

Factors Affecting The Adoption Of Mhealth In Maternal Health Care In Nakuru Provincial General Hospital

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Abstract : Access to timely and quality maternal health care remains to be a major development challenge in many developing economies particularly in Kenya. The country's system of providing maternal health care also continue to be anchored on conventional methods of physical presence of the patient and the doctor in a hospital setup. The country's ICT and health policies also place very little emphasis on the use of these platforms. This study therefore sought to establish the factors affecting the adoption of mHealth by focusing on maternal health in Nakuru Provincial General Hospital. Objectives of the study were: to determine the extent to knowledge and awareness affects the adoption of mHealth in maternal health care at Nakuru PGH, to identify the government policies affecting the adoption of mHealth in maternal health care at Nakuru PGH, to assess how access to technology affects the adoption of mHealth in maternal healthcare, to establish the effects of ICT infrastructure on the adoption of mHealth in maternal health care and to identify the cost aspects affecting the adoption of mHealth in maternal health care at Nakuru Provincial General Hospital. It is envisaged that the study could provide useful information on the adoption of mHealth in managing maternal health care in Nakuru Provincial General Hospital. Descriptive survey research design will be used where all the medical staff and patients of Nakuru Provincial General Hospital was surveyed. The study population therefore was made up of 24 medical staff and 3460 mothers visiting the antenatal clinic selected using clustered random sampling technique. The main instrument for primary data collection was the questionnaire. Data analysis was then done using both descriptive and inferential statistics. Descriptive statistics to be used include frequency counts, percentages, and measures of central tendency. Inferential statistics on the other hand include t-test analysis and spearman correlation. The study is expected to reveal the level of adoption of mHealth in maternal health care both at individual and hospital level at Nakuru Provincial General Hospital. The findings indicated that knowledge and awareness influences the adoption of mHealth in maternal health care. There was understanding of mHealth among hospital employees. The government policies influence the adoption of mHealth in maternal health care. The hospital had no policy to enhance the integration of ICT in health service delivery. From the findings on the access to mobile technology and adoption of mHealth in maternal health care, it was concluded that computers and computer accessories are fair while internet connectivity was poor. There was no promotion of government health policies on the use of mHealth. There were no government policies that guide the implementation of mHealth in the hospital. The government policies didn't promote the use of ICT in health care innovations. The cost aspects affect adoption of mHealth in maternal health care. The expense of mHealth was not affordable by the patients while the expense of mHealth is not affordable by the hospital employees.

Key words: Adoption, cost aspects, government policies, ICT infrastructure knowledge and awareness, Maternal health care, Mhealth, technology.

Introduction

Mobile technology and devices have in the recent past rapidly penetrated nearly all parts of the world. Qiang, Yamamichi, Hausman, Miller, and Altman [1] state that the devices have reached more people in many developing countries than power grids, road systems, water works, or fiber optic networks. Mobile telephony has quickly reached communities that previously received little protection from public agencies and little interest from private market. The adoption of mobile technologies in every dimension of life has also been phenomenal and in the span of two decades, ever-more sophisticated mobile technologies has fundamentally altered the ways in which people communicate and conduct business [2]. The rapid expansion of mobile information and communications technologies (ICT) within health service delivery and public health systems has created a range of new opportunities to deliver new forms of interactive health services to patients, clinicians, and caregivers alike [3]. Mobile health or mHealth, as the segment of healthcare delivery broadly defined as health-related services to patients, clinicians, and caregivers through mobile technology platforms on cellular or wireless networks. Mobile technologies can include, but are not limited to, tablets, cell phones (hardware and software) and smartphones, mobile-enabled diagnostic and monitoring devices, or devices with mobile alert systems. mHealth changes the traditional delivery of healthcare, allowing for continuous, pervasive healthcare anytime, anywhere. With mHealth, providers, caregivers and patients have the opportunity to continuously monitor health conditions and access health information outside of

the physician's office, and outside of the patient's home. mHealth interventions expand access to health information and services that promote personal wellness, preventive care, and chronic disease management, promoting efficiencies in care-management practices, and improving individual and population health outcomes. The scope and scale of mHealth interventions range from simple direct-to-individual consumer and interactive patient-provider communications to more complex computer-based systems facilitating coordinated patient care and management [4]. The mHealth market is defined in numerous ways by different analysts. However, by any definition, the mHealth market has expanded several fold in the last few years alone, and is expected to continue to grow at a prodigious rate. According to one analysis, the market size of mHealth is projected to reach \$4.6 billion by 2014 and grow to over \$12 billion by 2020 (CSMG) [5]. Viewed through another lens the market is expected to range from \$7.7 billion to \$43 billion annually (PWC) [5]. A recent report in February 2011 found that revenue from just one portion of the field - digital health technology and services (including mobile devices for chronic disease management, wellness and fitness programs) - was \$1.7 billion in 2010 and is projected to exceed \$5.7 billion in 2015 [6]. mHealth has been defined as "medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices [2]. Early in its development, in 2003, mHealth was defined as wireless telemedicine involving the use of mobile telecommunications and multimedia technologies and their integration with mobile healthcare

delivery systems [7]. Since then it has come to encompass any use of mobile telephony technology to address healthcare challenges such as access, quality, affordability, matching of resources, and behavioral norms [1]. mHealth technologies are a valuable partner in health care's shift towards a delivery model that is patient-centered and value-based. Mobile technologies can help to facilitate that shift among clinicians, life scientists, and consumers by defining and directing the patient-centered model towards health care that is community-based, integrated, seamless, and assimilated into the daily lives of consumers accustomed to an 'on-demand' environment. Globally, the demand for mHealth has also been growing. The global mHealth market was estimated at \$1.2 billion in 2011 and experts project that the market's value would increase to \$11.8 billion by 2018, implying that the demand is growing at an annual growth rate of 39 percent. Kenya has been on the fore front in the application of the mobile phone technology platform in providing solution to the social problems in the community. Qiang [1] in a World Bank report on mobile applications for the health sector indicated that Kenya has been the cutting edge of the use of mobile technology for development, with its M-PESA mMoney scheme having become a model for similar programs around the world. However, the report revealed that, the country's adoption of the mHealth technology remains low, while the landscape of the industry is changing rapidly as mHealth enterprises come and go. Half of the mHealth enterprises are less than two years old, and their commercial viability is still in question; only four percent are for profit, and none from any public sector are currently operating sustainably. Several mHealth programs in the country have been launched and run not for profit by the NGOs. For Instance, the Kenyan integrated mobile Maternal and Newborn Child Health information platform (KimMNCHip) which is a national scale effort to provide affordable and accessible mobile health solutions to all pregnant women and mothers with children under 5 everywhere in Kenya. It is run by a cross-sector partnership between the Government of Kenya, Safaricom, World Vision, Care, AMREF, and NetHope [8]. The programme was launched to make use of the 29.2 million mobile subscribers in Kenya on assumption that at least every household, has a phone therefore it is easy to reach the 41 million Kenyans through the mHealth platform.

1.2 Statement of the Problem

Access to health care is a major component of economic development in any economy. A healthy work force would be actively engaged in enhancing country's Gross Domestic Product. In Kenya, 41.8 percent of women are in the child bearing age between 15 and 45 years therefore need maternal health care services. Consequently, the government has invested heavily on maternal health. Maternal health has also been prioritized among other national health goals and interventions. For instance, the National Population Policy for Sustainable Development (2000) envisioned to reduce maternal mortality rate (deaths per 100,000 live births) from 590 in 1998 to 230 by 2005 and to 170 by 2010. This translated to enhanced access to maternal health care. The 2008-09 Kenya Demographics and Health Survey revealed that 92 percent of women in Kenya received antenatal care from a medical professional, either from doctors (29 percent), or nurses and midwives

(63 percent). A very small fraction (less than one percent) receives antenatal care from traditional birth attendants, and 7 percent do not receive any antenatal care at all. This indicated a rise since 2003 in medical antenatal care coverage. In June 2013, the government also declared a waiver on user fees for maternity services in all public hospitals and dispensaries to enhance access. However, alongside development in coverage the 2008-09 Kenya Demographic and Health Survey (KDHS; KNBS and ICF Macro, 2010) found that more women are dying of pregnancy and childbirth related causes than was the case in 2003 [9] 488 versus 412 per 100,000 live births. As at 2011, only 43.8% of births in Kenya were attended to by trained health personnel against a 2015 target of 90 % [10]. Contraceptive prevalence rate is at 46 % up from 39% in 2000 against a 2015 target of 70 %. Generally the country has been ranking behind in the implementation of Millennium Development Goals and the country continues to bear the burden of a high maternal mortality ratio that is not decreasing rapidly enough to reach the Millennium Development Goal 5 (German Foundation for World Population (DSW) and Institute for Education in Democracy [IED], 2011). This implies that despite the government's effort to increase access to maternal health care, more efforts are required to enhance efficiency in service delivery. The use of mobile telephone forms an efficient platform to offer real time maternal health care services, at minimal costs, and eliminating the need for physical presence which would play a role in minimizing maternal deaths. However the adoption of this platform in the country remains scanty. Despite the national ICT master plan, and the draft National ICT policy, 2006 and 2011 propositions to utilize the developments in ICT in improving service delivery and health care, there is no national statistics on the level of adoption and the factors underlying its adoption, Nakuru Provincial General Hospital is not exceptional. This study therefore sought to investigate the factors affecting the adoption of mHealth in maternal health care in Nakuru Provincial General Hospital.

1.3 Objectives of the Study

The general objective of the research was to study the factors affecting the adoption of mHealth in maternal health in Nakuru PGH.

The study focused on the following objectives:

- i. To determine the influence of knowledge and awareness on the adoption of mHealth in maternal health care at Nakuru PGH.
- ii. To establish the influence of the government policies on the adoption of mHealth in maternal health care at Nakuru PGH.
- iii. To assess how access to mobile technology affects the adoption of mHealth in maternal health care at Nakuru PGH.
- iv. To establish the effects of ICT infrastructure on the adoption of mHealth in maternal health care at Nakuru PGH.
- v. To identify the cost aspects affecting the adoption of mHealth in maternal health care at Nakuru PGH.

1.5 Justification

The study provides useful information to the Ministry of Health on the adoption of mHealth in managing maternal

health care in Nakuru PGH. This informs stakeholders including the hospital management, the government and NGOs actively involved in reducing cases of maternal deaths in the country in understanding the opportunities for improvement. Equally, the study helps the Kenya government in understanding the challenges hindering the full adoption of mHealth which helps in improving service delivery especially in maternal health care. The study also provides new insights to policy makers on the technologies, knowledge and awareness and policy issues that need to be addressed to improve adoption of mHealth in the country. The study also helps the researchers through contribution of literature on mHealth and the challenges experienced in its adoption.

1.7 Limitations of the Study

The study was limited by the lack of information on the usage of mHealth among patients and their literacy levels to enable them respond to the questionnaires. This however was addressed by designing the questions using simple language that is understandable to persons of all education level. The researcher together with the research assistants also assisted respondents in interpreting and filling the questionnaires where difficulties are observed. Questionnaires were administered to patients in the queues of the antenatal clinic as a way of engaging them as they wait to be attended. This took care of resistance among respondents, minimize boredom therefore improve the level of response in the study.

1.8 Theoretical Review

The Kenyan government's GHI has put three key propriety objectives: moving from disease-specific treatment to preventive care; finding cost savings; and doubling the number of mothers who have access to a skilled birth attendant and to emergency obstetrical care. The mHealth approach provides a platform potential to achieve these objectives by providing a cost effective and possibility to reach rural areas with various services across the patient healthcare pathway and health systems. mHealth is one of the practices that promote health thought changing the platform of implementing it. Therefore adoption of mHealth can be explained through theories of health promotion and technology adoption. There are a number of theories and models that underpin the practice of health promotion. This study will be guided by the health belief model (HBM), Diffusion of Innovations Theory, Technology Acceptance Model (TAM).

1.8.1 Health Belief Model (HBM)

The Health Belief Model (HBM) is one of the first theories of health behavior, and one of the most widely recognized in the field. This theory was developed in the 1950s by a group of U.S. Public Health Service social psychologists with a view to explain why so few people were participating in programs to prevent and detect disease. The aim of the theory therefore was to find answers on what was encouraging or discouraging people from participating in the programs. The theory posits that people's beliefs about whether or not they were susceptible to disease, and their perceptions of the benefits of trying to avoid it, influenced their readiness to act. Developments on this theory later concluded that six main constructs influenced people's

decisions about whether to take action to prevent, screen for, and control illness. They argued that people are ready to act if they: believe they are susceptible to the condition (perceived susceptibility), believe the condition has serious consequences (perceived severity), believe taking action would reduce their susceptibility to the condition or its severity (perceived benefits), believe costs of taking action (perceived barriers) are outweighed by the benefits, Are exposed to factors that prompt action (a television ad or a text reminder on regular checkups and routines to follow during the pregnancy period) (cue to action), Are confident in their ability to successfully perform an action (self-efficacy). These six constructs of the HBM provide a useful framework for designing both short-term and long-term behavior change strategies. When applying the HBM to planning health programs, practitioners should ground their efforts in an understanding of how susceptible the target population feels to the health problem, whether they believe it is serious, and whether they believe action can reduce the threat at an acceptable cost. Attempting to effect changes in these factors is rarely as simple as it may appear (US Department of Health and Human Services, 2005). In the current study, mHealth is a noble platform for enhancing health care service delivery through the mobile telephone technology which according to Germann [8] has penetrated to nearly every household in the country as evidenced by 29.2 million mobile subscribers out of 41 million Kenyans. Majority of the current mobile phones are GPRS enabled and the current generation of smart phones have health applications for monitoring ones blood pressure, blood sugar, body mass index, among others. However the level of adoption of this technology remains scanty in the country. This could be explained by the lack of specialization in the application of the technology in the prevention or monitoring of a specific disease which would enable the service users to have thinking on the perceived susceptibility, perceived severity, and perceived benefits in relation to the disease or medical condition in question. The use of mobile technology also heavily by various challenges (perceived barriers) which hinder the adoption of mHealth. This study explores the barriers that hinder adoption of this technology along five lines, technological barriers, policy by the government and the health professionals, knowledge and awareness, ICT infrastructure and Cost of mHealth services.

1.8.2 Diffusion of Innovations Theory

Diffusion of innovations is a theory that seeks to explain how, why, and at what rate new ideas and technology spread through cultures. The theory by Everett Rogers, was first published in the book "Diffusion of Innovations" in 1962. The theory states that, diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system. The theory states that there are four main elements that influence the spread of a new idea: the innovation, communication channels, time, and a social system. This process relies heavily on human capital. The innovation must be widely adopted in order to self-sustain. Within the rate of adoption, there is a point at which an innovation reaches critical mass. The categories of adopters are: innovators, early adopters, early majority, late majority, and laggards [11]. Diffusion of Innovations manifests itself in different ways in

various cultures and fields and is highly subject to the type of adopters and innovation-decision process. Rogers' diffusion theory remains a central basis for much research effort in ICT innovation. It provides a popular framework in media and communication studies as well as in the domain of business, management and marketing. Demographic profile assumptions are used for marketing purposes to select and target different types of adopter segments [12], econometric diffusion models have the normal diffusion pattern as underlying premise for forecasting purposes [13], whereas social psychologists have used the determinant assumptions to develop innovativeness and personality scales [14]. mHealth is a relatively new technology especially in Kenya and in line with Rodgers theory on innovation diffusion; its adoption could be influenced by communication channels, time, and a social systems in the society. The technology is anchored more on mobile platform especially smart phones which are also relatively new. Therefore based on the categories of adopters defined in this theory, at the moment the technology could be applied innovators and early adopters.

1.8.3 Technology Acceptance Model (TAM)

This theory was developed by Davis (1986). TAM is an adaptation of the Theory of Reasoned Action (TRA) to the field of information Science. TAM posits that perceived usefulness and perceived ease of use of technology determines an individual's intention to use a system. The technology acceptance model predicts that user acceptance of any technology is determined by two factors: perceived usefulness (U), and perceived ease of use (EOU). Perceived usefulness is defined as the degree to which a person believes that use of the system will enhance his or her performance. Perceived ease of use is defined as the degree to which a person believes that the system will be free of effort [15]. According to TAM, U and EOU will have a significant impact of a user's attitude toward using the system (A), defined as feelings of favorableness or unfavorableness toward the system. Behavioral intentions to use the system (BI) are modeled as a function of A and U. BI then determines actual use. Research has consistently shown that BI is the strongest predictor of actual use [15]. Researchers have also tried to simplify TAM by removing the attitude construct found in TRA from the current specification [16]. Developments of TAM have generally taken one of three approaches: by introducing factors from related models, by introducing additional or alternative belief factors, and by examining antecedents and moderators of perceived usefulness and perceived ease of use [17]. Application of ICT in health management by both individuals and public hospitals in Kenya varies from one school to the other. In addition to the variation in ICT infrastructure such as internet connectivity, the attitude of the user and the management a key role in adopting ICT as a health management tool. Both the patients and doctors and managements attitude toward technology must be favorable in order for its implementation both as a health management tool. Further, for all the stake holders to embrace mobile technology in their normal hospital work life, they need to be knowledgeable and skilled in the application of the new technology in order to apply it effectively in their operations [18]. Owing to the fact that the government so far has not implemented a sound

program on adoption of ICT in health management, the theory by Davis implies that adoption of ICT across various hospitals is based on management's perceptions on its usefulness, emanating from the ability to apply it. The two tenets of the TAM theory, that is usefulness (U) and ease of use (EOU) will guide this study in both data collection and analysis.

1.9 Empirical review

1.9.1 Adoption of mHealth in Maternal Health Care

mHealth remains to be one of the biggest technology breakthrough to address health as was revealed during the 2011 annual mHealth Summit in the Washington, DC area. Worldwide, the technology and its promise have moved up the healthcare agenda. Increasingly ubiquitous and powerful mobile technology holds the potential to address long-standing issues in healthcare provision. However, there are only a few proven business models of implementing this technology. A global survey of 114 nations undertaken by the World Health Organization (WHO, 2011: Online) found that mHealth initiatives have been established in many countries, but there is variation in adoption levels. The most common activity was the creation of health call centers, which respond to patient inquiries. This was followed by using SMS for appointment reminders, using telemedicine, accessing patient records, measuring treatment compliance, raising health awareness, monitoring patients, and physician decision support [19]. A study conducted by Economist Intelligence Unit [20] examined the current state and potential of mHealth in developed and emerging markets, the ongoing barriers to its adoption and the implications for companies in the field. The study was conducted in two surveys in ten countries: Brazil, China, Denmark, Germany, India, South Africa, Spain, Turkey, the UK and the US. The first survey asked 1,027 patients about their opinions on various aspects of mHealth. While the second survey queried 433 doctors and 345 executives from payer organizations. It was established that although the level of penetration of mHealth was low, 60% of doctors and payers believed that its adoption was inevitable in the near future and would eventually become an important part of care provision. However, its adoption would take time. Adoption of mHealth would require changes in behavior of actors who are trying to protect their interests. The study acknowledged that adoption of mHealth would also provide patients with more convenient health care with greater control. For doctors, mHealth can help provide better patient care and ease their administrative headaches, but they are likely to resist the loss of power implicit in greater patient control. A survey by Ruder [21] among 1000 consumers of health services in the US revealed that, about 31% of the U.S. population have used mobile phones for health information and applications (apps) in 2012. However, despite the increase in data consumption by mobile users, Americans have been slow to adopt mHealth apps on their smartphones and tablets. Data from the Ruder Finn study also shows that less than one-fifth (16%) of smartphone and tablet users access health apps regularly compared to the 59% who use social media apps and 56% for gaming apps. Consumers aged 35 – 44 are most likely to use mHealth apps, with 23% leveraging health apps three times more than consumers

ages 55-64 (7%). Adoption of mHealth is higher in developing economies than in developed economies. A study conducted by McKinsey & Company [22] on global healthcare revealed that, mobile healthcare solutions were being deployed more rapidly in emerging markets than in developed economies with 59% of emerging-market patients using at least one mHealth application or service, compared with 35% in the developed world. Among those who do not, emerging-market residents were more interested in starting. The study further revealed that these trends would imply that the larger developed economies could end up spending nearly 15 percent of their GDP on healthcare within the next two decades. McKinsey [22] conducted a market survey of 3,000 people in the US, China, Germany, South Africa, India, and Brazil. Participants were asked about their willingness to adopt and pay for mHealth services, specifically SMS medication reminders; remote medical advice, phone-prompted drug delivery, and health watch (remote monitoring of factors such as blood pressure and pulse). The survey revealed that a sizeable proportion of consumers were willing to pay USD 15 to 58 a month for a remote monitoring solution (in the survey the health watch), with interest in both emerging and developed markets. If the results are extrapolated to organization for economic co-operation and development (OECD) and BRIC countries (considering the different populations), we can estimate an untapped consumer-led market potential of up to USD 30 to 35 billion. The world of apps is set to transform healthcare in the coming years. It is estimated that some 30 percent of smartphone users are likely to use wellness apps by 2015, while the smartphone and tablet are becoming the most popular technological development for doctors since the invention of the stethoscope (Boston Consulting Group [BCG], 2012). The drivers of mHealth in each country are thus different. For Indian respondents, the three biggest attractions are cost reduction (cited by 58%), convenience of access (55%) and ability to obtain otherwise unavailable information (40%). Convenience is the biggest consideration of British patients (49%), but this is followed by a desire to take greater control of their own health (43%). Cost reduction (25%) is far down the list [23].

1.9.2 Knowledge and mHealth in maternal health care

In education and awareness applications, SMS messages are sent directly to users' phones to offer information about testing and treatment methods, availability of health services, and disease management. Formal studies and anecdotal evidence demonstrate that SMS alerts have a measurable impact on and a greater ability to influence behavior than radio and television campaigns [14]). SMS alerts provide the further advantage of being relatively unobtrusive, offering recipients confidentiality in environments where disease especially HIV/AIDS is often taboo. In the developing world, SMS alerts have proven particularly effective in targeting hard-to-reach populations and rural areas, where the absence of clinics, lack of healthcare workers, and limited access to health-related information all too often prevent people from making informed decisions about their health. SMS message campaigns can be set up either as one-way alerts or interactive tools used for health-related education and

communication. For example, a citizen may sign up to take a survey, delivered via SMS message, quizzing them on their knowledge about HIV/AIDS and the location of the nearest testing center. Depending upon their responses, information regarding where and how to receive a free test will be transmitted (Ruder, 2012). This interactive model has been deployed in several countries (India, South Africa, and Uganda) to promote AIDS education and testing and provide information about other communicable diseases (such as TB), as well as to promote maternal health and educate youth about reproductive health

1.9.3 Government policies in mHealth

mHealth relies on mobile and internet technology platform in delivering health services. Therefore the adoption of mHealth services is regulated by both technology and health policies. The Health Policies and Service Delivery Program (HPS) provide technical support to countries for the development of evidence based health policies and plans and their implementation using the primary health care values and principles. The coming of the information age has brought with it several policy issues, all having the common theme of applying long-standing social principles to new situations created by the possibilities of IoT. These issues include guaranteeing public access to electronic information, promoting public participation in eGovernment, ensuring accessibility for the disabled, protecting individual privacy, modernizing education, securing intellectual property, and, more recently, implementing electronic voting and stopping the export of American IT jobs. The highly regulated nature of healthcare also hinders innovation [23]. For rapidly changing technologies, the problem is frequently either a regulatory void which increases risk for providers or the application of inappropriate regulations from earlier technologies. The study by EUI in 10 developed countries revealed that 45% of payers and doctors believe that regulations in the health sector are holding up mHealth adoption and penetration. At the governance level, there is a need for the understanding of infrastructure issues and agreement on needs and priorities. Continuity of action must be coupled with the development of national policies and a regulatory framework aimed at the reduction of the impact of external factors, implementation of standards, and guidance of the organizational changes required for the deployment of ICT solutions. Strategies must be developed for the standardization and cost-effective use of technology and information for mHealth service delivery. Planning must also include the managerial issues and changes in work patterns and procedures which are inevitable, as is an increased documentation workload for staff and direct healthcare professionals. Other issues that require to be addressed include training, physical security and confidentiality of patient-related data [24]. According to Roemer [25], governments, through ministries of health and other related ministries and agencies, play an important role in health development. This is achieved through strengthening health systems and generation of human, financial and other resources. By having the right health systems and infrastructure in place allows the government to achieve their goals of improving health services, reducing health inequalities in access and securing equity in health care financing and responding to population need. Further, Roemer acknowledges that governments are the guardians

of social commitments and values such as social justice and equity, which are stated in their constitutions, signed treaties and conventions. Ministries of health oversee the overall development of health systems using their governance function, which includes policy analysis and formulation, regulating service delivery between partners, developing norms and standards for quality assurance and ensuring the implementation of agreed upon policies and strategies. The importance of ICTs in development process was long recognized and access to ICTs has even been made one of the targets of the Millennium Development Goal No. 8 (MDG 8), which emphasizes the benefits of new technologies, especially ICTs in the fight against poverty [26]. In the implementation of mHealth, ICT is a key component therefore policies on penetration, adoption and utilization of ICT in the health sector play a key role in enhancing mHealth adoption. The telecommunications sector of some countries such as Ghana, Kenya, Nigeria and Senegal, are very dynamic. Yet, as shown in the introductory section, Africa as a whole continues to lag behind other regions of the world. This is primarily as a result of the high cost of services [27]. Based on a review conducted across 17 Sub-Saharan African countries, Calandro et al. argue that the national objectives of achieving universal and affordable access to the full range of communications services have been undermined either by poor policies constraining market entry and the competitive allocation of available resources; weak institutional arrangements with a dearth of technical capacity and competencies; and, in some instances, regressive taxes on usage. Gillwald [28] argues that in addition to competition and open access regimes, effective regulation of other factors such as spectrum and interconnection and tariffs are required to stimulate market growth, improve access, and lower prices. This is because: many competitive markets with several players have experienced spectrum allocation problems high cost of services as a result of retrogressive tax on mobile communications despite having an open market with several operators such as Uganda and expensive leased lines generally available from incumbent operators which have mostly unregulated contributed to the high cost of doing business and inhibited growth and employment opportunities [28].

1.9.4 Technology and mHealth in maternal health care

Despite the high level of penetration of mobile telephony technology, penetration of mHealth has been picking at a slow rate. The field of technology also changes very rapidly because of innovation, therefore if technological innovations do not work out as planned, the risks to human health could be substantial and difficult to foresee [23]. A study by Calandro et al., [27] revealed that more than 70 percent of the world's population and more than 80 percent of people living in developing countries do not have internet access yet and even fewer have access to broadband internet [29]. In many developing countries, therefore, schools, hospitals, other institutions and households located outside major urban centers do not have access to high-speed internet services. Despite the spectacular growth in mobile technology, access to wireless internet via mobile phones has remained limited notwithstanding, the fact that most

mobile operators in Africa have introduced broadband services, including 3G and 3.5G [27]. It is only in South Africa, one of the first countries to introduce mobile broadband services, where ADSL connections have been overtaken by mobile internet subscriptions. The penetration and usage of internet services also vary across different demographics. Research by the ITU [29] found out that internet usage tends to be much higher among people with higher levels of education. Higher levels of education also correlated with a higher income and a higher degree of computer literacy both important factors that determine people's internet subscriptions as well as internet usage. The relationship between income and internet usage was also found to be stronger for Africa than for the developed world [29]. Majority of mHealth services are offered through the internet, and short messaging platforms. This therefore implies that populations with less access to internet have less chances of accessing mHealth services.

1.9.5 ICT Infrastructure and mHealth in maternal health care

Digital divide has been an issue of major concern in the African continent especially among sub Saharan countries. Globally, the continent is by far the least computerized [30]. ICT infrastructure has been very scarce and in some areas totally absent in the continent [31]. The continent not only lags behind in ICT infrastructure but also on other developmental aspects such as international trade, investment, production and consumption. As a result the continent has been exposed to social exclusion from the information [32]. Delivery of mHealth largely depends on ICT infrastructure among other health service delivery infrastructure. As a result the level of penetration of ICT devices and infrastructure and the digital divide in knowledge could be attributable to the poor penetration of mHealth globally. There is growing momentum and enthusiasm to capitalize on the rapid spread of telecommunications infrastructure and uptake of mobile phones and mobile broadband services in low and middle income countries to support the achievement of global, national, county, community, and individual level health priorities. Still in its infancy, mHealth, the use of mobile technologies for health, runs the risk of not realizing its full potential due to small scale implementations and pilot projects with limited reach.

1.9.6 Cost and mHealth in maternal health care

Acquisition and ownership costs refer to the risks and costs associated with purchasing mHealth solutions and operating/maintaining them, respectively. (Hereafter, the use of the word "cost" is intended to also include risk as appropriate.) A risk inherent to the adoption of solutions built on continuously evolving technologies is obsolescence. One aspect of obsolescence is the need to periodically upgrade a solution, which can be costly (both in terms of direct upgrade costs and indirect costs associated with integration and/or training). Tied to this hurdle is the increasing cost of maintenance, since older technologies are less readily supported. Another aspect of obsolescence can be even more costly (i.e., when business models are built on a given technology solution which has to compete with emerging, less expensive solutions addressing the same need). A good example of this is mHealth solutions

for arrhythmia diagnosis [27]. In an emerging field driven by high technology, many new solutions are developed and brought to market by start-ups. In some cases, when the technology risk has been overcome, large companies acquire a start-up's solution and integrate it into their own offering. When this does not happen, the risks associated with the business viability/success of a start-up (including from competition) add a meaningful element of cost to the solution [31]. As a result, initial uptake of a solution may be slow until there is sufficient confidence that the entity not only has a winning solution, but also is a robust supplier. Additional potential costs associated with start-up solutions are risks associated with manufacturing quality, supply volume and customer support services. Acquisition of new technology also has a potential cost due to an increase in the liability of the healthcare provider prescribing the related medical solution. Examples of this type of potential cost are often seen in the drug industry, due to unforeseen complications of the use of a pharmaceutical agent and its use in patients. Given the infancy of mHealth solutions, this type of potential cost may be meaningful until the field matures [21].

1.10 Conceptual Framework

Fig. 1. presents the variables for the study and their interrelationships in input output format.

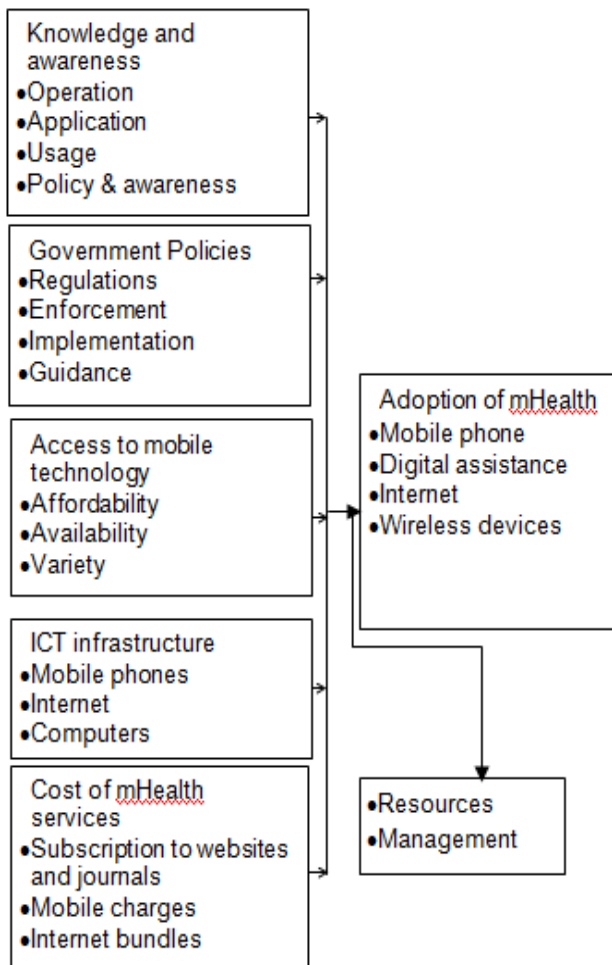


Fig. 1. Conceptual Framework

Conceptualization of this study is based on assumption that the level of adoption and application of mHealth in any economy is a result of several input factors, policy and technological factors. Policy in this study is looked at in tiers: at government and hospital level. In each of the two levels both ICT and health policies come into play in shaping the way of operation, and integration of ICT in health service delivery. mHealth is anchored on the use of ICT in health care service delivery therefore technological factors have a great deal of impact on mHealth adoption and use. Key technological factors considered in this study are infrastructure, access to technological devices such as mobile phones and internet. Awareness on mHealth technologies and knowledge on the use of these technologies also shapes the level of adoption of mHealth. Finally, digitization of medical records and communication procedures is also a technological factor that has an influence on the level of adoption. Other than these factors, the study identifies that the attitudes of the community towards the adoption of mHealth, and the socio cultural practices also play a key role on individual's choices to use or not use mHealth platform of health services delivery.

1.11 Critique of the Existing Literature Relevant to the Study

The emphasis on eliciting research gaps as highlighted in peer-reviewed publications was a significant departure from other mHealth reports, which focused on program and applications descriptions with very little documentation of what does and does not work. While many claim that the evidence base for mHealth is weak due to the lack of published material on the subject, this review found that there is a rapidly growing body of literature on the subject. However, the geographic location, scope of the implementation, sample sizes, and methods used do not provide statistically significant results that would inspire governments, industry, and donors to make the investments needed to truly capitalize on the reach of telecommunications infrastructure and the widespread uptake of services in LMICs. Further, a large portion of the research is concentrated on initiatives pertaining to HIV/AIDS, tuberculosis, and malaria, as a result of available funding. While important, the combination of epidemiological shifts in developing countries with the vast potential of mHealth calls for a more inclusive research agenda with funding that supports varied initiatives. Review on studies conducted in mHealth has revealed that more focus has been on the developed economies and the upcoming economies. Very little focus has been given to less developed countries. Studies from developed countries primarily focused on the use of mHealth in tackling non communicable and chronic diseases, such as asthma and diabetes and even tracking the health conditions of the elderly persons, on the other hand there is an epidemiological shift in middle income economies. Studies on application of mHealth in medium and low income economies focus on monitoring chronic infectious diseases such as tuberculosis and HIV/AIDS and maternal health. Therefore translating these studies from a high-income country context to a low and medium economy such as Kenyan context will be required to further understand effectiveness and usefulness of these technologies in health care service delivery. In the area of disease

surveillance, more and better research is needed to compare and contrast mHealth interventions, including having community health workers collect data, self-reporting data, and obtaining data from clinic and hospital records. Comparative studies that examine a range of reporting mechanisms are needed for more informed investments by governments and health organizations. Control in surveillance and response activities. In particular, systems that combine surveillance with point-of-care support tools need to be increasingly deployed and studied. Studies on the level of adoption of mHealth services are based on assumption that mobile phone penetration translates to better adoption on mHealth services especially in sub Saharan Africa. This overlooks service delivery platform where mHealth can be offered through short messaging, advanced mobile applications and through internet. Studies in this area also do not adequately breakdown an analysis on the application of each platform, its effectiveness, and conditions for better application. Applications of these technologies also vary between rural and urban settings. Bearing in mind that the role of mHealth is to address issues of cost, time, distance, convenience and enhance quality of service which are challenges often experienced in rural settings more focus should be given in mHealth technologies for the rural poor, which has been very much over looked in the previous studies. Studies on the use of mobile technologies in low income countries especially in rural settings are generally weak. The results of these studies focus on intermediary benefits such as cost savings and improved reliability of data, but do not go to the next level to show improved work flow, efficiency, quality of care, and/or health outcomes. The role of governments in creating favorable policies, infrastructure, technical personnel, regulation, sensitization and integrating mHealth in the public health care services has also not been explicitly explored. Studies have focused on casual relationships on practices in different countries rather than in depth analysis on the status of these roles.

1.12 Summary

Review of literature relevant to the study revealed that mHealth is one of the practices that promote health thought changing the platform of implementing it. There are a number of theories and models that underpin the practice of health promotion but the health belief model would provide a better understanding on why some people choose to use mHealth than others even within the same environmental setting. This theory was developed in the 1950s by a group of U.S. Public Health Service social psychologists with a view to explain why so few people were participating in programs to prevent and detect disease. The concept of the use of ICT including internet enabled mobile phones mHealth remains to be one of the biggest technology breakthrough in health as was revealed in annual mHealth Summit in the Washington, DC in 2011. The level of adoption varies from region to the other, from one economy as revealed in a global survey of 114 nations undertaken by the [33]. The most common adoption mode of mHealth was the use of health call centers, which respond to patient inquiries followed by use of SMS for appointment reminders, using telemedicine, accessing patient records, measuring treatment compliance, raising health awareness, monitoring patients, and physician decision support.

The level of adoption of this concept in developed economies was found to be significantly lower than in developing economies. A survey by Ruder finn [21] among 1000 consumers of health services in the US revealed that, about 31% of the U.S. population have used mobile phones for health information and applications (apps) in 2012. McKinsey & Company [22] revealed that, mobile healthcare solutions were being deployed more rapidly in emerging markets than in developed economies with 59% of emerging-market patients using at least one mHealth app or service, compared with 35% in the developed world. mHealth relies on mobile and internet technology platform in delivering health services. Therefore the adoption of mHealth services is regulated by both technology and health policies. Further governments, through ministries of health and other related ministries and agencies, play an important role in health development. Therefore at the governance level, there is a need for the understanding of infrastructure issues and agreement on needs and priorities. Continuity of action must be coupled with the development of national policies and a regulatory framework aimed at the reduction of the impact of external factors, implementation of standards, and guidance of the organizational changes required for the deployment of ICT solutions. When it comes to technology, digital divide has been an issue of major concern especially in the African continent particularly in sub Saharan countries. Globally, the continent is by far the least computerized [30]. ICT infrastructure has been very scarce and in some areas totally absent in the continent [31]. The continent not only lags behind in ICT.

1.13 Research Design

The study used a descriptive survey design. According to Graveter & Forzano [34], descriptive survey design involves the gathering of information from a large population, summarize, present and interpret data for the purpose of clarification. It also allows for generalization of results to a larger population after studying a smaller representative sample. Descriptive research determines and reports things the way they are and is intended to produce basic statistical information about aspects of interest [35]. The design was adopted because the study sought to bring into light the factors affecting the adoption of mHealth by seeking information from the medical staff and patients attending Nakuru PGH antenatal clinic.

1.14 Population of the Study

Target population is a set of people or objects the researcher wants to generalize the results of the research [36]. The target population was the 3460 patients attending the antenatal clinics, and the 24 medical staff in this section in Nakuru Provincial General Hospital. Patients provided information on the client related factors such as access to technology and digital divide while the medical staff provided information on institutional factors and policies in addition to technology and digital divide.

Table 1. Target population

Respondents	Target
Patients	3460
Medical staff	24
Total	3484

1.15 Sampling Frame

A sampling frame is the source material or device from which a list of all elements within a population that can be sampled is drawn [36]. It's a published list in which, there are a set of directions for identifying a population [37]. Rift Valley Provincial General Hospital Nakuru antenatal clinic receives on average 3460 patients per month and is served by 24 medical staff including doctors, nurses, pharmacists and laboratory technicians. The sampling frame therefore was 3484 respondents comprising of 3460 patients and 24 staff of antenatal clinics in Rift Valley Provincial General Hospital Nakuru.

1.16 Sample and Sampling Technique

Lavrakas [38] describes a sample in a survey research context as a subset of elements drawn from a larger population. Kothari [39] describe a sample as a collection of units chosen from the universe to represent it. Gerstman [40] stated that a sample is needed because a study that is insufficiently precise or lacks the power to answer research questions is a waste of time and money. A study that collects too much data is also wasteful. A proper sample size is one that is required to draw conclusions for the entire population from the respondents. The study sample constituted two independent samples for the: medical staff and patients. Due to the variations in the population sizes, sample size was determined independently in each sample. The sample size was determined using the formula [41] as follows.

$$n = (Nc_v^2) / (c_v^2 + (N-1) e^2)$$

Where n= Sample size

N= Population

C_v= Coefficient of variation (take 0.5)

e= Tolerance at desired level of confidence, take 0.05 at 95% confidence level

To obtain the sample for patients, substitution will be as follows:

$$n = (3460 * 0.5^2) / (0.5^2 + (3460 - 1) * 0.05^2)$$

$$n = 97$$

Therefore, the sample size for patients will be 97

For the medical staff, the study purposively selected all the 24 medical staff to participate in the study due to the small sample size.

Table 2. Sample size

Respondents	Target	Sample
Patients	3460	97
Medical staff	24	24
Total	3484	121

The study adopted cluster sampling technique in selecting the patients and medical staff in the two clusters. The sample for patients was done using systematic random sampling technique where every 36th client was selected. On the other hand the sample for medical staff was selected using purposive sampling technique.

1.17 Instruments

The study utilized both primary and secondary data. Secondary data was obtained from document analysis of policy documents by the government and the hospital management that guide the application of mHealth. Two sets of questionnaires were used to solicit information: one from the patients/clients and the other from medical staff. The questionnaire was based on the themes developed from the objectives. Questionnaires offer considerable advantages in the administration. They allow collection of data from a large number of subjects simultaneously and provide for investigation with an ease of accumulation of data [34]. Anonymity in the use of questionnaires helps to produce more candid answers than in an interview.

1.18 Data collection procedure

The study used self-administered questionnaires to collect data from medical staff, while questionnaires for patients were filled with the assistance of the research assistants. Questionnaires for medical staff were hand delivered to the sampled respondents. Introduction letter was first obtained from the university to obtain a research permit from the National Council of Science and technology. The researcher then liaised with the hospital management to get permission before paying a reconnaissance visit. Questionnaires were then administered to selected respondents. The researcher also assured the respondents of confidentiality of information provided and the handling of findings.

1.19 Pilot test

Validity refers to the extent to which an instrument can measure what it ought to measure. It therefore refers to the extent to which an instrument asks the right questions in terms of accuracy [38]. Validity of research findings was ensured through expert consultations with lecturers from Jomo Kenyatta University of Agriculture and Technology. According to Borg and Gall [37], content validity of an instrument is improved through expert judgment. To enhance reliability of the study findings, piloting of the questionnaires was conducted among selected patients and medical staff in Moi Teaching and referral Hospital in Eldoret. Piloting sample size was selected on a proportion 10% of the study sample size. Cronbach's Coefficient Alpha was then used to compute the reliability of the study instruments. According to Fraenkel & Wallen [42], a reliability coefficient of 0.7 and above implies that the study instruments are reliable therefore this criterion was used to establish the reliability level of the study instruments.

1.20 Summary of the Findings

1.20.1 Influence of knowledge and awareness on the adoption of mHealth in maternal health care

Majority of the medical staff respondents agreed as shown by the mean of 4.21 that there was understanding of mHealth among hospital employees. Majority of the medical staff respondents' disagreed that the employees know the advantages of embracing mHealth as shown a mean of 2.87. The medical staff respondents indicated that there wasn't embracing of mHealth by patients in the hospital and the hospital had no programs that enhance mHealth awareness as shown by the means of 1.25 and 2.34 respectively. There were no procedures of implementation of mHealth among hospital employees as shown by the mean of 1.92. Majority 11 (55%) of the medical staff respondents indicated that rate of the level of awareness of mHealth among the staff is very low while a few 3 (15%) indicated to be unsure. The findings on the influence of knowledge on adoption of mHealth indicated that majority 72 (90%) of the patient respondents agreed that knowledge had effect on the adoption while a few 18 (10%) disagreed to the statement.

1.20.2 Influence of the government policies on the adoption of mHealth in maternal health care

The majority of the medical staff respondents indicated that the hospital had no policy to enhance the integration of ICT in health service delivery as indicated by a mean of 4.76. The hospital has no policy to reward best practice in the use of ICT in maternal health care service delivery as indicated by a mean of 4.12 and standard deviation of 0.26. The hospital has not invested in mHealth equipment to facilitate adoption of mHealth in maternal health care as shown by a mean of 4.32. Majority of the medical staff disagreed that the staff from their departments were trained on the usage of ICT in health service delivery as shown by a mean of 4.34.

The hospital did not allocate sufficient budget for the development of mHealth in maternal health care as indicated by a mean of 4.89. The research of the effects of government ICT policies on the application of mHealth indicated that there were no clear policy guidelines exempting taxes on mHealth equipment for hospitals as shown by a mean of 4.12. The medical staff respondents disagreed that the country's ICT policies provided a clear guideline on the integration of ICT in health care service delivery as shown by a mean of 4.33. The respondents disagreed that ICT policies in the country provided awareness on the use of ICT in accessing health services as shown by a mean of 4.57. The mean of 4.76 indicated that there was no promotion of government health policies on the use of mHealth. There was no government policies that guide the implementation of mHealth in the hospital as shown by a mean of 4.94. The government policies didn't promote the use of ICT in health care innovations as shown by a mean of 4.98. The medical staff respondents indicated that the health policies did not facilitate financing of ICT infrastructure in the health care as shown by a mean of 4.67 and the government policies were not open for the public to access health care service through mHealth platform as shown by a mean of 4.12.

1.20.3 Access to mobile technology and adoption of mHealth in maternal health care

Majority of the medical staff rated the computers and computer accessories as being fair while 13 (65%) rated internet connectivity to be poor. Majority 15 (75%) of the medical staff respondents indicated that the telephone connectivity rating to be good. Majority 14 (75%) rated the health information systems to be fair while 13 (65%) rated the decision support system (for enhancing exchange of ideas among medical practitioners) to be poor. Electronic mHealth customer desk was rated to be poor by 16 (75%) respondents while computerization of medical procedures such as diagnosis, and patient monitoring was also rate by 16 (80%) medical staff respondents to be poor. The majority of the medical staff respondents indicated that the hospital had no policy to enhance the integration of ICT in health service delivery as indicated by a mean of 4.76. The hospital has no policy to reward best practice in the use of ICT in maternal health care service delivery as indicated by a mean of 4.12 and standard deviation of 0.26. The hospital has not invested in mHealth equipment to facilitate adoption of mHealth in maternal health care as shown by a mean of 4.32. Majority of the medical staff disagreed that the staff from their departments were trained on the usage of ICT in health service delivery as shown by a mean of 4.34. The hospital did not allocate sufficient budget for the development of mHealth in maternal health care as indicated by a mean of 4.89. The research on the effects of government ICT policies on the application of mHealth indicated that there were no clear policy guidelines exempting taxes on mHealth equipment for hospitals as shown by a mean of 4.12. The medical staff respondents disagreed that the country's ICT policies provided a clear guideline on the integration of ICT in health care service delivery as shown by a mean of 4.33. The respondents disagreed that ICT policies in the country provided awareness on the use of ICT in accessing health services as shown by a mean of 4.57. The mean of 4.76 indicated that there was no promotion of government health policies on the use of mHealth. There were no government policies that guide the implementation of mHealth in the hospital as shown by a mean of 4.94. The government policies didn't promote the use of ICT in health care innovations as shown by a mean of 4.98. The medical staff respondents indicated that the health policies did not facilitate financing of ICT infrastructure in the health care as shown by a mean of 4.67 and the government policies were not open for the public to access health care service through mHealth platform as shown by a mean of 4.12.

1.20.4 Effects of ICT infrastructure on the adoption of mHealth in maternal health care

Majority of patients agreed that the ICT infrastructure influences application of mHealth as shown by a mean of 1.26 and that the patients did not have mobile phones that support mHealth as shown by a mean of 4.92. The patients' respondents also disagreed that the hospitals employees had phones to embrace mHealth and that the internet is distributed well to enhance mHealth as shown by means of 4.38 and 4.42 respectively. The patients disagreed that the hospital had computers to embrace mHealth as shown by a mean of 4.48.

1.20.5 Cost aspects affecting the adoption of mHealth in maternal health care

The study on the Cost aspects affecting the adoption of mHealth in maternal health care. Majority of the medical staff respondents indicated that the expense of mHealth was not affordable by the patients as shown by a mean of 4.81 while majority also disagreed that the expense of mHealth is affordable by the hospital employees as shown by a mean of 4.19. Majority of the respondents disagreed that mHealth maintenance cost is sustainable in the long run as shown by a mean of 4.32 and the mobile technology used in mHealth is affordable as shown by a mean of 4.24. Majority of the medical staff indicated that the mHealth cost can be supported by the hospital income as shown by a mean of 2.76.

1.20.6 Regression Analysis

Regression was used to obtain an equation which describes the dependent variable in terms of the independent variable based on the regression model.

Table 17. Regression analysis

Unstandardized Coefficients		Standardized Coefficients	T	Sig.		
B	Std. Error	Beta				
(Constant)		.512	.160	3.2	.022	
Knowledge and awareness		1.237	.541	.52	2.286	0.00
Government policies		.8593	.368	.40	2.335	0.02
ICT infrastructure		1.281	.471	.411	2.720	0.01
Mobile technology		1.271	.457	.123	2.781	0.04
Cost aspect		1.321	.498	.465	2.635	0.01

Dependent variable: Adoption of mHealth
Hence the resultant regression model is:

$$CMS = 0.521 + 1.23KA + 0.8593GP + 1.281IC + 1.271MT + 1.321CA + e$$

X₁ – KA - Knowledge and awareness, X₂ – GP - Government policies, X₃ – IC - ICT infrastructures, X₄ – MT - Mobile technology and X₅ – CA - Cost aspects.

Table 17. shows the summary of the regression analysis that seeks to establish the relationship between adoption of mHealth, knowledge and awareness, government policies, mobile technology, ICT infrastructure and cost aspects. Knowledge and awareness was found to be the most significant factor influencing the adoption of mHealth with a p-value of 0.00.

Table 18. Anova

Model	Sum of squares	df	Mean Square	F	Sig
Regression	58.366	1	14.5915	2.472	0.00 _b

Residual	37.548	79	0.4172
Total	95.9346	80	

The F critical at 5% significance level was 2.472. Since F calculated is greater than F critical this shows that the overall model was significant.

Table 19. Regression Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics	F	df 1	df 2
0.78	.6084	.76	.64593	34.974	1	79	

The regression had a correlation coefficient (R²) of about 0.6084 and an adjusted R² of 0.76. This means that knowledge and awareness, government policies, mobile technology, ICT infrastructure and cost aspects explain 76 percent of the variations in adoption of mHealth. F test is used to test the significance of R², which is the same as testing the significance of the model as a whole with a probability of 0.00 at 5% significance level indicated that the joint contribution of the independent variables was significant in predicting the dependent variable. Knowledge and awareness is positively related to adoption of mHealth and has the most statistically significant coefficient as indicated by a P value of 0.00 which is statistically significant at 5%. This means that knowledge and awareness is a factor affecting adoption of mHealth. There is a positive relationship between adoption of mHealth and the government policies. It had a statistically significant coefficient as indicated by a P value of 0.02 which is statistically significant at 5%. Government policies are therefore contributing towards adoption of mHealth. The ICT infrastructure is positively related to the adoption of mHealth. This is shown by the positive sign of the coefficient. The coefficient of ICT infrastructure is also statistically significant as indicated by a P value of 0.01 which is statistically significant at 5%. On the mobile technology, the study found out that it is important in adoption of mHealth. This is shown by the positive sign of the coefficient. The coefficient is statistically significant as indicated by a P value of 0.04 which is statistically significant at 5%. This means that mobile technology is a factor affecting adoption of mHealth. There was a positive relationship between adoption of mHealth and the cost aspect. It had a statistically significant coefficient as indicated by a P value of 0.01 which is statistically significant at 5%.

1.21 Conclusions

The study concludes that knowledge and awareness influences the adoption of mHealth in maternal health care. There was understanding of mHealth among hospital employees. The employees do not know the advantages of embracing mHealth. There wasn't embracing of mHealth by patients in the hospital and the hospital had no programs that enhance mHealth awareness. There were no procedures of implementation of mHealth among hospital employees. The rate of the level of awareness of mHealth among the staff is very low. It was concluded that there is influence of government policies on the adoption of

mHealth in maternal health care. The hospital had no policy to enhance the integration of ICT in health service delivery. The hospital has no policy to reward best practice in the use of ICT in maternal health care service delivery. The hospital has not invested in mHealth equipment to facilitate adoption of mHealth in maternal health care. The staffs from their departments were untrained on the usage of ICT in health service delivery. The hospital did not allocate sufficient budget for the development of mHealth in maternal health care. There were no clear policy guidelines exempting taxes on mHealth equipment for hospitals. The medical staff respondents disagreed that the country's ICT policies provided a clear guideline on the integration of ICT in health care service delivery. The respondents disagreed that ICT policies in the country provided awareness on the use of ICT in accessing health services. There was no promotion of government health policies on the use of mHealth. There was no government policies that guide the implementation of mHealth in the hospital. The government policies didn't promote the use of ICT in health care innovations. The medical staff respondents indicated that the health policies did not facilitate financing of ICT infrastructure in the health care and the government policies were not open for the public to access health care service through mHealth platform. From the findings on the access to mobile technology and adoption of mHealth in maternal health care, it was concluded that computers and computer accessories are fair while internet connectivity was poor. The telephone connectivity rating was good. The health information systems to be fair while decision support system (for enhancing exchange of ideas among medical practitioners) was poor. Electronic mHealth customer desk was rated to be poor while computerization of medical procedures such as diagnosis, and patient monitoring was also rated to be poor. The hospital had no policy to enhance the integration of ICT in health service delivery. The hospital has no policy to reward best practice in the use of ICT in maternal health care service delivery as indicated. The hospital has not invested in mHealth equipment to facilitate adoption of mHealth in maternal health care. Majority of the medical staff disagreed that the staff from their departments were trained on the usage of ICT in health service delivery. The hospital did not allocate sufficient budget for the development of mHealth in maternal health care. The research on the effects of government ICT policies on the application of mHealth indicated that there were no clear policy guidelines exempting taxes on mHealth equipment for hospitals. The country's ICT policies do not provide a clear guideline on the integration of ICT in health care service delivery. ICT policies in the country do not provide awareness on the use of ICT in accessing health services. There was no promotion of government health policies on the use of mHealth. There were no government policies that guide the implementation of mHealth in the hospital. The government policies didn't promote the use of ICT in health care innovations. The medical staff respondents indicated that the health policies did not facilitate financing of ICT infrastructure in the health and the government policies were not open for the public to access health care service through mHealth platform. It can be concluded that ICT infrastructure influences adoption of mHealth in maternal health care. Patients did not have mobile phones that

support mHealth. The hospitals employees had no phones to embrace mHealth and that the internet is distributed well to enhance mHealth. The hospital had no computers to embrace mHealth. The study concludes that cost aspects affects adoption of mHealth in maternal health care. The expense of mHealth was not affordable by the patients while the expense of mHealth is not affordable by the hospital employees. mHealth maintenance cost is not sustainable in the long run and the mobile technology used in mHealth is not affordable. The mHealth cost cannot be supported by the hospital income.

1.22 Recommendations

The hospital should invest in new technology in order to embrace mHealth that is relevant in the modern world. This can be done by factoring the purchase of the needed technology in the yearly budget allocations. The hospital should consider improving their employees' competence in ICT skills since they are the ones who are going to implement the mHealth. This can be done through seminars and workshops. The hospital should enhance awareness of the benefits of mHealth and its operations on the staff members and the patients. This will enhance its adoption in the operations in the hospital. The hospital should come up with an ICT policy that will guide the employees in the implementation of mHealth in the hospital. This should involve all the relevant stakeholders working in the hospital. The adoption of mHealth will help in improving the hospital services by making them efficient and fast.

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