week	24	44	44
Total	55	100.0	100.0

Where do you charge your cellphone?

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	19	25.7	25.7	25.7
Own home	55	74.3	74.3	100.0
Total	74	100.0	100.0	

If participant has access to somebody else's cellphone, Who does it belong to? (relationship)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		59	79.7	79.7	79.7
	Family Member	1	1.4	1.4	81.1
	Neighbour	1	1.4	1.4	82.4
	own children	8	10.8	10.8	93.2
	own grand children	2	2.7	2.7	95.9
	Partner(Wife/Husband)	3	4.1	4.1	100.0
	Total	74	100.0	100.0	

Do you know what a Short Message Service (SMS) is?

		Frequency	Percent	Valid Percent
Valid	No	32	46	46
	Yes	38	54	54
	Total	70	100.0	100.0

Have you received an SMS on the cellphone (N= 70):

		Frequency	Percent	Valid Percent
Valid	No	37	53	53
	Yes	33	47	47
	Total	70	100	100.0

Have you received an SMS on the cellphone (Owners only N=55)

		Frequency	Percent	Valid Percent
Valid	No	23	42	42
	Yes	32	58	58
	Total	55	100	100

Have you received an SMS on the cellphone (those with access only N=15)

		Frequency	Percent	Valid Percent
Valid	No	14	93	93
	Yes	1	7	7
	Total	15	100	100

Do you think the people you mentioned in 3.1b will mind receiving SMS on your behalf?

		Frequency	Percent
	No	14	93
	Yes	1	93
	Total	15	100

Do you mind if they receive SMS on your behalf?

		Frequency	Percent
Valid	No	13	87
	Yes	2	13
	Total	15	100

What kinds of SMS would you like them to receive?

Appointment reminders		Frequency	Percent	Cumulative Percent
Valid	No	4	26.67	26.67
	Yes	11	73.33	100.0
	Total	15	100.0	

What kinds of SMS would you like them to receive?

Health Information		Frequency	Percent	Cumulative Percent
Valid	No	13	86.67	86.67
	Yes	2	13.33	100.0
	Total	15	100.0	

What kinds of SMS would you like them to receive?

Test Result		Frequency	Percent	Cumulative Percent
Valid	No	11	73.33	73.33
	Yes	4	26.67	100.0
	Total	15	100.0	

What kinds of SMS would you like them to receive?

Other (Specify)	Frequency	Percent	Cumulative Percent
None	12	80.00	80.00
Un-availability of medication	3	20	100.0
Total	15	100.0	

Are you able to open an SMS?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	55	74.3	79.7	79.7
	Yes	14	18.9	20.3	100.0
	Total	69	93.2	100.0	
Missing	System	5	6.8		
Total		74	100.0		

Participants who got the steps correct

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		60	81.1	81.1	81.1
	4 correct (all steps)	14	18.9	18.9	100.0
	Total	74	100.0	100.0	

Yes, how many cellphones do you own?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		19	25.7	25.7	25.7
	1	55	74.3	74.3	100.0
	Total	74	100.0	100.0	

If unable to read the SMS, who reads it for you?

	Frequency	Percent
Own (Grand) children	38	93
Family Member	2	5
Partner	1	2
Total	41	100.0

If unable to open the SMS: Show me how to open a phone book

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		29	39.2	39.2	39.2
	Able	26	35.1	35.1	74.3
	Unable	19	25.7	25.7	100.0
	Total	74	100.0	100.0	

Language Used in the SMS Received

Language used in the SMS	Frequency	Percent	Cumulative Percent
English	35	100	100.0
Total	35	100.0	

Language Preferred

	Frequency	Percent
English	3	4
IsiSwati	5	7
IsiZulu	8	10
Other	2	3
Sepedi	3	4
Sepulana	7	10
Xitsonga	42	62
Total	70	100.0

Tabulation of Home Language by Language Preferred

Home Language	English	IsiSwati	IsiZulu	Other	Sepedi	Sepulana	Xitsonga	Total
IsiSwati	1	5	1	0	0	0	1	**8**
IsiZulu	0	0	7	0	0	0	0	**7**
Other	1	0	0	2	0	0	0	**3**
Sepedi	0	0	0	0	3	0	1	**4**
Sepulana	0	0	0	0	0	7	0	**7**
Xitsonga	1	0	0	0	0	0	40	**41**
Total	**3**	**5**	**8**	**2**	**3**	**7**	**42**	**70**

Age and Difficulty in Understanding the Message

Age	Difficulty		Total
	No	Yes	
30-39	6	4	10
40-49	2	5	7
50-59	1	15	16
60-69	1	20	21
>70	1	13	14
	11	57	68

Level of Education and Difficulty Understanding Message

Level of Education	**Difficulty**		**Total**
	No	**Yes**	
No formal schooling	1	35	36
Primary education	2	20	22
High school	4	1	5
Matric	4	1	5
Total	11	57	68

Would like to receive SMS from your clinic in future?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	9	12.2	75.0	75.0
	Yes	3	4.1	25.0	100.0
	Total	12	16.2	100.0	
Missing	System	62	83.8		
Total		74	100.0		

Where would you prefer to receive appointment reminders?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Clinic nurse	23	31.1	31.1	31.1
	Not to receive	3	4.1	4.1	35.1
	SMS	48	64.9	64.9	100.0
	Total	74	100.0	100.0	

Where would you prefer to receive Test Results

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Clinic nurse	63	85.1	85.1	85.1
	SMS	11	14.9	14.9	100.0
	Total	74	100.0	100.0	

Where would you prefer to receive health information?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Clinic nurse	59	79.7	79.7	79.7
	Pamphlets	5	6.8	6.8	86.5
	SMS	10	13.5	13.5	100.0
	Total	74	100.0	100.0	