AN ADOPTION FRAMEWORK FOR TELEMEDICINE CARE:A STUDY OF NANDI COUNTY - KENYA

BY

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DECLARATION AND APROVAL

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I declare that this research thesis is my original work and has not been presented in any other university.

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DEDICATION

This research thesis is in memory of my late mother, Eunice Kobilo, dedicated to my loving wife Agnes and children.

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ABSTRACT

Telemedicine is one of the technologies that use the knowledge of Information Communication Technologies (ICTs) to curb geographical barriers while increasing access to healthcare services. This study aimed at design an adoption framework for telemedicine care in Kenya. This study was done in health facilities in Nandi County. The specific objectives of the study were: To examine healthcare needs for telemedicine care in Nandi County -Kenya; to analyze the readiness use status for telemedicine care adoption and to design a suitable telemedicine care adoption framework. Though telemedicine care is in existence, the researcher felt that an adoption framework should be considered to guide in its implementation. This study was conducted using cross-sectional survey design in which study sample of 4 doctors, 59 nurses, 12 clinical officers, 1 pharmacist and 4 pharmaceutical technologists, making it a sample size of 80 from target population of 100 healthcare workers working at the County hospital, two sub county hospitals and 2 health centers. Structured questionnaire was used to collect the data. Pretesting for the instruments was done to ascertain face and content validities. The data collected was analyzed using SPSS software version 20. Analyzed results were presented using table, pie-chart and bar graphs. From the findings it was evident that the most critical health care need in Nandi County is direct patient services (82.5 %) followed by special referral services and Tele-pharmacy which were rated at 77.5 % and 54.5 % respectively. While, the least critical healthcare need areas were medical education and mentoring (53.8%), Tele-nursing (51.3%), remote patient monitoring (45%), Tele-radiology 20%.In view of readiness for Tele-medicine, most of the respondents (46.3%) cited that other technologies started recently in Nandi County in solving healthcare problems. It was further noted that, 50% of the respondents observed that it takes up-to 10 minutes to attend to patients using telemedicine in the County Referral hospital as compared to 18.8% of the respondents who observe that it takes up-to 10 minutes to attend to patients without using telemedicine. These findings were used to design a Telemedicine framework to enhance improved service delivery. The framework designed has illustrated that direct patient services is popular with health workers interviewed at 82.5% and the least Tele-radiology at 20%.The health workers can comfortably use telemedicine service. From the research findings; it was noted that stakeholder involvement, human resources capacity building and increased funding can play an important role during adoption. Lastly, the findings has clearly demonstrated that; direct patient services, specialist referral services, and Tele Pharmacy need to be considered for acceleration of telemedicine care.

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LIST OF ABBREVIATIONS AND ACRONYMS

ATA	American Telemedicine Association
CEC	County Executive Committee
CHMT	County Health Management Team
CT	Computerized Tomography
ECG	Electrocardiogram
EHR	Electronic Health Records
GOK	Government of Kenya
ICTs	Information Communication Technology
KNH	Kenyatta National Hospital
KHWS	Kenya Health Workforce Survey
MAST	Model for Assessment of Telemedicine
MOH	Ministry Of Health
MTRH	Moi Teaching & Referral Hospital
MRI	Magnetic Resonance Imaging
NACOSTI	National Commission for Science Technology& Innovation
NTC	National Telemedicine Centre
NPT	Normalization Process Theory
PHR	Personal Health Records
PLWHAS	People Living With HIV/AIDs
SCHMT	Sub County Health Management Team
TAM	Technology Acceptance Model
UHC	Universal Health Coverage
WHO	World Health Organization

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

According to American Telemedicine Association (ATA,2012), Telemedicine is the use of medical information exchanged from one site to another via electronic communications for the health and education of the patient or healthcare provider and for the purpose of improving patient care, treatment. The term telemedicine is derived from a combination of Greek word *Tele* that means from a distance and Latin word *mederi* meaning to heal (Medical Dictionary).Initially, some scholars had perception that telemedicine is experimental and futuristic. Nonetheless, the perception has come to stay because it has become a reality. Other than patient care, there are other applications of telemedicine. These applications include; research, education, public health, and administration. There are several definitions given by various scholars and agencies, which have brought about varied perspectives of approaches in the treatment of the concept. According to the American Telemedicine Association, (ATA, 2012) telemedicine refers to the use of electronic communications and information technologies to provide clinical services when participants are at different locations.

The concept of telemedicine offers various remote healthcare services which includes; remote patient monitoring, special referral services, medical education and mentoring, direct patient care and consumer medical and health information. The stated services shall be delivered through; point-to -point connections, network programs, web-based e-health patient service, direct patient to monitoring center, and health provider to the home connections in Kenya. For telemedicine to be successful, it is important to note that the respective sites are adequately resourced in terms of equipment, training, staff, telecommunications, and support.

According to National Telemedicine Center of China-TECH4ALL (2020),Telemedicine is playing a key role in fighting COVID-19, taking diagnosis and treatment beyond the limits of time and distance, further the issue of unequal healthcare resources is a global problem that particularly affects people in rural and remote areas. Nevertheless, for China to build a remote diagnosis system for fighting Covid-19, Huawei teamed up with the National Telemedicine Centre, completing system set up in just four days and connecting 147 hospitals and designated to deal with the virus across 108 and 18 Cities. The system was able to allocate resources, conduct remote diagnosis, share treatment, guidance during the outbreak.

Developed countries have already deployed several telemedicine applications. Countries like Australia, Finland, United Kingdom, USA and Taiwan have reported the use of Telemedicine for 15-20 years. The countries have adequate resources that have geared the implementation of Telemedicine technology in the respective states. For instance, in Australia the program was used mainly for remote education. Medical Specialists provide psychiatric medical education via Telemedicine in Western Australia. Other assistance like wound cases was also provided. In developed countries, the use of Telemedicine proved to be cost-effective in the delivery of healthcare services in the US, (Nelson & Staggers, 2014)

The progressive implementation of Telemedicine technology in developed countries is because of having enough capital to initiate the program, (ATA, 2012). In addition to that, these countries are ahead in terms of conducting adequate research to solve problems that hinders the delivery of healthcare services.

In 2005, the World Health Organization came up with the Global Observatory for e-Health to survey the importance of ICTs in healthcare sector and patients' well-being. According to the survey, telemedicine has proved to be of great benefit to the WHO

member states in solving healthcare problems, which includes accessible, cost-effective and high-quality healthcare services. Projected number of Tele-health patients worldwide from 2013 to 2018 shows a progressive trend, the source further forecasts the number of Tele-health patients to grow to around 7 million in 2018 up from 350,000 in 2013. In the United States, there is a renewed emphasis on the potential role of telemedicine in redressing issues of accessibility, cost, and quality of medical care (WHO, 2005).

The informatics community made significant progress in the past twenty years by coming up with systematic approach to health information technology. Achievements like machine-level infrastructure have acted as stepping-stone for creation of clinical decision support system and electronic records. In January 2004, the then president of the United States of America George W. Bush urged the informatics to adopt telemedicine as a solution to healthcare problems (Capello, Naimoli, &Pilli, 2014).

In Africa, countries like Ghana and Mali were to launch telemedicine programs by 2016 after a successful trial. The aim of the program was to improve healthcare in the respective countries by ensuring that patients from rural environments receive adequate medical cover amid accessibility difficulty. However, Kenya is also among the African states to launch Mobile Telemedicine Clinic Project (MOH, 2015)

Telemedicine can be beneficial for those people living in remote environment and isolated communities. Patients living in those regions can accurately access medical services from specialist via video conferencing. This technology reduces the time that the patients could spend in queues, and the cost of transport in visiting conventional hospitals. Telemedicine is also useful for a specialist and general practitioner because it acts as a communication tool especially when they are available in remote locations needed (Nelson & Staggers, 2014).

The technology can improve access to healthcare services especially for patients in remote locations because the technology bridges the gap of inaccessibility through real-time monitoring and provision of adequate solutions to the existing problems. Telemedicine can be used as a teaching tool, through which specialists can advise medical staff on handling a certain problematic situation that can be faced. The teaching tool can be a more effective technique since it is faster.

Several studies have shown that the use of telemedicine can increase efficiency and reduce the cost of healthcare through reduced travel times, better management of chronic diseases, shared health professional staffing, and fewer or shorter hospital stays in the counties (Bediang et al., 2014). However, human resource should play a critical role on capacity building to ensure the implementation of Telemedicine in the County becomes achievable. Working towards attaining capacity building in the health sector is inevitable. Human resource capacity building through training of medical practitioners who in turn shall offer civic education to the residents.

According to the classification proposed by Nelson and Staggers,(2014) telemedicine services or programs are grouped into services based on stored images (store and forward) such as Tele-radiology, Tele-histopathology, Tele-dermatology, etc.; home monitoring programs and systems (home-based services) and real-time specialized care (hospital-based services). However, other authors consider other categories, such as the type of service delivered, Tele-consultation, Tele-monitoring, and Tele-radiology, for different specialties. The unique set of healthcare challenges in Africa has made the use of telemedicine suitable, for example ratio of doctors to patient is very low, the location of the hospitals to where patients are living is far, lack of good roads to the villages and other impediments are factors which makes telemedicine a crucial tool to cater for the needs of patients in Africa, (Nelson & Staggers,2014).On the other hand, the use of

telemedicine in Africa healthcare has a long way to go before its full benefits could be realized even in the areas in which it's being used or piloted at the moment. Infrastructures like broadband and stable mobile networks are still not stable or not available where needed (Nelson & Staggers, 2014).

The national referral and teaching facilities are the only well-equipped hospitals to implement the concept of telemedicine. KNH in Nairobi City County and MTRH to represent the Western region form this critical block. Kenya's persistent healthcare crisis has been found to have a big professional's distribution problem that has left Nairobi with nearly half of all practising doctors and more than 70 per cent of dentists, a newly released sector report say (MOH, 2015)

According to Kenya Health Workforce Survey report [KHWS],(2015) it was found that the country has a total of 5,660 practicing medical doctors and 603 dentists, nearly half of whom are based in Nairobi. Developing countries are greatly faced with a shortage of healthcare professionals (MacLean et al., 2014). In addition, the few available healthcare professionals are mainly based in major towns of the country (Androuchko & Nakajima, 2004). As a result, people living in rural areas or the underserved communities have limited access to healthcare. The advancement of technology is another contributing factor to the success of implementing Telemedicine in developed countries. Telemedicine uses the knowledge of information and communication technologies to operate thus, developed countries have an added advantage when it comes to experienced personnel in the field of ICTs. Therefore, there was need for an adoption framework that entails identifying critical healthcare that need telemedicine care, examine existing telemedicine care practices, assess their readiness status and design an adoption framework for telemedicine care.

1.2 Statement of the Problem

Telemedicine is critical in contributing to an affordable and accessible healthcare service, as one of the fundamental aspects to human life, both developing and developed countries strive to ensure there is affordable healthcare to their citizens. However, based on the geographical position and settlement pattern of Kenyans, access and delivery of healthcare services is a great challenge. Many hospitals in developing countries are experiencing pressure due to rising numbers of patient presentations, Compounding pressure is inadequate access to health care services in the community, which can lead undertreated health conditions to escalate to critical levels (Abiiro & De Allegri, 2015)

According to World Health Organization survey, the ratio of doctor to patient is approximately 1 doctor for every 16,000 patients in Kenya. This ratio makes it difficult for doctors to attend to patients. In addition, the act of patients travelling from remote environments to access high-quality healthcare services in urban centers is costly.

Nearly 50 percent of doctors and 70 per cent of dentists based in Nairobi. Only high level facilities able to implement telemedicine; KNH, MTRH & Machakos level 5 hospitals, there is a big gap in addressing this challenge hence the need to put more efforts on telemedicine frameworks adoption to meet the target (KHWS.2015).

The use of telemedicine can solve most of the outlined problems facing healthcare sector in Kenya. Therefore, there was need for an adoption framework that entails identifying critical healthcare that need telemedicine care, examine existing telemedicine care practices, assess their readiness status and design an adoption framework for telemedicine care in Nandi County.

1.3 Purpose of the Study

The purpose of this study is to design an adoption framework for telemedicine care which provide healthcare organizations with strategic benefits.

Research Objectives

i. To examine healthcare needs for telemedicine care in Nandi County.

ii. To analyze the readiness status for telemedicine care adoption in Nandi County.

iii. To design a suitable telemedicine care framework for Nandi County

1.4 Research Questions

i. What are the healthcare needs for telemedicine care?

ii. What is the level of readiness status in the adoption of telemedicine?

iii. What are the components of a suitable telemedicine care framework?

1.5 Justification of the Study

Abiiro and De Allegri (2015) argued that UHC aims at enrolling all residents into a health related social security systems and securing equitable entitlements to the benefits from the health system for all. They further stated that, UHC enables everyone to access services that address the most significant causes of disease and death, and ensures that the quality of those services is good enough to improve the health of the people who receive them.

On the 12th December 2018, President Uhuru Kenyatta declared Universal Health Coverage (UHC) to be a national priority in Kenya, as part of his 'Big Four Agenda' for national sustainable development.

Under this initiative, the Government of Kenya has committed to make strategic investments in health to ensure that all residents of Kenya can access the essential health services they require by 2022, on November 1st 2020, President Uhuru Kenyatta unveiled a raft of policy interventions Saturday aimed at fast tracking the national rollout of the Universal Health Coverage (UHC) pillar of the Big 4 Agenda. (MOH, 2020)

Access to healthcare by people living in rural Kenya is still hindered by lack of physicians situated in those areas. According to Njoroge, Zurovac, Ogara, Chuma and Kirigia, (2017) having equitable and affordable healthcare at the highest achievable standards to all citizens is one of the overall goals of Kenyan Vision 2030. Telemedicine was identified as one of the strategic areas of intervention in Kenyan e-Health strategy presented in Vision 2030 report. Basing on the Kenyan geographic distribution, the majority of citizens are located away from hospital where healthcare specialists are located .The study sought to examine healthcare needs for telemedicine care, analyze the readiness status for telemedicine care adoption in Nandi County and design a suitable telemedicine care framework.

1.6 Limitations of the Study

Nandi County has 143 government managed health facilities. A sample size was drawn from 5 high volume health facilities, results from this facilities has the potential to improve the quality of telemedicine care. The researcher administered the tools to health workers offering services within the selected health facilities. The findings are derived from a small sample and must be validated through a more rigorous empirical research studies.

There is also need for more time to evaluate the effectiveness of adoption framework for telemedicine.

1.7 Delimitations of the Study

The theoretical approaches to the current study covered past studies on the implementation of telemedicine care and how it has impacted positively on the delivery of healthcare services. Nevertheless, only 80 health workers deployed at the 5 selected health facilities were interviewed. Health care needs, readiness use and telemedicine care were covered extensively to facilitate an adoption framework.

1.8 Significance of the Study

Telemedicine, as well as every other digital health technology, comes with the promise of changing care delivery for the better, be it by reaching traditionally underserved regions or populations or by enhancing patient-provider communication to facilitate shared decision making (Harst, Lantzsch & Scheibe, 2019).

The study can therefore be of great benefit to patients and health care as it provides a framework on the adoption, implementation, and improvement of telemedicine care to enhance the delivery of healthcare services. This has the potential to help the ministry of health to bridge the gap between the quality of services and the acute number of healthcare practitioners.

Furthermore, the successful adoption of the technology can help physicians and clinicians to improve the quality of services offered in the county level hospitals.

Telemedicine has the potential to simultaneously improve healthcare quality and efficiency by providing patients with virtual access to an organization's healthcare processes (Harst, Lantzsch & Scheibe, 2019).Telemedicine has the potential to change the way health care is delivered in the world and in Kenya particularly as it can enable health care service providers deliver better and coordinated health care to most communities and population that the current health services cannot reach. The findings of the study has the potential to improve quality of healthcare offered, health workers, also benefit through improved service processes.

Medical education and mentoring, from the findings demonstrate that health workers benefit through continuous medical education done remotely by experts globally. The study further aimed at, providing background information to research organizations and scholars interested in carrying out further research in the area of telemedicine frameworks amongst clinicians in Kenya (NTC-TECH4ALL, 2020)

1.9 Assumptions of the Study

The study assumed that an adoption framework has the potential to improve HealthCare delivery to the disadvantaged people from hard to reach areas. Recommendations and conclusions form a very critical role in influencing both national, county governments and implementing partners enable strengthening telemedicine policies.

1.10 Operational Definitions of Terms

Adoption Framework	An essential supporting structure for accelerating Health care needs and readiness use
Health care needs	Tele Nursing, Tele Pharmacy, Remote Patient Monitoring, Tele Radiology Specialist Referral Services, Medical Education and Mentoring
Readiness use	Include Staff attitude, Available funding, Political goodwill, Equipment for use.
Telemedicine Care	Include improved quality of care, Affordability, Timeliness, Equity.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents the relevant literature about Telemedicine care and how it has impacted on the delivery of healthcare services. It also reviews literature or topics that are consistent and related to the research aims and objectives highlighted in chapter one. This chapter is vital since it connects the use of Telemedicine care in Kenya with the previous and future studies on Telemedicine that help to gain more knowledge on the use of the technology.

2.2 Origin of Telemedicine

High-quality healthcare has been on demand commodity, from house calls to urgent clinics, technologies used in heath sector have developed with time. The generation of 20th century is familiar with technologies like Skype and Face time, which seem brand new, but in real sense, telemedicine existed longer than most people could imagine.

In the early 1900s, people used radio-revolutionized communication. Innovators from Australia were inspired by the prominence of radio in every field of national defense to entertainment. It never took long before the innovators could figure out how doctors could attend to patients with the help of the radio communication.

However, telemedicine technology in United States of America featured in a Radio News Magazine from 1924 (Capello et al., 2014). The illustration involved a doctor attending to a patient through video call. In 1940s, radiology images belonging to a patient were sent 24 miles from one town to another in Pennsylvania via telephone line. The transfer was the first scenario of an electronic media record transfer. Africans had their own way of communicating as far as the delivery of healthcare services are concerned. For instance, African villagers used smoke signals to warn people to stay away from the village in situation of serious disease.

Though a smoke signal was a primitive way of communicating, the latter proved to be the most effective way of disseminating health information during the ancient period within a short time. Telemedicine is viewed as a new way of offering medical services. It is seen as a means of overcoming the growing shortage of health practitioners in developing countries (Breen & Matusitz, 2010).

Further, telemedicine is the new way of delivering health services to patients and can be defined as the provision of medical services by using information technology and communication systems. Moreover, it emphasizes the interaction and collaboration with the increase of sharing information and knowledge between healthcare provider and patient

Healthcare information systems contain large volumes of information that include demographic and medical history of patients such as medication, lab test results, radiology information and procedures that are constantly growing. Thus, the need of complete medical data which supports video, audio and images has to be accomplished before implementing the telemedicine system (Harst, Lantzsch, & Scheibe, 2019).

2.2.1 History of Telemedicine in Kenya

Kenya launched telemedicine initiative for disadvantaged community in 2015. The aim of the initiative was to help residents of rural regions in Kenya access quality healthcare. The part of the programme was to help the government in tackling non-communicable diseases (NCDs). Experts urged stakeholders and County governments to invest in telemedicine. The initiative was a partnership of Germany-headquartered Merck Group and Kenya's Ministry of Health. The first phase of telemedicine in Kenya started at the main referral hospital, Kenyatta National Hospital (KNH). The technology initiative was to link KNH to the Machakos Level Five Hospital, which is situated in the Eastern part of Kenya. The second phase of Telemedicine initiative was to start at Moi Teaching

and referral Hospital in Uasin Gishu County. The initiative was to help patients of the Rift Valley region access Medicare at ease (MOH, 2015)

Therefore, telemedicine consults have become a major technological advancements towards providing better health care services. The technology enables primary care and front-line clinicians to get real-time support from the specialists and make accurate diagnosis thus making it easier to make the best on the appropriate care plan (Breen & Matusitz, 2010).

2.2.2 Telemedicine in Nandi County

In general, on-line medical consultation reduces time required for medical consultation and induces improvement in the quality and efficiency of healthcare services, e-health, medical services in remote places which include rustic healthcare centres, ships, ambulances and home healthcare services can be supported through the applications of e-health services such as medical databases, electronic health data and the transferring of text, video, sound and images (Algaet et al., 2019). Health workers in Nandi County can interact with healthcare experts at Moi Teaching and Referral Hospital via a platform. MTRH, was part of the three pilot sites to launch telemedicine, identified by the ministry of health in 2015.The preferred platform is video conferencing whereby; there are live administration, training and research purposes to help in improving healthcare services in the County. Furthermore, the initiative aims at boosting research, community awareness, medical education and pharmaco vigilance in areas of non-communicable diseases. Based on Algaet et al. (2014) argument, using information and communication technologies, telemedicine can improve access to research and medical education. This enhances the provision of better healthcare in Kenya. It is also important to note that the use of telemedicine in Kenya can help in diagnoses, treatments and prevention of diseases. The programme has bridged the gap left by the

old manual paper system by strengthening electronic documentation of data belonging to patients by aiding their access, skill transfer, and promotion of knowledge.

2.3 Healthcare Needs for Telemedicine Based Care

According to Algaet et al., (2014) Argued that Telemedicine involves the use of information and communication technologies to improve healthcare services by increasing access to medical information and care. The technology is beneficial to areas where distance is a critical factor when it comes to the delivery of healthcare services. The four elements that relates to telemedicine include; its goal to improve health outcome, the use of various types of ICTs, to provide clinical support, and to overcome geographical barriers. The idea of caring for patients remotely by use of telemedicine applications has fascinated computer literate physicians for long. The concept has made the future of telemedicine be in full potential because it provides many solutions to healthcare problems. Some of the solutions provided by telemedicine in solving healthcare problems include; high-quality healthcare. The concept of bringing healthcare professionals and doctors together makes telemedicine deliver high-quality healthcare for patients. High quality healthcare services are offered from a distance through telemedicine (Nelson & Staggers, 2014). Some of the health care needs include Specialist referral services**,** direct patient care services, Medical education and mentoring, Tele-nursing, Tele-pharmacy, Tele-radiology and remote patient monitoring.

2.3.1 Specialist Referral Services

This involves a specialist trying to assist a general medical practitioner in rendering a diagnosis. This service involves a patient interacting with a specialist live, via remote control or may include the transmission of diagnostic videos or images to a specialist. In such instances, the use of technology helps in advancing the diagnosis, thus

improving the quality of care among the patients. Specialist referral services have been on the rise due to increasing health complications among humans (Mars, 2013). In this regard, it becomes critical to develop the best way of improving such services with telemedicine. With a greater level of interaction between the patient and the specialist, it becomes easy for the two to engage each other and enhance patient's experience within the health care. Patients' visits could be augmented with the help of telemedicine thus giving them and their doctors real-time access to a specialist. Through such collaborations, it becomes easy for the specialists to successfully conclude the initial visit without the need for another appointment.

Telemedicine consults have become a major technological advancements towards providing better health care services. The technology enables primary care and front-line clinicians to get real-time support from the specialists and make accurate diagnosis thus making it easier to make the best on the appropriate care plan (Breen & Matusitz, 2010). Telemedicine within the specialist field can be applied to stroke care, where the doctors can connect with the neurologists to diagnose a stroke within the shortest time limits before starting life-saving treatment. Also, within the field of dermatology, clinicians can easily gain access of a dermatologist through the use of telemedicine technology to identify strange skin problems and effect quick treatment upon the patient. Telemedicine has been proven to increase access to timely and cost-effective specialty services for patients who need urgent health attention.

2.3.2 Direct Patient Care Services

Such as, sharing audio, video, and medical data between a patient and a health professional. The shared data can be for use in rendering a diagnosis, treatment plan, prescription or advice. This might involve patients located at a remote clinic, a physician's office or home (Nelson & Staggers, 2014). There are numerous benefits

that come with the implementation of telemedicine within the healthcare set up. The direct patient care services have been enhanced by the use of telemedicine by ensuring that patient satisfaction and loyalty is maintained at all times. Through the provision of convenient access to healthcare, patients are in a position to evaluate the quality of services offered and will always go back with greater levels of satisfaction. Secondly, telemedicine lowers the cost of care. Through the direct patient care services, the technology reduces the rate of readmissions. Furthermore, the patients can get data on their health history and diagnosis even without visiting the hospitals. This can be done by creating a unique account for every new patient in which all the data on their health journey can be stored. With such accounts, it becomes easy for the patients to access their data wherever they are, thus reducing the costs of travelling (Doukas, Pliakas & Maglogiannis, 2010). Also, telemedicine has continued to enhance patient outcomes by promoting compliance of treatment plans and the medication adherence. The technology has made it easier for the management of chronic diseases through frequent touch points with patients. With the increased patient engagement, it is becoming more efficient to monitor various diseases and come up with timely response mechanisms during emergencies. This has improved the quality of healthcare services thus enhancing healthy living.

2.3.3 Remote Patient Monitoring

Uses devices to remotely collect and send data to a monitoring station for interpretation. Notably, as of March 20, 2020, expert teams had used telemedicine system to diagnose more than 2,000 cases of the corona virus in towns and counties. The system was also used to remotely check patients in isolation wards and organize online workshops with corona virus experts, greatly improving the capabilities of smaller hospitals to fight COVID-19(NTC-TECH4ALL, 2020).

Jackson and Mclean (2012) found that such “home telehealth” applications might include using telemetry devices to capture a specific vital sign, such as blood pressure, glucose or weight. Such services can be used to supplement the use of visiting nurses. With the exception of image-oriented subspecialties such as teleradiology and telepathology, few clinical studies have documented the accuracy, reliability, or clinical utility of most applications of telemedicine as a primary diagnostic or therapeutic modality. There are numerous benefits that come with remote patient monitoring to the patients. The ease of access to patient data and the ability to deliver quality care to more patients with a low risk of burnout has continued to make telemedicine the most adored technology in healthcare. Remote patient monitoring enhances the capacity for the physicians to treat more patients. As a result of more patients accessing care, it becomes easy to monitor various diseases due to timely diagnosis and proper care services. Also, the technology improves the quality of healthcare services. In addition to enhancing the quantity of patients accessing care, the technology improves the quality by boosting the accuracy in terms of diagnosis and treatment. Since the remote patient monitoring links the clinicians directly with relevant patient data, it makes the daily activities more efficient as they can discharge their duties more efficiently, thus reducing the possibility of burnout. With reduced workload and lower chances of burnout, the system improves the overall efficiency of the health care systems which benefit the patient in a greater way.

Another benefit of the telemedicine in the remote patient monitoring is the fact that it offers patients invaluable assurance that someone is watching out for their health and wellbeing on a daily basis. With their data being managed within the healthcare systems, it becomes easier for the physicians to monitor various patients on matters pertaining such activities as when to go for check-ups (Yellowlees et al., 2010). With

such high level of monitoring, the patients will have peace of mind knowing that their health needs are always taken care of by the health care staff. Furthermore, remote patient monitoring has been instrumental in enhancing the relationship between the people and their caregivers. The system provides the patients with expanded levels of education, support and feedback as compared to the traditional patient management.

2.3.4 Medical Education and Mentoring

Which range from the provision of continuing medical education credits for health professionals and special medical education seminars for targeted groups to interactive expert advice provided to another professional performing medical procedure.

Telemedicine consultations also give auxiliary medical personnel direct medical guidance, for instance in China, the National Telemedicine Centre (NTC) delivers at least four lectures each week, plus one medical case discussion and one live surgery broadcast every two weeks(NTC-TECH4ALL,2020).

Consumer medical and health information includes the use of the Internet for consumers to obtain specialized health information and on-line discussion groups to provide peer-to-peer support. Telemedicine makes the dissemination of health information very efficient and effective (Kohnke, Cole & Bush, 2014). The technology is fast, accurate and without bias. Specialist can access, and retrieve the information at ease anytime anywhere. Telemedicine is the best way of improving rural health care access. Many recent studies have shown the advantages of telemedicine. It makes life easier for both patients and caretakers. It has a positive effect on both environmental and travel costs. It offers access to caretakers in remote areas and limits the time involved for a traditional consult, and it can assist in broadening medical education. By providing feedback to clients on their health status, they give details of their health conditions and educate them on their health needs and what they are required to do. In

this case, it helps in creating more self-awareness and empowers the patients to be more health-conscious (Lin, 2012). Telemedicine is solving the long-standing obstacles of too few primary care physicians in sparsely resourced areas and limited support for specialty care. As the new technologies are enabling greater access for patients and enhanced training to improve care coordination, old education and payment standards persist.

In medical education, the technology is more effective and stronger especially in the surgical training through tele mentoring. In this case, the physicians learn to perform surgeries under the guidance of experienced mentors. Using this approach, remote clinicians learn about surgical devices, procedures, and techniques. However, to date medical education has not taken full advantage of advances in telehealth. Despite its impressive growth, information about this mode of healthcare delivery remains noticeably absent from the medical school curriculum (Wechsler et al., 2017). Traditional medical education consists of two components: Basic science and clinical education. According to Lin (2012), telemedicine has the potential to transform professional health education at all levels. While the merger of telemedicine and medical education is in its infancy, there have been several experimental applications demonstrating a wide range of effects in terms of promoting the learner's knowledge, attitudes, skills and behaviors, as well as advancing patient care.

2.3.5 Tele Nursing

Refers to the use of information technology in the provision of nursing services whenever physical distances exist between patient and nurse, or between a number of nurses. The types of telemedicine can be categorized as real-time or pre-recorded telemedicine. Information is sent and received by the participants almost immediately in the case of real time telemedicine while in the case of pre-recorded telemedicine;

information is captured and then transmitted later for subsequent reply (Jackson, D.E., & Mclean, S.I., 2012).Tele-Nursing is a care delivery method that has been used for many years. However, recent studies have focused on the tools when providing client care and the possible use of telehealth technology to perform clinical trials or even measure the level of satisfaction clients have after they have received the health care services.

Telenursing is expanding throughout the world, and nurses conduct care vie telenursing tools to complete assessments and assess medical treatments. This approach has been proven to be positive to client care. Telephonic nursing is slowly being introduced into schools of nursing curricula. Reasons for this may include access to call centers with telephonic nurses. For telephonic nursing care to be fully embraced, schools of nursing need to identify locations and opportunities for students to observe, learn, and participate in this approach to care delivery. The foundation of nursing is always anchored on establishing credible relationships (Palmas et al., 2010). Therapeutic relationships have been developed with the help on Tele-nursing, as the nursing practice interacts with the patient on a daily basis. In this regard, it becomes easy to closely monitor any condition and improve the patient experience. Furthermore, Tele-nursing ensures that there is compliance with the prescribed treatment. Tele-nursing also encourages and empowers the clients to implement various actions prescribed to improve their own health situations. Telephonic nurses are always in a better position to teach and model the development and implementation of the therapeutic communication.

2.3.6 Tele Pharmacy

According to Le, Toscani and Collaizi (2018) Telepharmacy is a rapidly growing area of communication within pharmaceutical care delivery, especially in rural areas. Tele

pharmacy has been successfully implemented within community pharmacy settings through the creation of remote dispensing sites. Trends in telemedicine show that tele pharmaceutical care is likely to expand as it allows for a better allocation of resources and access to more patients. Is the delivery of pharmaceutical care via telecommunications to patients in locations where they may not have direct contact with a pharmacist (Waegemann, 2010).Tele pharmacy services include drug therapy monitoring, patient counseling, prior authorization and refill authorization for prescription drugs and monitoring of formulary compliance with the aid of teleconferencing or video conferencing. Remote dispensing of medications by automated packaging and labeling systems.

Telepharmacy is considered to be one of the best ways of delivering pharmaceutical products and care through the use of telecommunication to different clients. In this manner, patients can receive their medication and other health-related pharmaceutical products at the comfort of their homes (Lokkerbol et al, 2014) some of the services that have been delivered through Telepharmacy include drug therapy monitoring, counselling to patients, and the refill authorization of the prescribed drugs. Other services include taking medicine to the rural areas. Other services which involve video conferencing include the provision of training, education, and even the provision of management services to those who run pharmacies.

There are numerous benefits that come with Telepharmacy. One of the major advantages is the fact that the technology it provides reliable services to remote areas where there are no health facilities. In this case, it provides health care services to the most vulnerable thus averting massive deaths and extreme health conditions. Telepharmacy is one way that many people living in remote areas will enjoy especially if they are unable to get basic experts in the pharmacy care thus reducing the cost of

traveling to other places for the same services. Patients are also counseled, and drug administering is monitored from time to time thus ensuring the medicines are taking place (Hill et al., 2010). Any facility near the point of services delivery will benefit by getting other pharmacists thus minimizing the cost of hiring full-time employee. As a result of the high demand for health care services in the remote areas, at times it becomes difficult to get the right personnel to help in the transmission of the technology in largely remote places. In such case, the health care systems end up providing poor services where patients fail to get the right services. Many patients will not get the right information regarding the health status or even the critical knowledge about the different medications available for their illnesses.

2.3.7 Tele Radiology

This is the ability to obtain medical images (X-rays, MRIs, and Ultrasounds) in one location and their transmission over a distance so that they can be viewed and interpreted for diagnostic or consultative purposes by a radiologist. Work at Johns Hopkins University illustrates the shift in research results.

In an initial effort to assess the acceptability of digital images for primary interpretation by emergency department physicians, researchers selected images from their radiology library based on their clinical importance and difficulty and also selected a comparison group of less challenging images (staff radiologists, emergency physicians, radiology residents, and emergency medicine residents) using the relatively low resolution monitors then available, they concluded that the teleradiology images were not satisfactory for primary interpretation.

Teleradiology has continued to impact positively the health care systems by improving diagnosis of various diseases from scanned images. One of the major advantages of this technology is faster diagnostics. The technology offers nearly instant viewing of

medical imaging results in which analysis can be performed and results obtained. In this case, the technology allows the physicians to provide better information thus allowing for improved patient care (Yuan & Herbert, 2011). Also, teleradiology reduces travel costs. In this manner, the patients may not be required to travel to where the radiologists are to capture the images. This allows the radiologists to work from any part provided the images are sent to them. Furthermore, the technology reduces the cost by ensuring that health care systems do not employ full-time radiologists. Remote radiology services offer the radiologists the ability to work together and also find the best treatment method for the patient. Also, in the process of evaluating the images, second opinion can be easily reached and make it easier to make to effect decisions.

Many hospitals in developing countries often experience shortage of specialists in many health areas. In particular, the radiologists staff have been highly limited in such countries. This means that whenever such staff are in holidays, patients go un-attended. Teleradiology helps in ensuring that health care staff are not strained in their duties. By the transmission of images from various, it saves time and allows the radiologists to perform their duties more effectively (Shah et al., 2013). In this regard, there will be no shortage of radiologists. Notably, teleradiology improves the levels of rural care. It allows the hospitals to expand their services to the remote places without having to deploy staff to such areas. Rural hospitals can easily send their patient images to teleradiology providers to receive quick and expert interpretation of medical images, thus allowing for quicker decisions in terms of the type of medication to be administered to a patient. Teleradiology gives physicians and radiologists the ability to learn and expand their ability within the field. The technology can be particularly helpful as an educational device through presentations from clinical radiologists or other knowledgeable health care experts in the field.

2.4 Telemedicine Based Care Use and Readiness

Healthcare providers have used the telephone as a communication tool for patient interaction for decades. Adding to the complexity of remote care delivery today, it is becoming increasingly common to use computers, remote monitoring devices, and interactive audio and video conferencing for patient interaction (Majerowicz & Tracy, 2010). With expanding Tele-health technology capability, new and more efficient models of care are facilitated, allowing for removal of time and distance barriers (Nelson & Staggers, 2014). Tele-health or e-health systems involve geographical information and the use of telecommunication technologies in providing healthcare services to the patients. Tele-health applications can be implemented in healthcare facilities or provide services direct to patients through the internet (Palmas et al., 2010).

The most common types of telemedicine technologies used recently are interactive Tele-videoconferencing and store-and forward technology (Nelson & Staggers, 2014). E-Healthcare readiness can be defined as the degree to which a community is ready to participate and succeed in e-Healthcare adoption. Understanding readiness is a critical first step towards the successful adoption of e-Healthcare. Administrators, policy planners, and governmental agencies require clear mechanisms to determine the readiness status of communities before investments are made to help avoid failure rates associated with ICT projects (Justice, 2012)

2.4.1 Human Resource Capacity Readiness and Telemedicine Based Care

Telemedicine like most other advanced information and communication technologies depend on complex technical and human infrastructure that operate both within discrete institutions and across organizational and geographic boundaries. According to Nelson and Staggers, (2014), Tele-health expands further integration with informatics will continue. Tele-health encounters will be integrated into data repositories within PHRs

and EHRs. Self-care data will also be integrated into data repositories for individuals and populations. As the global population increases, the supply and distribution of health care providers can be optimized using Tele-health to provide services regardless of the geographic location of those in need (Alajmi, Almansour & Househ, 2013). Shortages in primary care providers and nurses for example, can benefit from redistribution of portions of clinical expertise using Tele-health as the export mechanism.

Generally, human resource plays a critical role in the management of patients with modern technology. One of the biggest issues with the human resource has been compliance. With the new technologies coming up, there are strict rules, regulations and standards that must be met by those who operate the technologies. One of the biggest issues has been the privacy and the safety of the data collected using the devices (Fadhil, 2018). Notably, Tele-health systems operate with protocols and the human resource department are responsible for the safety and the operations that occur inside the devices. The adoption of Tele-health depends heavily on the attitude and the willingness of the human resource to adopt the technologies. When there is too much resistance from the human resource to adopt the technologies, it becomes extremely difficult to implement them. In this context, the health care setting must first embark on a training program of all users within the health care to ensure that they get acquainted with the technology. They will in turn train the customers on how they can operate their devices at home (Sohn et al., 2012). The resistance to adoption always comes when the human resource personnel believe that the technology will take away their jobs. Tele-health has been seen to bring a lot of disruption in the human resource sector within the heath care setting and this could be a major risk to its adoption. There is need to first train employees and educate them on the benefits they would gain by adopting

telemedicine. Some of the greatest benefits include reduced workload and increased efficiency, which improves the overall performance of the health care.

The proliferation of information technology (IT) in supporting highly specialized tasks and services has made it increasingly important to understand the factors essential to technology acceptance by individuals. In a typical professional setting, the essential characteristics of user, technology, and context may differ considerably from those in ordinary business settings, human resource personnel always aspire to use a technology that is less sophisticated and has non-complex elements that are easy to learn (Chow, Herold, Choo & Chan, 2012).

In most cases any complexity in the use of telemedicine discourages staff from adopting such technologies. Furthermore, it brings additional costs when it comes to training staff, as the process may take longer time than expected. In such instances, the ease of use is impacted negatively and such technologies might be abandoned despite huge investment in the purchase and installation. The perceived use of telemedicine shows that new technology models should provide platforms for easy learning and application among the health care staff to improve their morale and passion towards the technologies. All the challenges in the technologies must be addressed before the adoption process to avoid any mishaps in the implementation stage which might discourage staff from use.

2.4.2 Telecommunication Readiness and Telemedicine Based Care

A recent endorsement of 4G standards in wireless telecommunications by the International Telecommunications Union, a branch of the United Nations, will have significant implications for speed and quantity of data transmission and for the future capacity of m-health technologies in healthcare delivery. Bandwidth includes elements of telecommunication technology, including information transmission and connectivity

to move and store digital data. Infrastructure and telecommunication architecture in some geographic areas may limit use of Tele-health applications and have direct implications for access to and delivery of healthcare. This is particularly problematic for rural, isolated and undeserved regions (Nelson & Staggers, 2014). Telecommunication readiness implies the preparedness in terms of the software, the hardware and the internet. In this case, the software, at minimum, must be a secure Tele-health software. In this case, the software must be highly protected to safeguard patient data and avoid any access by unauthorized people. The software must also be easy to learn and operate since Tele-health is used mainly by the doctors and physicians including patients who may not be highly knowledgeable about information technology.

Also a good sign of preparedness could be evidenced by a strong hardware system. These include the computers, laptops, and tablets which can be used to access and receive patient data from the remote areas. Also, another critical hardware is the operating system on which the machines operate. This could be either macs or windows. Also, there must be an integrated or even an external microphone. Most of the mobile devices and computers have a built-in microphone which help the users to communicate effectively (Alajmi, Almansour & Househ, 2013).

If the devices being used by the patients do not have a microphone, they can be fitted externally to ensure that they are in constant communication with their caregivers. Also, an integrated or external camera is critical in ensuring that there is preparedness to adopt telemedicine. Just like the microphones, the cameras help the patients to take images, and even during teleconferencing. Finally, all these systems cannot work together without a stable and reliable internet. Having a solid internet connection is a crucial piece of having a successful telehealth visit with a patient. If the patient has a shaky

connection, not even the best telehealth app will be able to deliver quality video. A good internet connection must display a reliable speed at all times. The speed of the internet can be checked through the speedtest.net website (Zanaboni, Knarvik & Wootton, 2014). All these systems must be run by highly qualified personnel to ensure that they remain efficient and effective in the management of patients particularly in the remote areas. The systems require individuals with unique technological skills for proper installation. Telecommunications technologies are changing ways of thinking, acting and communicating throughout the world.

2.4.3 Cost Readiness and Telemedicine Based Care

Nelson and Staggers, (2014) points out that one market research firm valued the market for remote patient monitoring, one form of telehealthcare, in the United States at about $7.1 billion in 2010 and anticipated this market will grow to $22.2 billion by 2015.Healthcare technology usage in Canada during 2010 includes delivery of 260,000 telehealth encounters and 2500 patients enrolled in telehomecare services, reflecting a 35% annual growth during the previous 5 years. Continued global growth in telehealth is anticipated as technology evolves and the need for cost effective healthcare delivery increases in both developed and developing countries. It is important to consider the incentives for clinicians to participate in telemedicine. The conventional method of patient referral to a specialist is well entrenched and highly efficient for clinicians, with the cost and inconvenience of travel borne by patients or their families. When the distances are large, the health service may assume responsibility for patients' travel costs, which may be substantial. A major challenge for sustainable telemedicine programs is related to funding. Generally, government funding supports the purchase and maintenance of telemedicine infrastructure, which leaves little or no investment towards the operation costs of managing the service and formal evaluation. Apart from

telepsychiatry, videoconference activities tend to operate within the public health sector. If this method of health care is to be propagated, it should be acknowledged as a Medicare fee-for-service schedule item. Unfortunately, there are numerous examples of telemedicine failures around the world where large telemedicine networks have been constructed, but underutilized. Telemedicine provides enormous potential to improve equity of access to health services in a cost-effective manner. To be successful, the focus must move beyond simply the provision of equipment and connectivity. Telemedicine services should be easily accessible, present no hindrance to the clinician, and should complement conventional outpatient services. Clinical processes may need to be re-engineered to ensure effective engagement of clinicians and efficient use of equipment. Attention must be paid to communication of clinical information, preferably in electronic format, to increase reliability and avoid wasteful duplication (Smith & Gray, 2009). For telemedicine to become a mainstream service, its focus must move beyond simply the provision of equipment and network connectivity.

E-Healthcare readiness can be defined as the degree to which a community is ready to participate and succeed in eHealthcare adoption. Understanding readiness is a critical first step towards the successful adoption of eHealthcare (Justice, 2012).

2.4.4 Customer Readiness and Telemedicine Based Care

Nelson and Staggers,(2014) argue that numerous pilot studies have demonstrated that telehomecare technology may improve client outcomes through timely intervention and health crises intervention, thereby reducing return visits to hospitals and physician offices. In some instances, patients have to be trained on how to use the devices to avoid miscommunication. Advanced telemedicine involves patients being given the devices to take home and use them to monitor their health. In such cases, prior training is critical for the successful utilization of the devices. The patients must be trained properly on

what to do with the devices such as blood pressure and diabetes devices which require the patient to use them on a daily basis. The readiness of the patients to telemedicine care can be measured basing on the ability of the patient to perform various operations with the devices. However, challenges arise when the customers are not willing to take up the task and use the devices. There are those patients who prefer being attended to by a professional than doing it on their own. Such patients might end up making numerous visits to the hospitals to ensure that they get those services from professionals (Kamsu-Foguem & Foguem, 2014). An alternative to this would be to use a close associate of the patient, these could be the parents, children, and relatives. They can help in operating these devices to reduce the burden on the patient of having to visit the hospital for basic operations that can be achieved with the use of the devices. Telemedicine makes the dissemination of health information very efficient and effective (Kohnke, Cole & Bush, 2014). The technology is fast, accurate and without bias. Specialist can access, and retrieve the information at ease anytime anywhere. Telemedicine is the best way of improving rural health care access. Many recent studies have shown the advantages of telemedicine. It makes life easier for both patients and caretakers. It has a positive effect on both environmental and travel costs. It offers access to caretakers in remote areas and limits the time involved for a traditional consult, and it can assist in broadening medical education. By providing feedback to clients on their health status, they give details of their health conditions and educate them on their health needs and what they are required to do. In this case, it helps in creating more self-awareness and empowers the patients to be more health-conscious (Lin, 2012). In health care, especially in rural settings, most patients do not have the required skills to perform complex operations on the telemedicine devices. As a result, the technologies should be designed with simple features that make it easier for the

patients to perform basic steps and operations. This allows easy follow and feedback from the patients and constant and efficient information flow from one end user to the other.

2.4.5 Political Goodwill and Telemedicine Based Care

The implementation of telemedicine requires appropriate legislation which is often within the confines of the political space. In this regard, lack of political goodwill towards the improvement of health care sector could result in slow implementation of telemedicine in many countries. The political class can enact laws and develop policies that makes it necessary for health care facilities to improve their technology and enhance patient experience.

Governments as policy making organizations play a pivotal role in formulating regulations in the health sector. The contribution of governments is particularly important in developing countries where the public health system is usually the major provider of services. Government policies often have a significant impact on governing, financing and regulating the health sector in developing countries. Although policy makers in developing countries are aware of the benefit of e-health, for a range of reasons they are reluctant to include this tool in their ICT initiatives, this may be due to limited financial capability. Policy makers are more likely to spend limited resources on interventions that are known to produce health gains, such as sanitation, clean drinking water and vaccination rather than funding e-health projects (Palmas et al., 2010). An understanding of the benefits of e-health, current applications, technical requirements and ethical/legal aspects would enable health professionals to adopt this technique. On the other hand, policy makers must adopt an open minded approach to these new changes. Political will and commitment which often has been lacking in developing countries, are important elements in bringing about changes in these

societies. The willingness of policy makers to use ICT in health is important in integrating this tool in the health sector. The role of the WHO in promoting e-health globally has to be acknowledged. The WHO has recognized the need for e-health to address health issues in developing countries. It has also been instrumental in forming strategies, policies and standards for the utility of e-health (Palmas et al, 2010). ICT is fundamental to providing effective and efficient health services and systems. These technologies can improve workforce and work place efficiently and boost quality of care by reducing medical errors, reducing costs and improving safety. They provide networks and tools for learning, research and practice. They enable access to information, products and advice for disease prevention and management, and will be essential to the more personalized health and care in the future (Palmas et al., 2010)

2.4.6 Staff Attitude and Telemedicine Based Care

Attitude plays a big role in any implementation program. The more the staff are enthusiastic about a program, the higher the chances of success. Innovators must build the right attitude among the users by ensuring that the technologies are simple to understand, easy to use and highly effective in the management of patients (Zanaboni, Knarvik & Wootton, 2014). Low morale from the health car staff could ground the entire program of adoption of telemedicine. It is therefore, critical to embark on a training program to ensure that staff members are equipped with all the operational skills in which they can transfer the same knowledge and skills to the patients. The attitude of a user towards the usage of a technology is a critical component of the acceptability of a technology. One of the biggest mistakes made in the past is taking technology to a health care setting and expecting the physicians and the patients to learn on their own (Ketikidis, Dimitrovski, Lazuras & Bath, 2012). Whenever they experience challenges, they start developing cold feet towards the technologies. The

initial process involves the familiarization of the technology among the staff which involves rigorous training to ensure that they master every component of the devices. When users face difficulty in operating the machines, they get excessive exposure and are subjected to a lot of anxiety towards the technology which results in withdrawal. In most instances, the users walk away in frustration, and negative thoughts are projected towards the technology. A good learning environment, therefore, provide users with a better opportunity to change their perceptions, making it possible to embrace technology utilization. Complex technologies that require a lot of effort often creates negative perception from the employees. Also, technological limitations that come with the devices themselves further leads to more frustrations which eventually results in low uptake of telemedicine (Moores, 2012)Furthermore, every patient who is given any telemedicine device must be trained on how to use the device. Also, their caregivers must undergo the same training to ensure that there are adequate personnel to help them out when using the devices at their homes.

2.4.7 Equipment use and Telemedicine Based Care

The use of equipment has a greater impact on the adoption of telemedicine-based care. First, it is critical to understand the users before implementing such technologies. The primary users are the patients and the healthcare staff (Fadhil, 2018). In this case, the proper use of telemedicine equipment plays a big role in the implementation process. Prior training is important as it helps in familiarizing the users with the operational activities involved in the management of the devices. The benefit of mobile devices is not always limited to only increased access to information but also facilitate the changes in the character of learning modalities which bring positive impact in the health care. The devices, particularly the mobile devices, provide better opportunities for meaningful engagements thus enhancing positive interactions between the patients and

the physicians. Also, the basic fact that mobile devices are relatively cheaper makes it accessible to the lower market segments. The availability of these devices are affordable prices make it easier for those patients with low income to access the technology. The usefulness of new technologies is measured by various factors which include the ability of the devices to meet the intended purpose of enhancing communication and information sharing (Pai & Huang, 2011). In health care, especially in rural settings, most patients do not have the required skills to perform complex operations on the telemedicine devices. As a result, the technologies should be designed with simple features that make it easier for the patients to perform basic steps and operations. This allows easy follow up and feedback from the patients and constant and efficient information flow from one end user to the other.

2.5 Framework Design

Research shows that telemedicine is increasingly being used for purposes of consulting and/or carrying out remote medical procedures including examination and treatment Mayoka, Rwashana, Mbarika & Isabalija, (2012).In view of this, a number of applications are being developed and deployed in hospitals to support clinical medicine and medical information sharing through telecommunication links and the internet. However, with these developments, there have been a number of challenges with systems design and sustainability in developing countries. The telemedicine frameworks are very important in ensuring that the application of technology within the health sector is performed effectively without impacting negatively on the quality of service. Frameworks therefore, provide ways of adopting, implementing, and assessing technologies within the health sector. Further, these frameworks provide evaluation mechanisms to help in monitoring the progress of such technologies, a critical step

which ensures continuous improvement process in technology adoption in the health care sector.

The WHO, urges countries to develop strategies for proper design and implementation of e-health technologies since it is a cost-effective method of healthcare delivery (Blaya, Fraser, & Holt, 2010). Through adoption of telemedicine, governments would be able to benefit from services such as medical education, health surveillance, knowledge sharing and research.

2.5.1 Existing Telemedicine Framework Designs

Previously, a number of studies have been carried out with an aim of designing frameworks, models and/or theories explaining telemedicine implementation. Oladosu et al., (2009) developed a "context-aware mobile e-health framework", which was enhanced to provide semantic e-health services deployed via wireless mobile platforms in rural areas. Oladosu et al (2009 proposed a framework that does not go beyond mobile telephony in the use of telemedicine, issues such as video conferencing, e-mail and knowledge sharing are left out. Meanwhile, Mayoka et al., (2012) designed a framework for developing logically relevant e-health applications for rural South Africa with a social awareness perspective. It was noted that, the framework was very instrumental in building proto type e-health systems which allowed for synchronous and asynchronous communications between health centers in distant locations. However, taking a critical look at Mayoka et al., (2012) framework, one is left to think that it is more of a software development methodology than design framework. Kovacic, (2007) compared the telemedicine legislation development and the laws in the USA and Europe, and developed a telemedicine legislative framework for countries that did not have adequately defined telemedicine legislation by transferring best practices from countries that had developed legislation concerning telemedicine to

countries that were yet to adopt the technology. Luk, Ho and Aoki, (2008) Also developed a tele-consultation framework for Africa, which was built from existing literature. This framework is generally a good guide for the design of future tele-consulting systems since it addresses accountability, connectedness, and respect of the various actors in tele-consulting. Nevertheless, this framework concerns more on the ethical conduct of medical practitioners than medical applicability problems of telemedicine. Treurnicht, (2009) designed a decision support framework for telemedicine implementation in developing countries using a clinical-pull approach to ensure that the technologies that are developed addressed the needs of the patients. While this framework assisted telemedicine decision makers with a scientifically based needs assessment for decision making, it was mainly based on the principles of data warehousing design (Sharda, Delen & Turban, 2013).

2.5.2 Telemedicine framework in Developing Countries

As compared to developed countries, developing countries are still struggling to adopt Telemedicine technology because they do not have enough capital to implement the initiative. Based on previous considerations, it is suggested that the application of telemedicine in developing counties should be studied; analyzed and relevant criteria need to be put in place (Ryu, 2012). There is need to take into account the environmental, organizational, cultural, and economic peculiarities of the considered populations and countries. Most of the developing countries like in Africa face many challenges towards realization of a fully implemented telemedicine initiative. Other than inadequate capital, lack of knowledge on how the technology operates is also a challenge in developing countries.

2.5.3 Model for Assessment of Telemedicine (MAST)

This is a framework that is critical in the assessment of the value of telemedicine. The application of telemedicine in the health care sector always comes with different outcomes. For the innovators to produce the best telemedicine that is critical for making decisions in the healthcare sector, it became necessary to develop an assessment framework which help in evaluating the effectiveness of the technologies (Waegemann, 2010). MAST provides the relevant assessment framework which is crucial in fulfilling the objective of providing quality care services. The framework comes with three main steps which include the preceding assessment, multidisciplinary assessment, and the transferability assessment.

In the preceding assessment, the preceding considerations are the factors which lead to an organization adopting a new technology. In this context, it becomes crucial to evaluate the level of technology at the institution, on whether it can support the intended adoption. The second stage of multidisciplinary assessment involves the evaluation of the outcomes of the application of the technology. The assessment of the outcomes can be performed focusing on seven primary domains which include socio-cultural, ethical, and legal aspects, organizational aspects, patient perspectives, clinical effectiveness, safety, economic aspects, and health problem and characteristics of the application (Kohnke, Cole, & Bush, 2014). The final assessment concerns the transfer of results to other settings after successful application of the technology.

2.6 Theoretical Framework

The purpose of using theory is one of the fundamental aspects of a good research. Theoretical framework helps in underpinning the design, methodology, measures, interventions, and interpretation of the project proposal Momeyer et al., (2016). In this research thesis, several theories relevant to the use of telemedicine were described,

discussed, and connected to the typical research questions that were collected by the researcher from the field. These theories include **Normalization Process Theory and Technology acceptance model (TAM).**

2.6.1 Normalization Process Theory

May et al., (2018) defined Normalization Process Theory (NPT) as an explanatory model that helps managers, clinicians, and researchers understand various processes. Like all theories NPT is build up around a set of constructs-organizing ideas that represent human processes that really happen in the world. NPT is a sociological theory in the field of science and technology studies. The theory deals with the adoption of technological and organizational innovations, originally in the healthcare system (Finch et al., 2013). This theory originated from telemedicine research unlike other theories, which developed from other fields. With further technological advancement, this theory has developed to an extent that it has been termed as the general theory of innovation in health sector. Normalization of process theory is a complex concept, with a series of matrices that describes how the work is organized. The normalization process theory has been critical in the implementation of complex interventions within the health care systems. Understanding and evaluating the complex interventions is very crucial in the delivery of better healthcare services. The normalization process theory is good at identifying the factors which promote and inhibit the integration of complex interventions into the health care systems and programs. Furthermore, it explains how such interventions operate, with the main focus on ensuring that the interventions become fully embedded into the daily routines within the heath care (McEvoy et al., 2013). The theory, therefore, emphasizes on the work that persons and groups do to ensure that the intervention is completely normalized. The normalization process theory has four main components which include coherence, cognitive participation, collective

action, and reflexive monitoring. These components are in highly dynamic relationships and impact on the greater parts of intervention which include the structures, social norms and the organizational context.

Coherence is the sense-making work which individuals engage in when faced with challenges of operationalizing certain sets of practices. This construct has four components which include differentiation, communal specification, individual specification, and internalization. In differentiation, coherence makes it possible for the individuals and groups to understand the different sets of practices and distinguish them from each other (May et al., 2011). As for the communal specification, coherence specifies that people should work together as a group to achieve a common understanding on the shared aims, objectives and the expected benefits of the sets of practices. For the individual specification, coherence help individuals to understand their specific tasks and responsibilities within the set of practices. Finally, internalization is a component of coherence which allows individuals to understand the value, benefits and importance derived from the specific set of practices.

Cognitive participation, too, has four constructs which include initiation, enrolment, legitimation, and activation. For the initiation construct, it concerns most to the ability of the participants to drive a set of practices forward (Lloyd et al., 2013). For example, when setting up a small clinical service, this role can be left for a small group of managers to oversee the process. Within the enrolment construct, coherence help the participants to organize or reorganize themselves and together with other teams in order to have a collective responsibility in the implementation of new practices (Lloyd et al., 2013). Legitimation is a critical construct which ensures that the individuals involved understand and believe that it is right for them to get involved in the entire process. With the process of legitimation, it becomes easy to bring everyone on board and ensure

personal contributions are included in the process. Finally, the activation process is where the participants define the action and the procedures that are required to sustain a set of practices.

For the collective action, participants engage in operational work to enact a set of practices and this could be a new technology or complex healthcare intervention. Collective action has four constructs of interactional workability, relational integration, skill set workability, and contextual integration (May, 2013). The interactional workability implies the interactional work that individuals engage in with each other, with artefacts, and with other elements of a set of practices, when they seek to operationalize them in daily settings. For example, a key problem of telemedicine systems has been shown to be their negotiation by doctors and patients as they try to communicate complex clinical information each other over a videoconferencing link. The relational integration implies the knowledge work that people do to build accountability and also maintain a high level of confidence in a set of practices (May, 2013). The skill set workability implies the assignment of work which underpins the division of labor that is anchored on a set of practices as they are made operational in the real world. The contextual integration is more of the allocation of the different sets of resources and the execution of various protocols, policies and procedures.

The reflexive monitoring involves the appraisal work which individual perform to evaluate and comprehend the ways that a new set of practices impact on them and those around them. The component has four constructs of systematization, communal appraisal, individual appraisal, and reconfiguration (Finch and Rapley, 2013). In the construct of systematization, it could be critical for the participants to know and determine how the set of practices are useful for them and for others. This involves the work of gathering information in many different ways. The construct of communal

appraisal seeks to enhance the collaboration between the participants. In this context, the construct supports formal collaborations which help in the evaluation of the various sets of practices. The participants may use various means to work, drawing on a variety of experiential and systematized information.

The individual appraisal construct is where the participants within a new set of practices work as individuals to appraise the effects of the practices on them and the contexts in which they are set in. In this case, the construct allows individuals to express their personal relationships with new technologies and complex interventions (Ketikidis, Dimitrovski, Lazuras & Bath, 2012). Finally, the reconfiguration construct is where appraisal work by individuals or groups could translate to attempts to redefine procedures or even seek to modify the practices. This may also include changing the shape of the new technology in its entirety.

2.6.2 Technology Acceptance Model (TAM)

It is an information theory that models how users come to accept and use a technology. This model suggests that users use information technology in telemedicine mainly because of two reasons, perceived usefulness and the ease of use. The two concepts link one another with intention. Being concerned with only intentions instead of actual use is the limiting factor to this theory. Although many models have been proposed to explain and predict the use of the system, the Technology Acceptance Model has been the only one which has captured the most attention of the Information Systems community (Irfan et al., 2019).According to Turner, Kitchenham, Brereton, Charters and Budgen, (2009) Technology Acceptance Model was proposed in 1989 as a means of predicting usage. The model has been used to explain how the users come into terms with the adoption of new technologies in various sectors. The model focuses on three

main areas which include the perceived ease of use, perceived usefulness, and the attitude towards use.

i) Perceived usefulness

The perceived usefulness is associated with the ability of a technology to provide ease of access to the users. In this context, the technology should provide better access to different options, websites, graphics, and video simulations. The devices are avenues which provide greater opportunities to demonstrate processes and events within the health care setting (Holden & Karsh, 2010). Additionally, the devices provide opportunities to the patients to access learning content at any time, thus making it possible for individualized learning. The benefit of mobile devices is not always limited to only increased access to information but also facilitate the changes in the character of learning modalities which bring positive impact in the health care. The devices, particularly the mobile devices, provide better opportunities for meaningful engagements thus enhancing positive interactions between the patients and the physicians. Also, the basic fact that mobile devices are relatively cheaper makes it accessible to the lower market segments. The availability of these devices at affordable prices make it easier for those patients with low income to access the technology. The usefulness of new technologies is measured by various factors which include the ability of the devices to meet the intended purpose of enhancing communication and information sharing (Pai & Huang, 2011). Any technology can be modified to perform specific tasks that are relevant to the field in which the technology is adopted. With the technological advancement being witnessed globally, every technology is being invented with unique features that are meant to solve a certain problem. The perceived usefulness therefore, implies that the devices must have easy configuration and with better ways of solving unique challenges in the health care sector. In this context, there

is need to utilize the technology acceptance model which can be applied to telemedicine to provide a better approach to health care service delivery. The adoption of telehealth depends heavily on the attitude and the willingness of the human resource to adopt the technologies. When there is too much resistance from the human resource to adopt the technologies, it becomes extremely difficult to implement them. In this context, the health care setting must first embark on a training program of all users within the health care to ensure that they get acquainted with the technology. They will in turn train the customers on how they can operate their devices at home (Sohn et al., 2012). The resistance to adoption always comes when the human resource personnel believe that the technology will take away their jobs

ii) Perceived ease of use

The argument behind this construct is that technology must provide an easy way to use operating systems which use the hardware and the software components. Operating systems are always designed to provide better experience with technology, in this case, the systems must be highly defined and customized to fit the needs of the health care setting. Human resource personnel always aspire to use a technology that is less sophisticated and has non-complex elements that are easy to learn (Chow, Herold, Choo & Chan, 2012). Any complexity in the use of telemedicine discourages staff from adopting such technologies. Furthermore, it brings additional costs when it comes to training staff, as the process may take longer time than expected. In such instances, the ease of use is impacted negatively and such technologies might be abandoned despite huge investment in the purchase and installation. The perceived use of telemedicine shows that new technology models should provide platforms for easy learning and application among the health care staff to improve their morale and passion towards the technologies. All the challenges in the technologies must be addressed before the

adoption process to avoid any mishaps in the implementation stage which might discourage staff from use. The perceived ease of use does not only cover the ability for one to easily operate the devices, but also the ability of the devices to present information in a simpler manner (Gagnon, Orruño, Asua, Abdeljelil & Emparanza, 2012). In health care, especially in rural settings, most patients do not have the required skills to perform complex operations on the telemedicine devices. As a result, the technologies should be designed with simple features that make it easier for the patients to perform basic steps and operations. This allows easy follow and feedback from the patients and constant and efficient information flow from one end user to the other.

iii) Attitude towards use

The attitude of a user towards the usage of a technology is a critical component of the acceptability of a technology. One of the biggest mistakes made in the past is taking technology to a health care setting and expecting the physicians and the patients to learn on their own (Ketikidis, Dimitrovski, Lazuras & Bath, 2012). Whenever they experience challenges, they start developing cold feet towards the technologies. The initial process involves the familiarization of the technology among the staff which involves rigorous training to ensure that they master every component of the devices. Furthermore, every patient who is given any telemedicine device must be trained on how to use the device. Also, their caregivers must undergo the same training to ensure that there are adequate personnel to help them out when using the devices at their homes.

One of the best ways of enhancing positive attitude is by creating a good learning environment where individuals can engage with qualified personnel through trainings and learn to usage of the telemedicine devices. When users face difficulty in operating the machines, they get excessive exposure and are subjected to a lot of anxiety towards

the technology which results in withdrawal. In most instances, the users walk away in frustration, and negative thoughts are projected towards the technology. A good learning environment, therefore, provide users with a better opportunity to change their perceptions, making it possible to embrace technology utilization. Complex technologies that require a lot of effort often creates negative perception from the employees. Also, technological limitations that come with the devices themselves further leads to more frustrations which eventually results in low uptake of telemedicine (Moores, 2012). Innovators must therefore, resolve any limitations with the devices thus offering a viable and exciting option that would create meaningful learning experiences. Therefore, before mobile technologies can be adopted in any learning environment there is need to conduct scientific investigation, guided by an appropriate technology acceptance model with a view of identifying the factors that may hinder sustained acceptance of the technologies into the health care system.

2.7 Knowledge Gap in Literature Review

There is limited research on the relevance of Telemedicine. Due to the increasing changes brought by improved medical technology, there is increased expectation by users and patients on the level of activity in hospitals, which is not possible with the old procedures. Telemedicine like most other advanced information and communication technologies depend on complex technical and human infrastructure that operate both within discrete institutions and across organizational and geographic boundaries. According to Nelson and Staggers, (2014) who argue that as telehealth expands, further integration with informatics will continue. Telehealth encounters will be integrated into data repositories within PHRs and EHRs. Self-care data will also be integrated into data repositories for individuals and populations. As the global population increases, the supply and distribution of health care providers can be optimized using telehealth to

provide services regardless of the geographic location of those in need. Shortages in primary care providers and nurses for example, can benefit from redistribution of portions of clinical expertise using telehealth as the export mechanism. One of the biggest challenges is developing the best framework that helps in the adoption of telemedicine in standard hospital setting. The implementation and adoption of a good telemedicine requires a good framework that ensures there is a smooth transition from one set of practices to another without impacting negatively on the delivery of services. A good framework ensures that the transition process is effected in phases until a new technology or intervention is fully integrated into the system.

2.8 Conceptual Framework

Independent variables **Intervening Variable** **Dependent variable**

Adoption Framework

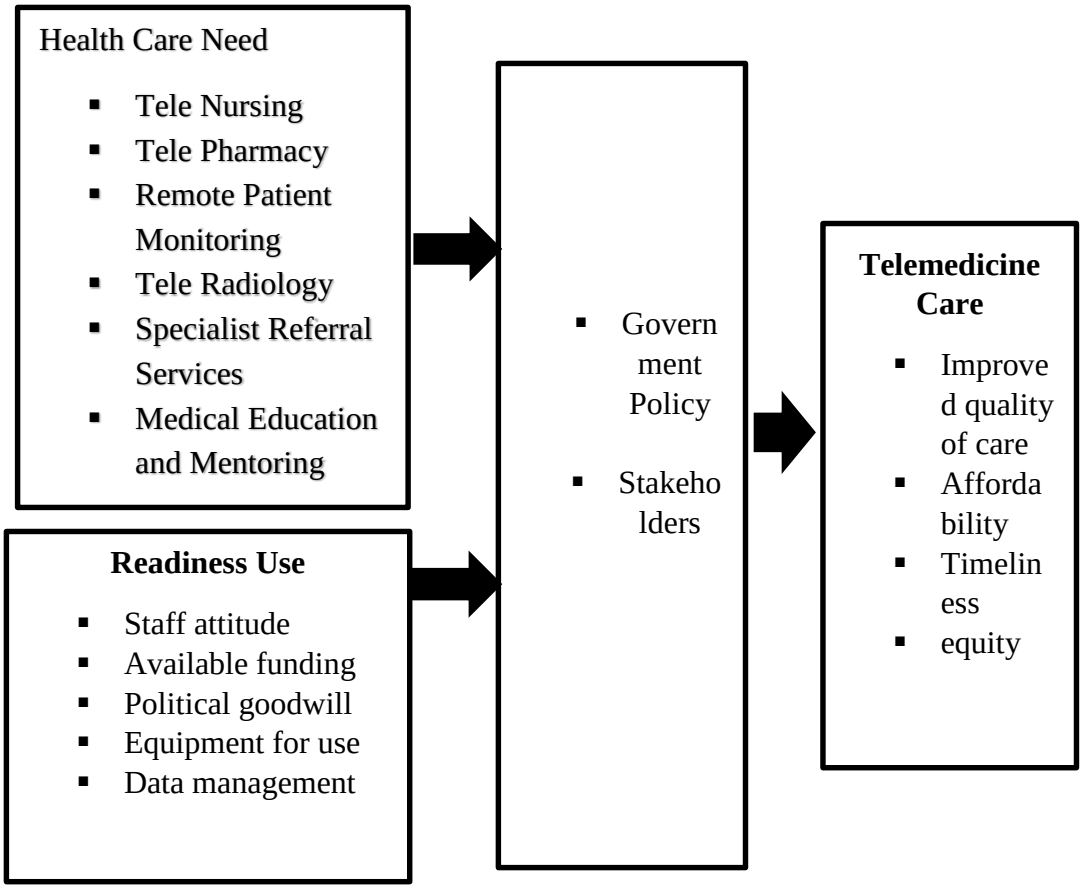

Figure 2.1: A diagram showing conceptual framework

Figure 2.1 demonstrates a conceptual framework showing the relationship that exists between adoption framework telemedicine care. From the diagram, Telemedicine Care depends on health care needs and readiness for implementation of telemedicine. In the above diagram, the current framework which borrows ideas from both the normalization model and the technology acceptance model, seeks to provide a platform in which health care managers can evaluate a new adoption and how well it fits the health care setting. The framework provides ways of evaluating the readiness to adopt a telemedicine technology and the healthcare needs that are likely to be affected by telemedicine. In this context, the framework furthermore provides the perceived

benefits of the success implementation of telemedicine, with a consideration of the factors which could affect adoption and implementation. In this framework, it is argued that with the right staff attitude, good political goodwill, availability of the equipment and proper funding, the areas of Tele-radiology, Tele-nursing, Tele-pharmacy and remote monitoring could be achieved and be enhanced through increased access time, improved quality and affordability.

Through Normalization Process Theory, several activities that promote telemedicine care can be accelerated by coming up with standard operating procedures (SOPs).Healthcare needs like; remote patient monitoring, direct patient services, specialist referral services, Tele radiology, Tele pharmacy and Tele nursing can be achieved by normalized procedures

Medical education and mentoring, can enable implementing partners to lay down structures, consider social norms that can motivate health workers embrace telemedicine. NPT states that, well trained staff provide opportunities as they work together as a team to achieve a certain goal. Once staff understand their specific tasks and responsibilities, adoption of telemedicine care

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes methodology used to examine healthcare needs for telemedicine care in Nandi County, to analyze the readiness status for telemedicine care adoption in Nandi County, to design a suitable telemedicine care framework in Nandi County.

The chapter further, covers research study area, sampling method, research design, data collection instruments, target population, data collection procedures, data analysis Validity and reliability of the research Instruments and ethical consideration.

3.2 Research Design

Cross-sectional study design was used to conduct this study. This research design was suitable for this study since data about healthcare needs and level of readiness favored comprehensive gathering of information on the critical care and readiness use of Telemedicine as a solution to healthcare problems in Nandi County. The information gathered is also generalizable to the entire population in examining healthcare needs for telemedicine, analyzing the readiness for telemedicine care and to design a suitable telemedicine care framework in Kenya

3.3 Study Area

This study was conducted in selected health facilities in Nandi County. The County has one county referral hospital and two sub-county hospitals. It also has six health Centres. Attached as an appendix is the Map of Nandi County.

3.4 Target Population

The target population comprised of healthcare workers who offer services to patients. The study targeted 100 healthcare workers offering services in the selected health facilities in Nandi County. There is a total of 140 GOK facilities spread across the County, as listed;

Level four facilities 3, Health centres 17 and Dispensaries 123.The study was conducted in the County referral hospital, Sub County hospitals and two Health Centers were involved in the study based on their high workload. The cadres are listed below.

Table 3.1: Available Clinical Staff for Selected Facilities in Nandi County

Doctors	5
Pharmacists	1
Pharmaceutical Technologists	5
Clinical Officers	15
Nurses	74
Total	100

Source: DHIS, Nandi County

3.5 Sampling Procedure

Stratified random sampling method was used to select managers and staff based on their ranks in the management level. The stratified random sampling technique was used because it does not provide biased grouping and it gives each participant an equal chance to participate and that the strata developed gave manageable groups.

This sampling technique gave each participant in every strata an equal chance of participating and that the data obtained can be generalized to the entire population.

3.5.1 Sample size determination

The samples size was calculated using Yamane formula for sample size: a simplified formula for sample size calculation with the assumption of a 95% confidence level and P=0.05 (Singh & Masuku, 2014).

$$n = \frac{N}{1 + N(e)^2}$$

Where the sample size is given by n, N represents the population size, and e stands for the level of precision.

N=100

e=0.05

n=N/ (1+N (e) ^2)

n=100/ (1+100(0.05) ^2)

n=100/1.25

n=80

n=80 health workers

The findings are generalizable to the population of the study

Table 3.2: Summary of Target Population and Sample Size

Respondents	Target	Sample Size	Percentage
Doctors	5	4	5
Pharmacists	1	1	1
Pharmaceutical Technologists	5	4	5
Clinical Officers	15	12	15
Nurses	74	59	74
TOTAL	100	80	100

Source: DHIS, Nandi County

3.6 Research instruments and data collection procedures

The researcher used a questionnaire to collect the data from the respondents. The questionnaire was divided into three sections. Section A collected demographic information of the respondents, section B collected information on health care needs for telemedicine care in Kenya and section C collected information on use of telemedicine.

3.7 Validity and Reliability of the Research Instruments

Data gathered was organized and checked for validity and consistency. Experts of research in Rongo University were requested to examine both face validity and content validity of the research instruments. Pretest of the research instruments was done in the neighboring Uasin Gishu County, in randomized selected health facilities, to check whether the instruments collect the required information. The pre-test achieved 10 successfully completed questionnaires from 10 respondents and the pre-test results were used by the researcher to evaluate the compatibility and the consistency of the instrument with the study requirements. The table with the correlation matrix for

convergent and divergent validity are shown in **appendix 2**. Cronbach alpha coefficients was used to assess the reliability of the research instrument, the Cronbach alpha coefficients for the independent and dependent variables are shown in **appendix 3**. The research items in the instruments were restructured, based on the outcome of the pre-test study in order for the instrument to collect the required information.

3.8 Data Analysis and Presentation

Categorization of data was done before entering the data into the Statistical Package for Social Sciences (SPSS) software version 20 for analysis. Descriptive statistics; frequencies and percentages was used to examine healthcare needs for telemedicine and to analyze readiness for telemedicine care. Data analyzed was presented using tables, pie charts and bar graphs.

3.9 Ethical considerations

The researcher sought for an introduction letter from Rongo University, a research permit was obtained from NACOSTI regulatory and ethics committee before conducting the research. The anonymity of the participants was protected by not indicating their names or those of their institutions so that information will not be traced back to individuals or their institutions. The researcher observed confidentiality and privacy of patients' information. The data collection exercise was done by the principal investigator hence consistency

CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSION

4.0 Introduction

This chapter presents results and analysis of data collected based on study objectives and research questions. The main purpose of the study was to examine healthcare needs for telemedicine care in Nandi County, to analyze the readiness status for telemedicine care adoption in Nandi County and to design a suitable telemedicine care framework in Nandi County. The researcher administered all the 80 questionnaires to the respondents, returning a 100% response rate.

According to Mugenda and Mugenda (2003), a response rate of below 40% is unreliable. A response rate of 40-50% is poor, 50%-60% is acceptable for analysis reporting, above 60% is good and 70% and above is rated very well. Therefore a response rate of 100% is rated very well.

4.1 Healthcare needs for Telemedicine Care in Nandi County

This section presents findings for Healthcare needs for direct patient care services, specialist referral services, medical education & mentoring and remote patient monitoring, Tele-nursing and Tele-pharmacy and Tele-radiology.

The findings reported in **Table 4.3** shows ages and gender of all the respondents. A total of 43 respondents fall between 20 and 30 years; 23 of them fall between 31 and 40 years while 14 respondents have their ages falling above 40 years. Also, 52 males and 28 females participated in the study, giving a total of 80 respondents.

From above data, it is evident that majority of the health workers who shared their views were below 40 years of age. The researcher therefore, concludes that the most productive group form the biggest team of human resource capacity for Nandi County to implement a strong Telemedicine framework.

Table 4.3: Age and Gender of the Respondent

Category		No. of Respondents (n=80)	Percent (%)
Age	20-30 Years	43	54
	31-40 Years	23	29
	Above 40 Years	14	18
Gender	Male	52	65
	Female	28	35

4.1.2 Specialist referral services and direct patient services need Levels

From **table 4.4**, total of 62 (77.5%) of the respondents supported that specialist referral services are critical with 36 (45%) of them strongly agreeing and 26 (32.5%) agreeing that these needs are critical. However, 9 (11.3%) of the respondents did not support the idea that these services are critical where 8 (10%) disagreed and 1 (1.3%) of the respondents strongly disagreed. Nine of the respondents too were not sure whether these services are critical or not, representing 11.3%.

With respect to direct patient care services, a total of 66 (82.5%) respondents supports that these services are critical, where 50 (62.5%) of them strongly agreed that these services are critical and 16 (20%) agreed. Nine respondents (11.3%) were not sure whether these services are critical or not, with five (6.3%) of the respondents perceiving these services are not critical.

Specialist referral services, involves a specialist trying to assist a general medical practitioner in rendering a diagnosis. This service involves a patient interacting with a specialist live, via remote control or may include the transmission of diagnostic videos or images to a specialist. In such instances, the use of technology helps in advancing the diagnosis, thus improving the quality of care among the patients. Specialist referral services have been on the rise due to increasing health complications among humans

(Mars, 2013). In this regard, it becomes critical to develop the best way of improving such services with telemedicine.

Based on the review above, 77.5% of the health workers strongly believe that specialist referral services is very critical to the delivery of health care services in the county, therefore supporting Mars argument. Telemedicine has been proven to increase access to timely and cost effective specialty services for patients who need urgent health information.

Table4. 4: Direct patient care services and specialist referral services

Category		**No. of Respondents (n=80)**	**Percent (%)**
Direct patient care services	Strongly Agree	3	4
	Disagree	2	3
	Not Sure	9	11
	Agree	16	20
	Strongly Agree	50	63
Specialist Referral Services	Strongly Disagree	1	1
	Disagree	8	10
	Not Sure	9	11
	Agree	26	33
	Strongly Agree	36	45

4.1.3 Medical education & mentoring and remote patient monitoring needs.

Table 4.5 shows the opinions of the respondents towards medical education and mentoring together with remote patient monitoring towards level of their criticalness as healthcare needs in Nandi County. Forty three (53.8%) of the respondents accepted that medical education and mentoring is a critical healthcare need. Fourteen (18.8%) of them were not sure and a total of twenty three (28.8%) disagreed with these needs.

Concerning remote patient monitoring, 36 (45%) respondents agreed that it is a critical healthcare need, 23 (28.8%) were not sure and 21 (26.3%) disagreed with it and hence pointed out that it is least critical.

Remote patient monitoring enhances the capacity for the physicians to treat more patients. As a result of more patients accessing care, it becomes easy to monitor various diseases due to timely diagnosis and proper care services.

Another benefit of the telemedicine in the remote patient monitoring is the fact that it offers patients invaluable assurance that someone is watching out for their health and wellbeing on a daily basis.

With their data being managed within the healthcare systems, it becomes easier for the physicians to monitor various patients on matters pertaining such activities as when to go for check-ups (Yellowlees et al., 2010).It is evident that, For Nandi County, medical education and mentoring is considered a critical element for the provision of telemedicine services .54% of the health workers believe that using devices to take vital signs and management of chronic diseases is of high priority.

Remote patient monitoring is another key area to be considered when it comes to the designing of the telemedicine framework.45% of the respondents believe that use of devices can be entrenched to improve patient seeking behavior.

Patients were also asked to briefly explain how telemedicine can help health workers attain continuous medical services in Nandi County and the following were the ways they suggested; Through health education conducted regularly; improves on effectiveness, affordability, efficiency and accessibility of the medical services as it is flexible; it is a cost effective and a cheaper way of learning; reduces patients' waiting time and queuing especially during consultations; it facilitates continuity of care to all

clients as it offers a daily access to telemedicine and that through research from the internet clients and attendants can be able to have access to current and up-to date information on their areas of practice. The patients are actually in agreement with health workers views that, telemedicine can promote continuity of care, quality and affordable services.

Table 4.5: Remote Patient Monitoring and Medical Education and Mentoring

Category		**No. of Respondents (n=80)**	**Percent (%)**
Remote patient monitoring	Strongly Disagree	9	11
	Disagree	14	18
	Not Sure	14	18
	Agree	18	23
	Strongly Agree	25	31
Medical Education and Mentoring	Strong Disagree	9	11
	Disagree	12	15
	Not Sure	23	29
	Agree	13	16
	Strongly Agree	23	29

4.1.4 Tele-nursing and Tele-pharmacy as healthcare needs

From **table 4.6**, it is evident that 41 (51.3%) of the respondents perceive that Tele-nursing is a critical healthcare need, 21 (26.3%) of them perceive it negatively that it is less critical while 17 (21.3%) respondents are not sure on the level of Tele-nursing as a healthcare need.

About Tele Pharmacy, 36 (54.5%) of the respondents perceive that it is critical, 19 (23.4%) think that it is less critical and 25 (31.2%) are not aware of the situation of Tele Pharmacy as a healthcare need.Tele Nursing, refers to the use of information technology in the provision of nursing services whenever physical distances exist between patient and nurse, or between any number of nurses. The types of telemedicine can be categorized as real-time or pre-recorded telemedicine. Examples of real time telemedicine include Tele-consultation, Tele Pathology and Tele Dermatology. From the data from health workers who participated in the study, 51% support the view that Tele-consultation being a priority area, 55% of the respondents also believe that Tele Pharmacy is critical to the delivery of services through provision of remote dispensing sites.

Tele Pharmacy is one way that many people living in remote areas will enjoy especially if they are unable to get basic experts in the pharmacy care thus reducing the cost of traveling to other places for the same services. Patients are also counseled, and drug administering is monitored from time to time thus ensuring the medicines are taking place (Hill et al, 2010).

Due to poor terrain in some parts of Nandi County, Hill et al argument that drug administering can easily be monitored is valid and can be accelerated to promote Tele Pharmacy services.

Table 4.6: level of Tele-nursing and Tele-pharmacy Healthcare Needs.

Category		No. of Respondents (n=80)	Percent (%)
Tele Pharmacy	Strongly Disagree	9	11
	Disagree	10	13
	Not Sure	25	31
	Agree	13	16
	Strongly Agree	23	29
Tele Nursing	Strongly Disagree	10	13
	Disagree	11	14
	Not Sure	17	21
	Agree	19	24
	Strongly Agree	22	28

4.1.5 Tele-radiology as an emergency healthcare need levels

It is evident from **figure 4.2** that more than 20% of all respondents perceive that Tele Radiology is a critical healthcare need, with less than 20% perceiving that it is least critical and more than 20% of the respondents are not sure. Though Tele Radiology has continued to impact positively the health care systems by improving diagnosis of various diseases from scanned images, 20% of the respondents believe it is critical when it comes to designing a framework for Telemedicine care in Nandi County.

One of the reasons as to why Tele-radiology is unpopular among the health workers is the inadequate number of radiologists in the county. Only 1 radiologist is available at the county referral hospital and the majority of the staff are radiographers. Therefore more specialists are needed to promote Tele Radiology awareness and use. In addition inadequate modern equipment is another challenge within the high volume facilities

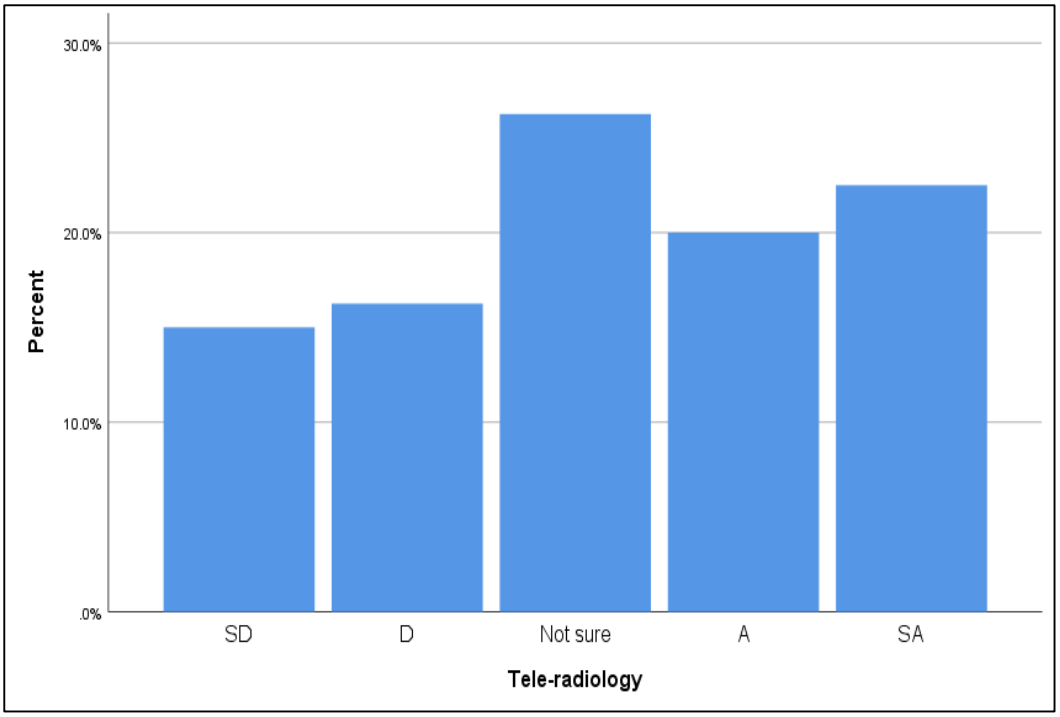

Figure 4.1: level of criticalness of Tele-radiology as a healthcare need .

In summary, the most suitable critical health care need in Nandi County is direct patient services (82.5 %) followed by special referral services and Tele Pharmacy which were rated at 77.5 % and 54.5 % respectively. Least critical healthcare need areas were medical education and mentoring (53.8%), Tele Nursing (51.3%), remote patient monitoring, (45%), Tele Radiology 20%. In conclusion, the county government can plan adequately for the three key areas-: direct patient services (82.5 %) followed by special referral services 77.5 % and Tele Pharmacy and 54.5% as discussed above.

4.2 Readiness Status on Adoption and Use of Telemedicine

This section presents information on the readiness on use of telemedicine in Nandi County with its importance, benefits of various healthcare specialties, Provision of telemedicine facilities and services in health stations within Nandi County and Technology & Practice readiness in Nandi County.

4.2.1 Responses from respondents on the readiness

A focused group discussion was conducted with the patients about the readiness towards the use of telemedicine and the respondents were asked whether they are aware of the existence of telemedicine technology. Most of them indicated that they have an idea about telemedicine.

They were also asked to conduct a discussion on whether telemedicine technology should be implemented in Nandi County.

Most patients think that the timing is right to implement telemedicine in Nandi County because it is time saving in terms of long queues witnessed in most of the outpatient departments; its convenience of seeking care within one's comfort, saves money in terms of transport and it improves the quality of care because of wider consultations with experienced consultants

4.2.2 Various healthcare specialties readiness

a) **Tele Nursing and Tele Pharmacy**

Table 4.7 shows a cross tabulation of the attitude of respondents on benefits of Tele-nursing and Tele-pharmacy specialties in readiness on use of Telemedicine in Nandi County.

From **table 4.7**, 42 (52.5%) of the respondents believe to a large extent that Tele Pharmacy is beneficial to telemedicine, 11 (13.8%) believe to a moderate extent and 2 (2.5%) believe to a small extent. However, 25 (31.3%) of the respondents perceive that it is not beneficial.

About Tele Nursing, 28 (35%) of the respondents agree that it is beneficial to a large extent, 20 (25%) to a moderate extent and 7 (8.8%) to a small extent. Twenty five (31.3%) of the respondents believe that Tele Nursing is not beneficial

From the findings, over 60% of the respondents believe that the county is ready for Tele Pharmacy services because of availability of technical staff to scale it up. Nevertheless, over 60% of the respondents do believe that the infrastructure for Tele Nursing is also available. One of the key advantage is that clients are already aware of Telemedicine services like Tele Consultation and Tele Obstetrics.

Table 4.7: Readiness status in Tele Nursing and Tele Pharmacy specialties

Category		**No. of Respondents (n=80)**	**Percent (%)**
Tele Nursing	To a small extent	7	8.75
	To a moderate extent	20	25
	Not at all	25	31.25
	To a large extent	28	35
Tele Pharmacy	To a small extent	2	2.5
	To a moderate extent	11	13.75
	Not at all	3	3.75
	To a large extent	42	52.5

b) Remote monitoring and Tele-radiology

From **table 4.8**, 22 (27.5%) of the respondents believe to a large extent that remote monitoring is beneficial to telemedicine, 13 (16.3%) to a moderate extent and 15 (18.8%) to a small extent. However, 18 (22.5%) of the respondents perceive that it is not beneficial and 12 (15%) of them are not aware.

About Tele Radiology, 26 (32.5%) of the respondents agree that it is beneficial to a large extent, 14(17.5%) to a moderate extent and 7 (8.8%) to a small extent. Twenty

three (28.8%) of the respondents believe that Tele-radiology is not beneficial while 10 (12.5%) of them are not aware.

Through a focused group discussion conducted to some selected patients, they were asked to have a discussion on importance of taking a patient vital signs remotely and they observed that it is possible to take vital signs remotely which will in the long term help patients with unknown chronic illness like hypertension and diabetes.

The researcher too sought to find out how telemedicine can be used to assist patients with serious medical conditions as compared to traditional patient admission in a hospital set up. The respondents perceive that this technology enables quick service to client on medical records e.g. the faster the patient is attended or communicated of severity of condition the faster he/she can get help.

Communication across departments was also noted by the respondents as a benefit of telemedicine. The person attending to the patient will have access to a broad ways and approaches to manage a particular condition effectively through the input of other medics elsewhere. Patients will also be able to get guidelines on how to handle emergencies and crisis at localities rather than getting to hospitals for management.

Table 4.8: Attitude of respondents on benefits of remote monitoring and Tele Radiology.

Category		No. of Respondents (n=80)	Percent (%)
Tele Radiology	To a small extent	7	8.75
	To a moderate extent	14	17.5
	Not at all	23	28.75
	To a large extent	26	32.5
	Not aware	10	12.5
Remote Patient Monitoring	To a small extent	15	18.75
	To a moderate extent	13	16.25
	Not at all	18	22.5
	To a large extent	22	27.5
	Not aware	12	15

4.2.3 Technology and Practice readiness in Nandi County

The researcher sought to establish the level of readiness in technology and practice in the health facilities in Nandi County. The respondents were asked whether patients interact with clinicians in telemedicine.

They responded that it is done through consultations with the Doctor via phone calls while at home. They argued that they are comfortable communicating while at home as it also saves time. They viewed that such consultations make the doctor to understand the situation better.

Bandwidth includes elements of telecommunication technology, including information transmission and connectivity to move and store digital data. Infrastructure and telecommunication architecture in some geographic areas may limit use of Tele-health

applications and have direct implications for access to and delivery of healthcare. This is particularly problematic for rural, isolated and undeserved regions (Nelson & Staggers, 2014).The availability of 4G telecommunications wireless network within the county implies that Telemedicine can work well. Consistent high speed internet is a key factor when it comes to technology readiness and the researcher can conclusively attest to that.

In comparison, a focused group discussion was also done with some selected patients on whether they interact with clinicians through this technology of telemedicine.

Quite a number responded that they interact through reminders via phone calls and internet services. In general, their comments point to the readiness that will boost telemedicine care in the county.

4.2.4 Other technologies to solve healthcare problems in Nandi County

The researcher also sought to find out from the respondents the use of other technologies in health facilities within the County and the discussions in **tables 4.7** and **4.8** below captures their responses.

Table 4.9 shows when other technologies to solve healthcare problems started in Nandi County. Most of the respondents (46.3%) cited that other technologies started recently in Nandi County in solving healthcare problems, 13.8% also suggests so while 40% of the respondents perceive that other technologies are not used in Nandi County to solve healthcare problems.

In times of emergencies, the researcher sought to establish whether there are hotlines to handle such cases and most of the respondents viewed that such services are available and they are done by enhancing quick service rendered to emergency cases; through effective referral systems and getting patients to hospitals by an ambulance. From the

comments above, over 50% of the respondents agreed that there is a hotline to handle emergency

services. Hospital managers have been provided with a smart phone to aid in mobilizing for emergency response from relevant specialist teams within the county

Table 4.9: Other technologies to solve healthcare problems in Nandi County

Category		**No. of Respondents (n=80)**	**Percent (%)**
Contribution towards technology advancement in the selected area	Natives	25	31.25
	New Comers	55	68.75
Local Authority Implementing Telemedicine	Kapsabet	59	73.75
	Nandi Hills	18	22.5
	Others	3	3.75

4.2.5: Effectiveness and efficiency readiness in using telemedicine.

It is evident from **table 4.10** that 40 (50%) of the respondents observed that it takes up-to 10 minutes to attend to patients using telemedicine in the County Referral hospital as compared to 15 (18.8%) of the respondents who observed that it takes up-to 10 minutes to attend to patients without using telemedicine.

A total of 37 (46.3%) of the respondents also observed that it takes between 10 and 60 minutes to attend to patients using telemedicine as compared to 33 (41.3%) of them who believes that it takes the same time to attend to patients without using telemedicine in the County Referral hospital.

It is also noted that from **table 4.10**, three (3.8%) of the respondents observed that it takes more than one hour to attend to patients using telemedicine as compared to 8 (10%) of their counterparts who believe that it takes more than one hour to attend to

patients without using telemedicine. From the observation above, it is evident that telemedicine technology can reduce patient waiting time, hence making them satisfied with service provision at their convenience.

Table 4.10: Time taken to attend to patients using telemedicine.

Category		**No. of Respondents (n=80)**	**Percent (%)**
Attendance Without Using Telemedicine	Within 10 minutes	15	18.75
	10 to 30 minutes	33	41.25
	30 to 60 minutes	24	30
	More than 1 hour	8	10
Attendance Using Telemedicine	Within 10 minutes	40	50
	10 to 30 minutes	30	37.5
	30 to 60 minutes	7	8.75
	More than 1 hour	3	3.75

On the focused group discussion conducted to some patients on whether the use of Telemedicine could be the solution to healthcare problems in Nandi county, all of them supported this technology as it will help eliminate corruption in hospital care, timely decisions will be made and that it creates awareness to a large audience.

4.2.5 Provision of telemedicine facilities and services in stations within Nandi County

a) Affordability

Table 4.11: indicates that most of the respondents (40) corresponding to 50% observes that telemedicine facilities are fairly available in their work stations. Also, 8.8 % of

them noted that they have adequate facilities, 17.5% observes that the facilities are inadequate while 23.8 % of the respondents reported that telemedicine facilities are not provided.

Some selected patients were also grouped and told to make discussions on the availability of facilities in Health facilities supporting telemedicine within the County. They observed that some facilities are available to some extent especially defaulter tracing has been ongoing especially people leaving with HIV & AIDS (PLWHAS), pregnant women get reminders to prepare them come up with a birth plan to avoid last minute complications during delivery and that ANC mothers sometimes get reminders to encourage them attend 4th ANC visit which is very important.

Table 4.11: Affordability of telemedicine facilities

Category	Frequency	Percentage
Adequate	7	8.8
Fairly	40	50.0
Inadequate	14	17.5
Not provided	19	23.8
Total	**80**	**100.0**

b) Administration services in the Stations within Nandi County

Distribution of administration services within stations in Nandi County Majority of the respondents as shown by the greatest proportion in **figure 4.3** indicate that the administrative services are fairly good. However some of the respondents as shown by the smallest proportion in figure 3 noted that the administrative services are inadequate.

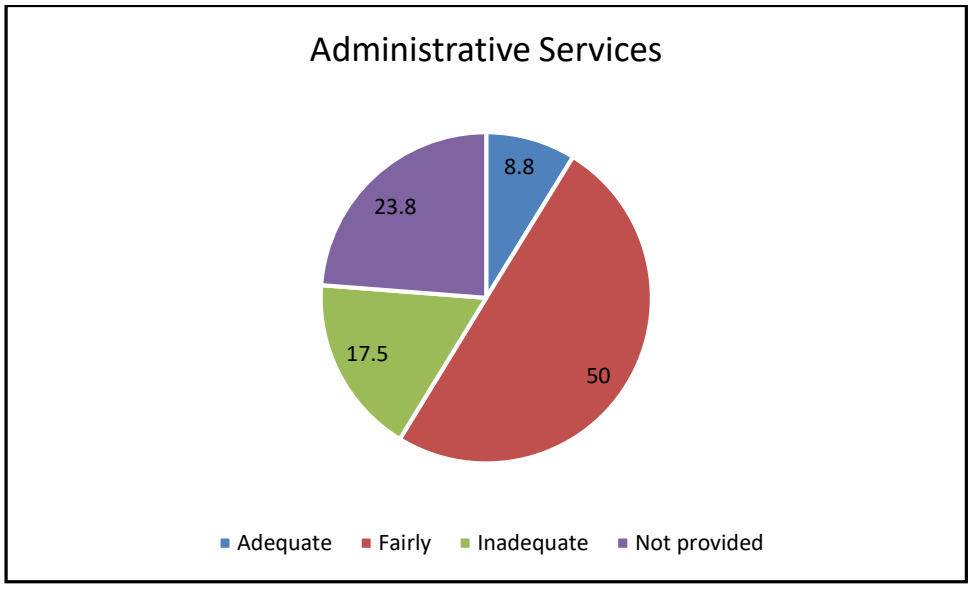

Figure 4.2: Administrative services are conducted in Nandi County

c) Training

Table 4.12: shows that majority (32.5%) of the respondents reported that training services are offered to a fair extent, 10% observe that the training services are adequate and 27.5 % of them observe that the training programmes are inadequate while 30 % of them noted that the training services are not provided.

From the data above, it is evident that more than 50% of the respondents believe that health workers need further training on the concept of telemedicine. Therefore, the findings above supports the view that, once the staff are well sensitized, they will be highly motivated when it comes to telemedicine services.

The adoption of Tele-health depends heavily on the attitude and the willingness of the human resource to adopt the technologies. When there is too much resistance from the human resource to adopt the technologies, it becomes extremely difficult to implement them.

In this context, the health care setting must first embark on a training program of all users within the health care to ensure that they get acquainted with the technology. They will in turn train the customers on how they can operate their devices at home (Sohn et al., 2012). The resistance to adoption always comes when the human resource personnel believe that the technology will take away their jobs.

Table 4.12: Training services offered in Nandi County

	Frequency	Percentage
Adequate	8	10.0
Fairly	26	32.5
Inadequate	22	27.5
Not provided	24	30.0
Total	**80**	**100.0**

Research

Research services offered by Nandi County as a telemedicine service. Forty percent of the respondents as shown in figure 4 reported that research services are fairly offered in health facilities in the County, with below 10 % saying that these services are adequately offered, and above 20% claiming that such a services are inadequate or not provided. Telemedicine can provide a platform for health workers to link with other professionals globally to promote research in the medical field.

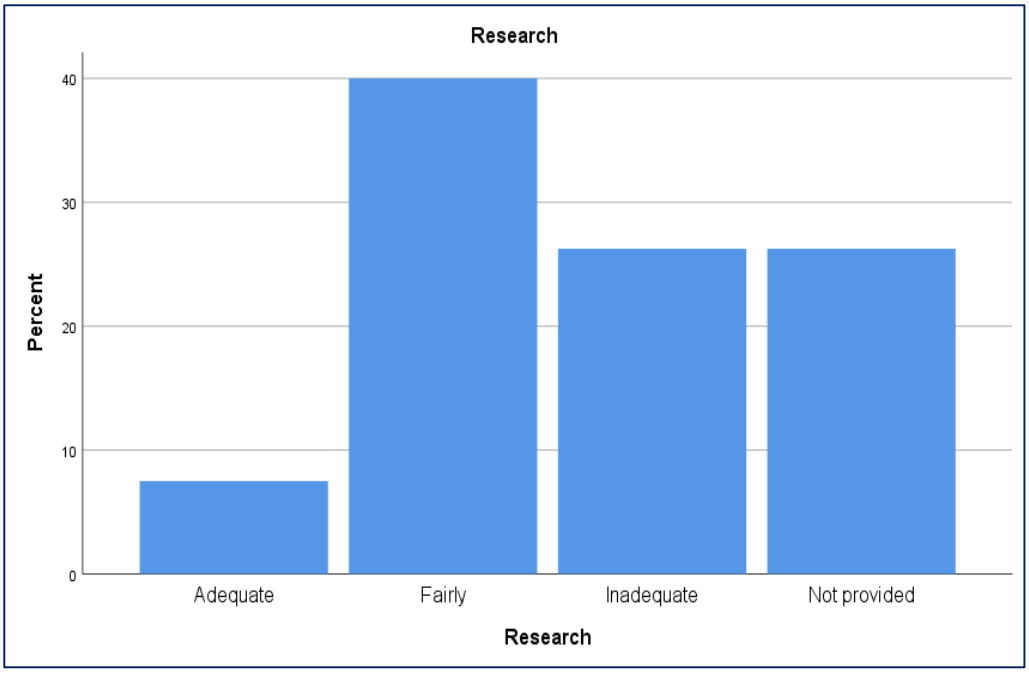

Figure 4.3: Extent of research services offered in health facilities in Nandi County.

d) Quality Health care

As shown on **table 4.13**,indicates that majority of the respondents (42.5 %) believe that quality healthcare services are fairly offered in the health facilities in Nandi County. 13.8 % argue that these services are adequately offered while 28.7 % and 15.0 % cite that such a services are inadequate and not provided respectively. In 2005, the World Health Organization came up with the Global Observatory for eHealth to survey the importance of ICTs in healthcare sector and patients' well-being. According to the survey, telemedicine has proved to be of great benefit to the WHO member states in solving healthcare problems, which includes accessible, cost-effective and high-quality healthcare services. In view of the findings, improved quality of care becomes a priority area globally, Nandi county included.

Table 4.13: Quality healthcare services

Category	Frequency	Percentage
Adequate	11	13.8
Fairly	34	42.5
Inadequate	23	28.7
Not provided	12	15.0
Total	**80**	**100**

e) Medical referral services

From **table 4.14**, majority of the respondents (47.5 %) believe that medical referral services are fairly offered in the health facilities in Nandi County. 13.8 % argue that these services are adequately offered while 21.3% and 17.5.0 % cite that such services are inadequate and not provided respectively.

Table 4.14: Availability of Medical Referral Services in Nandi County

	Frequency	Percentage
Adequate	11	13.8
Fairly	38	47.5
Inadequate	17	21.3
Not provided	14	17.5
Total	**80**	**100.0**

4.2.6 Local authority responsible for implementing health technology

Table 4.15 shows a summary of the Local authority responsible for implementing health technology in the selected areas within Nandi County, as perceived by the respondents, and who contributed to technology advancement.

The data shows that 59 (73.8%) of the respondents believe that Kapsabet is the local authority responsible for implementing health technology and mostly as it is presently the county headquarters, new comers have contributed towards technology advancement. 18 (22.5%) of them believe that Nandi Hills is the local authority responsible for implementing health technology. 24 (30%) of the respondents perceive that natives have contributed towards technology advancement.

The researcher also sought to find whether there has been telemedicine technology in the localities within Nandi County. Some of the respondents observed that this

technology exists and observed that private company radiology technology dynamics contributed to the implementation of telemedicine.

Table 4.15: Local Authority Implementing Telemedicine

Category		No. of Respondents (n=80)	Percent (%)
Contribution towards technology advancement in the selected area	Natives	25	31.25
	New Comers	55	68.75
Local Authority Implementing Telemedicine	Kapsabet	59	73.75
	Nandi Hills	18	22.5
	Others	3	3.75

4.2.7 Plans to implement telemedicine in Nandi County

Most of the respondents (41.3 %) as shown in table 14 believe that no plans have been put in place to implement telemedicine in Nandi County, with 22.5 % of them reporting that plans are have been implemented to an extent of 40 %, 20 % saying that 20 % of the plans have been implemented, 13.8 % argue that 60 % of the plans have been implemented and 2.5 % believe that over 60 % of the plans have been implemented.

In the situations where the respondents believe that no plans have been put in place, they cited lack of adequate resources (especially finances) by the County government to implement telemedicine.

Negative attitude towards this technology was noted by other respondents to be another cause. Some respondents feel that lack of knowledge and low willingness by the County Government Officers to implement telemedicine are also other reasons why no plans are there towards the implementation of telemedicine.

Table 4.16: Implementation Readiness of Telemedicine in Nandi County

Rate	Frequency	Percentage
0 %	33	41.3
20 %	16	20.0
40 %	18	22.5
60 %	11	13.8
Over 60 %	2	2.5
Total	**80**	**100.0**

a) Cost readiness

The researcher wanted to establish whether the county government has budgetary provision to support telemedicine. Most of the respondents suggested that the County government has such plans and that Ministry of Finance and that of Medical services at the County Level, coordinated by the two CECs, are responsible for ensuring funds are spent properly

b) Data Management Readiness

The researcher also found out that most of the respondents believe that telemedicine data can easily be accessed if security measures are put in place and that the adoption framework can help in patient privacy.

c) Legal Framework Readiness

In dealing with ethical issues, it was found out that there are measures already put in place.

d) Political Goodwill

In this study, it was found out that both National and County assemblies have the capacity to pass relevant bills to support telemedicine foundation structures as reported by majority of the respondents. Some of them suggested that awareness should be created to sensitize all stakeholders within the County.

4.2.8 Focused Group Discussion thematic areas

Most respondents were aware of Telemedicine as technology and they believed it would help address healthcare problems in the county. They were therefore of the opinion that telemedicine should be adopted by the county health office in all public hospitals. For example;

Respondent 1 “sometimes i think, at this modern times, technology is everything”

Respondent 2 “most people know advantage of using telemedicine, very timely indeed”

Furthermore, the respondents felt capturing patient vital signs remotely was important.

The respondents indicated that seeking care took between 1-2 hours but believed telemedicine would reduce care seeking duration to between 10-30 minutes. They believed telemedicine can offer critical care to patients in a timely manner compared to traditional care giving at the hospitals. For example

Respondent 3 “what puts me off at a government facility is time taken between services”

Respondent 7“When i’m unwell, i use my phone to consult my doctor”

The respondents believed the technological infrastructure that would support telemedicine is available but not adequately.

Respondent 11 “Most patients have smart phones, hospitals too have Wi-Fi”

4.3: Adoption Framework for Telemedicine Care

This framework is derived from the findings of health care needs and readiness use, as discussed in section 4.1 and 4.2.

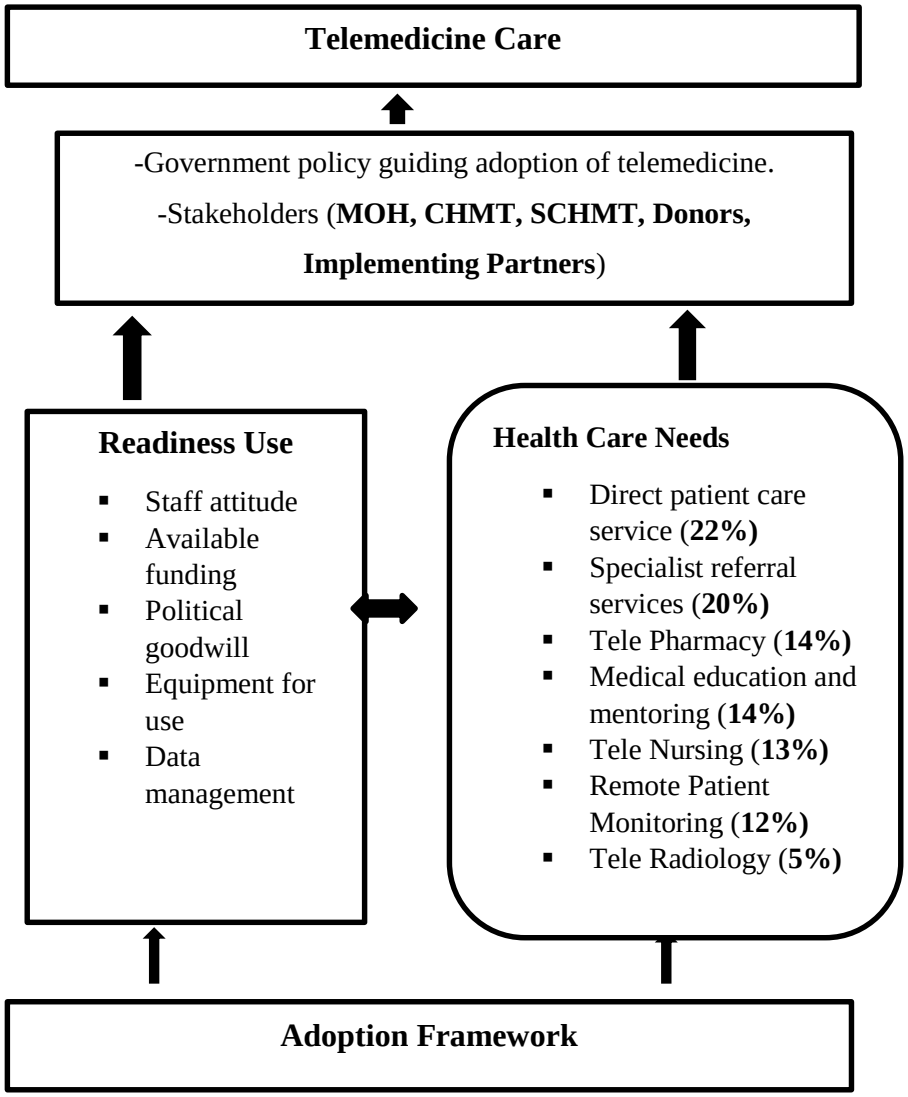

Figure 4.4: An adoption framework for telemedicine care in Kenya

From **figure 4.4** above, it is evident that an adoption framework is dependent on all systems that work effectively. As explained by both normalization process theory (May et al, 2018) and technology acceptance model , readiness status, healthcare needs, telemedicine based infrastructure and well trained health workers form part of the enablers of telemedicine care adoption. The model has outlined areas to be considered as priority; direct patient care services; such as, sharing audio, video, and medical data

between a patient and a health professional. The shared data can be for use in rendering a diagnosis, treatment plan, prescription or advice. The direct patient care services have been enhanced by the use of telemedicine by ensuring that patient satisfaction and loyalty is maintained at all times.

In the literature review, though it was demonstrated that telemedicine has been in existence in Kenya, the researcher felt that an adoption framework should be considered to guide in its implementation in order to provide healthcare organizations with strategic benefits. The study further interrogated various studies to ascertain previous success on telemedicine care. It was noted that, all variables must be working coherently and the relevant telemedicine based infrastructure put in place. As indicated on the conceptual framework, all indicators influenced by telemedicine policies and stakeholder participation, work towards successful adoption of telemedicine care. Improving health service coverage and health outcomes depends on the availability, accessibility, affordability, timeliness, equity and capacity of health workers to deliver quality people- centered integrated care.

According to Turner, Kitchenham, Brereton, Charters and Budgen, (2009) Technology Acceptance Model (TAM) proposed in 1989 as a means of predicting usage. The model has been used to explain how the users come into terms with the adoption of new technologies in various sectors. The model focuses on three main areas which include the perceived ease of use, perceived usefulness, and the attitude towards use. The perceived ease of use does not only cover the ability for one to easily operate the devices, but also the ability of the devices to present information in a simpler manner.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter gives a summary of the findings of the study, an adoption framework for Telemedicine care, it also presents conclusions, recommendations and suggestions for further research.

The study sought to examine healthcare needs for telemedicine care and to analyze readiness status and use of telemedicine in Nandi County and design a framework for Nandi County. In the research methodology, the study applied cross-sectional design to gather both qualitative and qualitative data.

The target population involved 80 individual health workers and 2 focused group discussion (FGD) that comprised of 8-12 clients or patients. Stratified random sampling techniques were used for the health workers .The qualitative data was analyzed using descriptive statistical analysis while qualitative data was analyzed by grouping and summarizing into clusters.

5.2: Summary of the findings

It was found out that, direct patient care services, specialist referral services, Medical education and mentoring, remote patient monitoring, Tele-nursing, Tele-pharmacy and Tele-radiology are critical healthcare needs for telemedicine care and hence these services are necessary in the health facilities within Nandi County.

Information regarding these services was gathered from all the respondents and most of them rated that these services were critical. They strongly agreed and some agreed with the developed items concerning these services. The most suitable healthcare need in Nandi County is direct patient services where 82.5 % of the respondents perceived that it is a critical health care need. Special referral services and Tele-Pharmacy were also rated at 77.5 % and 54.5 % respectively as critical healthcare needs.

The respondents who were mainly clinical staff, were also asked to briefly explain how telemedicine can help health workers attain continuous medical education services in Nandi County and they suggested that it improves on effectiveness, affordability, efficiency and accessibility of the medical services as it is flexible and time saving. They also argued that telemedicine facilitates continuity of care to all clients as it offers a daily access to telemedicine and through research, clients and attendants can be able to have access to current and up-to date information on their areas of practice. Based on these findings, an adoption framework telemedicine care therefore is a necessary service within all facilities in Nandi County.

Concerning the level of readiness on use of telemedicine in Nandi County, information regarding benefits of various healthcare specialties, technology and practice readiness, provision of telemedicine facilities and services in stations within the County and local authority responsible for implementing health technology, plans to implement telemedicine in Nandi County, data management readiness and legal framework readiness and Political Goodwill to support telemedicine were all analyzed comprehensively.

Most of the respondents supported the adoption framework for telemedicine care within the County, as the researcher sought to find out how telemedicine can be used to assist patients with serious medical conditions as compared to traditional patient admission in a hospital set up.

The respondents perceive that this technology enables quick service to client on medical records e.g. the faster the patient is attended or communicated of severity of condition the faster he/she can get help. Communication across departments was also noted by the respondents as a benefit of telemedicine.

The person attending to the patient will have access to a broad ways and approaches to manage a particular condition effectively through the input of other medics elsewhere. Patients will also be able to get guidelines on how to handle emergencies and crisis at localities rather than getting to hospitals for management. Plans are underway towards telemedicine as pointed out by most respondents.

Generally, results for healthcare needs and readiness status and use of telemedicine informed the researcher on the priority healthcare needs when designing an adoption framework on telemedicine care, the researcher noted that direct patient services was the most popular with health workers at 82.5%. And the unpopular at 20% being Tele-radiology.

The county government of Nandi can therefore empower Kapsabet County Referral hospital with the telemedicine technology infrastructure to link other health facilities for ease of service delivery. When it is fully set the doctors can also connect with global experts in case of complicated health conditions.

Availability of smart phones within the health facilities and high speed internet can help in setting of teleconferencing platform. Nelson & Staggers (2014) are in agreement with above statement. They argued that; direct patient services involved, sharing audio, video, and medical data between a patient and a health professional.

The shared data can be for use in rendering a diagnosis, treatment plan, prescription or advice. Also, telemedicine has continued to enhance patient outcomes by promoting compliance of treatment plans and the medication adherence. In view of the above statement, Telemedicine lowers the cost of care and also reduces the rate of readmissions.

5.3 Conclusion Based On the Findings

Through the research, it has been demonstrated that, the data obtained on healthcare need for telemedicine care and the level of readiness on use of telemedicine in Nandi County indicate that these services, Direct patient care services, specialist referral services, Tele-pharmacy, medical education and mentoring are critical and the county facilities are adequate to sustain it.

Further, it was also noted that, the county government has budgetary provision to support telemedicine since most of the respondents suggested that the County has plans to support it and that Ministry of Finance and that of Medical services at the County Level, coordinated by the two CECs, are responsible for ensuring funds are spent properly and as budgeted. The level of awareness is quite encouraging at all levels. Majority of the health workers who participated in the study are well informed of the benefits of integrating Telemedicine in the provision of health care services. In addition to that, clients seeking health services within the selected facilities are also well informed about the existence of Telemedicine technology and they are ready to embrace it fully.

Generally, the respondents felt that infrastructure for adoption are available in the county. They argued that majority of the people have smart phones, laptops, computers and some level four hospitals have high speed internet, Wi-Fi was also counted to support adoption framework for telemedicine care. The researcher also found out that most of the respondents believe that telemedicine data can easily be accessed if security measures are put in place and that the introduction of telemedicine will help in patient privacy. In dealing with ethical issues, it was found out that there are measures already put in place.

Lastly, it was also observed that the county and national government should embrace telemedicine technology. This will help change poor health seeking behavior currently

being witnessed in many facilities, and that investing in telemedicine technology will help solve major healthcare problems in terms of human capacity and infrastructure and full realization of universal health coverage (UHC).

Based on these findings, before scaling up telemedicine, there are many hurdles to be overcome, including administrative, technological and regulatory ones. Both national and county government's leadership, working in partnership with stakeholders to provide guidance, and also relevant policies are key and important for the success of telemedicine.

Through the literature review, it was demonstrated that apart from its advantages, telemedicine has major limitations which include inaccessibility to e-health to the masses. It was also noted that, it limits the treatment of emergency patients except (First Aid) surgical patients & clinical patients.

5.4 Recommendations Based On the Findings

Health care needs for Telemedicine implementation are key priority areas for the country. Direct patient care services, specialist referral services, Tele-pharmacy, medical education and mentoring are ranked most popular respectively in that order by the health workers. There is need for the stakeholders to develop a strategic plan for a national roll out. Majority of the respondents believe that both National and county government can scale up budgetary allocations for the specific purpose of adoption of Telemedicine care.

In terms of readiness adoption, human resource capacity and availability of facilities can act as a baseline for up scaling of Telemedicine. Health workers should continuously be trained on use of available technologies to enable accelerated services delivery. Availability of high speed internet, accessibility of smartphones in majority of households can also provide a stronger basis for considering Telemedicine as a better

option when solving health problems. Proximity to Moi Teaching and Referral Hospital in Eldoret which was part of the initial health facility selected as a pilot site by the government is a bigger motivation for Nandi County to ride on availability of medical consultants deployed at the national facility. For telemedicine to be successful, it is important to note that the respective sites are adequately resourced in terms of equipment, training, staff, telecommunications, and support.

Lastly, stakeholder involvement is key when it comes to sustainability of telemedicine in the health sector. This includes taking advantage of the high level of awareness in the county when embracing the value of technological advances.

5.5 Suggested Areas for Further Research

The researcher recommends further studies on integration of telemedicine to strengthen continuous medical education for health workers.

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APPENDICES

Appendix 1: Consent and Study Questionnaire

I am Sammy Amdany, a postgraduate student at Rongo University, department of informatics and information science. This questionnaire is meant collect data on an adoption framework for telemedicine care; a study of Nandi County. You have been chosen as a respondent to give your views and comments. This will be treated with confidentiality since no name or identity number will be required. I therefore request you to join me; can we proceed……?

(Check all that apply)

Section A: Background Information

Name of the respondent (optional)……

Job title…… Questionnaire No…….

Station of work …….....Gender 1. Male 2 Female

Age 1. 20-30 Years 2. 31-40 Years 3. Above 40 Years

Section B: Healthcare Needs for Telemedicine Care in Kenya

Listed below are some of the healthcare needs areas. In your opinion which of the following is the most critical healthcare need area. Assign rank appropriately by indicating your view on the most critical to least critical.

1. **SD 2. D 3. Not sure 4. A 5. SA**

SNo.	Healthcare needs areas	Rank	Describe your reason of choice of ranking
A	Specialist referral services		
B	Direct patient care services		
C	Remote patient monitoring:		
D	Medical education and mentoring		
E	Tele-nursing		
F	Tele-pharmacy		
G	Tele-radiology		

Section C: Adoption Readiness on Use of Telemedicine

(i)Attitude, Knowledge/Practice (Skill)

1. Taking a patient vital signs remotely is important?

   Yes ☐ No ☐
2. Teleconsultation can save patient waiting time?
   Yes ☐ No ☐
3. Briefly explain how telemedicine, can help health workers attain continuous medical education----------

4. Rate the benefits of the following specialties in a scale of1-5;

    1. To a small extent 2. To a moderate extent 3. Not at all
    4. To a large extent 5. Not sure

Category	**Scale**
a. Tele Nursing	
b. Tele Pharmacy	
c. Tele Radiology	
d. Remote Monitoring	

5. Which Tele Pharmacy services are available to you as a service provider?

1	Drug therapy monitoring	
2	Patient counseling	
3	Prior authorization and refill authorization for prescription drugs	
4	Remote monitoring	

6. Are you aware of the existence of telemedicine technology?

    Yes ☐ No ☐

If your answer above is yes, do you think the technology should be adopted in this County?

Yes ☐ No ☐

7. How fast can this technology be used to assist patients with serious medical conditions compared to traditional patient admission in a hospital set up?.....

8. According to your view, do you think the use of Telemedicine could be the solution to healthcare problems in this County?

   (a) Yes ☐ (b) No ☐

9. Do you think human resource capacity building could play a role in adoption of Telemedicine in the County?

   Yes ☐ No ☐

10. If "Yes" what role can it play?

    (a) Administration ☐ (b) Research ☐

11. The use of Telemedicine is associated with both negative and positive effects. Do you think the positive effects outlays the negative effects ?

    (a)Yes ☐ (b) No ☐

(ii)Technology/Practice Readiness Adoption

12. Do you think patients interact with clinicians through this technology?
    Yes ☐ No ☐
13. If yes please clarify……..

14. In times of emergencies, do you have a hotline to handles such cases?
    Yes ☐ No ☐
15. If yes how does it work? Briefly explain…….

16. Do you monitor patients in intensive care unit remotely?

    Yes ☐ No ☐

    a. If "Yes" are you the one in charge of multiple ICU patients at the time?

       ☐ Yes No ☐

    b. If "No" could you wish to have that technology in this County?
    Yes ☐ No ☐

c. Does each ICU system that you monitor have a mechanism for power backup in case of an emergency?

Yes ☐ No ☐

17. When did the County government start using other technologies to solve healthcare problems ?

1. A long time ago ☐ 2. Recently ☐ 3. None of the above ☐

18. Do the current facilities in the County support Telemedicine Technology?

(a) Yes ☐ (b) No ☐

If "No" who do you think is responsible for ensuring the technology is supported?

(a) County Government ☐ (b) National Government ☐

20. Is there a provision for pre-recorded tele-obstetrics or teleconsultation?

☐ Yes ☐ No

21. Do you have remote dispensing sites in the county?

☐ Yes ☐ No

22. Is it possible to digitally produce, transmit and display images to be viewed and interpreted for diagnostic or consultative purposes by a radiologist?

☐ Yes ☐ No

23. Do you have devices that can be used to remotely capture BP, glucose or Weight?

☐ Yes ☐ No

24. Do you have a hotline for responding to emergency referrals in the county?

☐ Yes ☐ No

25. How long does it take to attend to patients in the County Referral hospital?

(Tick where applicable).

1. Within 10 minutes. ☐

2. Between 10 to 30 minutes ☐

3. Between 30 minutes to 1 hour ☐ 4. More than one hour. ☐

26. If you could be using Telemedicine, how long could it take to attend to patients in the County Referral hospital?

(Tick where applicable).

o Within 10 minutes. ☐

o Between 10 to 30 minutes ☐

o Between 30 minutes to 1 hour ☐

o Others. ☐

27. Do you think telemedicine infrastructure are available for all health facilities?.....
....

28. How would you rate the provision of telemedicine facilities and services in your station of work based on the specified criteria below? Tick where applicable

Services	**Adequately**	**Fairly**	**Inadequately**	**Not provided**
Affordability				
Administration				
Training				
Research				
Quality HealthCare				
Medical Referrals				

29. Which is the local authority responsible for implementing health technology in the area?

1. Kapsabet ☐ 2. Nandi Hills ☐ 3. Others ☐

30. in your opinion who has contributed most towards the technology advancement of this area?

Natives ☐ Newcomers ☐

31. Has there been telemedicine technology in this area? Yes ☐ ☐ No

If yes, what contributed to its implementation of these plans...If no, what do you attribute to this?……

32. Have the plans been implemented for Telemedicine use? ☐ Yes ☐ No

If the plans are not implemented, what do you think are the reasons for this?.....

If the plans are being implemented, what has been the extent of implementation of such plans?

1. 0% 2. 20% 3. 40% 4. 60% 5. Over

(iii) Cost Readiness

32. Do you think the county government has budgetary provision to support telemedicine?.....

33. Who is the responsible person for ensuring funds are spent properly……

(iv) Legal Framework Readiness

34. Are there measures in place to deal with ethical issues that may arise?.....

35. In your opinion, do you think there is a legal framework to support telemedicine?……

(v) Data Management Readiness

36**.** Do you think telemedicine data can easily be accessed?……

37. In your own view do you think data privacy is guaranteed?.....

(Vi) Political Goodwill

38. Do you think both national and county assemblies have the capacity to pass relevant bills to support telemedicine foundation structures……
……

Thank you for participating!!!

Appendix II: Correlation matrix for Convergent and Divergent Validity

	HealthCare Needs	Readiness Use	Telemedicine
Tele Nursing	0.647	-0.169	0.329
Tele Pharmacy	0.532	-0.099	0.239
Remote Patient Monitoring	0.564	0.032	0.289
Tele Radiology	0.647	0.054	0.323
Specialist Referral Services	0.668	0.146	-0.028
Medical Education and Mentoring	0.553	0.035	0.127
Staff attitude	0.307	0.531	0.303
Available funding	0.307	0.569	0.303
Political goodwill	0.091	0.853	0.123
Equipment for use	0.255	0.739	0.404
Quality of care	0.367	-0.12	0.507
Affordability	0.412	-0.191	0.589
Timeliness	0.418	0.147	0.492
Equity	0.377	0.129	0.602

Appendix III: Cronbach's Alpha Reliability coefficients for Independent and Dependent Variables

Variable	No. of Items	Cronbach's alpha
HealthCare Needs	6	0.7412
Readiness Use	4	0.7167
Telemedicine	4	0.7301

Appendix IV: Focused Group Discussion Guide

(FGD for: Clients.)

I am Sammy Amdany, a graduate student at Rongo University, department of informatics and information science. This guide is meant to collect data on adoption framework for telemedicine care; a study of Nandi County. You have been chosen as respondents to give your views and comments. This will be treated with confidentiality since no name or identity number will be required. I request you to join me in this very important discussion; Can we proceed……?

Section A: Readiness on Use of Telemedicine

(i)Attitude, Knowledge/Practice (Skill)

1. Are you aware of the existence of telemedicine technology?
2. If your answer above is yes, do you think the technology should be adopted in this County?
3. According to your view, do you think the use of Telemedicine could be the solution to healthcare problems in this County?

(ii)Technology/Practice Readiness

4. Do you interact with clinicians through this technology?
5. Do the current facilities in the County support Telemedicine Technology?
6. How long does it take to attend to you in this health facility?
7. If Telemedicine could be used, how long could it take to attend to patients in this facility?

Thank you for participating!!!

Appendixs V: Introductory Letter from Rongo University

RONGO UNIVERSITY

OFFICE OF THE DEAN

SCHOOL OF GRADUATE STUDIES

Tel. 0771349741 P.O. Box 103 - 40404
RONGO

Our Ref: **MHI/6702/2015** **Date:** Tuesday, August 6, 2019.

The Chief Executive Officer,
National Commission for Science, Technology & Innovation,
off Waiyaki Way, Upper Kabete,
P.O Box 30623-00100,
Nairobi-KENYA.

Dear Sir,

RE: RESEARCH PERMIT FOR MR. AMDANY SUMUKWO SAMMY-MHI/6702/2015

We wish to inform you that the above person is a bona fide graduate student of Rongo University in the School of Information, Communication and Media Studies pursuing a Master of Science in Health Informatics. He has been authorized by the University to undertake research titled; ***"A Framework for Telemedicine Care in Kenya: A Study of Nandi County".***

This is, therefore, to request the commission to issue him with a research permit to enable him proceed for field work.

Your assistance to him shall be highly appreciated.

Thank you.

RONGO UNIVERSITY
THE DEAN
06 AUG 2019
SCHOOL OF GRADUATE STUDIES
P. O. BOX 103 - 40404, RONGO

Dr. Edward Anino
DEAN, SCHOOL OF GRADUATE STUDIES

Copy to: Vice Chancellor
Deputy Vice Chancellor (Academic and Student Affairs).
Dean, Information, Communication and Media Studies
HoD, Information Science

Appendix VI: Permit from NACOSTI

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **587777**

Date of Issue: **09/September/2019**

RESEARCH LICENSE

This is to Certify that Mr.. Sammy Amdanyi of Rongo University, has been licensed to conduct research in Nandi on the topic: A FRAMEWORK FOR TELEMEDICINE CARE IN KENYA:A STUDY OF NANDI COUNTY for the period ending : 09/September/2020.

License No: **NACOSTI/P/19/1257**

587777

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

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THE SCIENCE, TECHNOLOGY AND INNOVATION ACT, 2013

The Grant of Research Licenses is Guided by the Science, Technology and Innovation (Research Licensing) Regulations, 2014

CONDITIONS

1. The License is valid for the proposed research, location and specified period
2. The License any rights thereunder are non-transferable
3. The Licensee shall inform the relevant County Governor and County Commissioner before commencement of the research
4. Excavation, filming and collection of specimens are subject to further necessary clearence from relevant Government Agencies
5. The License does not give authority to tranfer research materials
6. NACOSTI may monitor and evaluate the licensed research project
7. The Licensee shall submit one hard copy and upload a soft copy of their final report (thesis) within one of completion of the research
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Appendix VII: Administrative Map of Nandi County