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Knowledge, Attitude, and Use of Telemedicine among Health Care Professionals in Federal Medical Center, Bayelsa State, Nigeria

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Abstract

Background: Telemedicine systems are essential in addressing the shortage of competent medical specialists as well as the availability of healthcare delivery in underdeveloped nations. However, the question is whether medical professionals would use this technological advancement, which has improved medical practice everywhere. The study aims to evaluate the attitude, knowledge and usage of telemedicine services among healthcare personnel in Bayelsa State.
Method: 150 clinicians at Federal Medical Centre (FMC), Yenagoa, were chosen in a cross-sectional descriptive study employing a standardized questionnaire. Statistical analysis was performed on the collected questionnaire data using SPSS, Chi-square, and Pearson correlation.
Results: According to the findings of this survey, there were 150 respondents in total, most female. Furthermore, the majority of responses were nurses. Moreover, most responders had 6 to 10 years of work experience. Again, 23.3% of respondents had high awareness of telemedicine services, compared to 69.3% who had moderate understanding and 7.3% who had low awareness. The mean score of all categories was more significant than the standard mean score of 0, indicating that a large proportion of participants had a favourable attitude response towards telemedicine. According to the survey, most study participants do not deliver telemedicine services.
Conclusion: In conclusion, while a large majority of respondents had strong knowledge and a positive attitude towards telemedicine, more needs to be done in the areas of use and awareness for the technology to be fully implemented.

Keywords: Knowledge, Attitude, Telemedicine and Healthcare Professionals.

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Background to the Study

Telemedicine is the provision of healthcare services where access to healthcare is a significant barrier by healthcare professionals using technologies for communication for the exchange of trustworthy information for the diagnosis of illness, prevention, and treatment, as well as continuing education, evaluation, research for medical personnel, all intending to improve people's and communities' health (Ryu, 2012).

The phrase "telemedicine," was adopted in the 1970s and translated to "at a distance or remote healing," defines *telemedicine* as using information and communication technology (ICT) to enhance client/patient results by providing access to treatment and medical data (Strehle et al., 2006). According to the World Health Organization (WHO) *telemedicine* is "the interchange of accurate data and information for disease diagnosis, prevention and treatment by healthcare providers employing information and communication technology and tools where access is a major problem." (WHO, 1998).

Furthermore, the primary goals of telemedicine are to provide medical decision support by exchanging data and information between healthcare practitioners, to eliminate geographical barriers by linking clients or consumers who are not present physically in the same area, and to improve medical results by allowing consumers to control their care (Horsch et al., 1999).

Since telemedicine incorporates new technical breakthroughs that responds to and adapts to the revolving health requirements and situations of communities, it is an open and growing science, as illustrated by several definitions. Some people distinguish between telehealth and telemedicine, with the latter encompassing providing care by all healthcare professionals, such as nurses, chemists, and others, and the former referring specifically to physicians. However, telehealth and telemedicine are synonymous terms with the same meaning. There are four main components of telemedicine. One of its primary goals is to provide medical assistance. Second, it tries to break down geographical barriers by bringing together people physically in different places. 3. It calls for deploying a wide range of ICT tools. Fourth, it is designed to improve people's health (WHO, 1998).

By facilitating access to medical expertise, telemedicine helps lessen geographic disparities in diagnosis, treatment, and clinical care. A survey from 2009-2010 in far-flung regions of the Brazilian state of Minas Gerais found that teleconsultations can reduce referral rates by 80.8 per cent and transportation expenditures by 45.5 per cent (Alkmimet al., 2012). Numerous other studies have revealed that telemedicine can significantly reduce healthcare expenditures, minimise wait times and promote the effectiveness of using health resources (Jueet al., 2017).

We refer to these disparities in health as "health inequalities." Health inequalities exist across the population and between different social categories, are unfair, and may be avoided (National Health Service, 2020).

Numerous studies have demonstrated a direct correlation between socioeconomic factors and an individual's health. According to research, sixty-seven low- and middle-income nations account for 87 per cent of premature mortality caused by non-communicable diseases (WHO, 2017), this statistic demonstrates the disparities between the health status of high-income and low-income countries (HICs). Health disparities exist not just between continents but also within individual nations, for instance, the WHO notes that although making up only around

13 per cent of the United States population, African-Americans account for most of all new HIV infections. Using mobile phones, laptops and several other gadgets, healthcare practitioners can treat, examine, diagnose, and evaluate patients' health needs wherever they are (WHO, 2010). However, due to the unique telemedicine difficulties these nations experience, there is debate over whether or nottelemedicine exacerbates health inequality in poor nations with limited resources (Combi et al., 2016).

Healthcare Resources in under-developed nations and middle-income countries often need to be adequate and geographically unequal, especially between rural and urban areas. The internet has spread to nearly every country in Africa. Internet access is ubiquitous in African capitals, with 53 out of 54 countries having it (Kamsu-Foguem et al., 2014). Telemedicine in developing nations has helped equalize access to medical care. First, it closes the urban-rural divide, bringing dermatology and other specialized care to even the most out-of-the-way places in low-income countries (Bagchi, 2006). Technology has also helped with timely disease detection, increased access to primary health information and education, and better disease management through teleconsultations (Woodend et al., 2008), lowering the cost of healthcare services overall. Telemedicine offers opportunities for research and education worldwide through online courses, and biomedical databases for doctors and other medical professionals (Conde et al., 2010).

By facilitating access to a second opinion, tele-expertise has decreased the likelihood of medical mistakes (Dharmar et al., 2013), (Kamsu et al., 2014). Finally, telemedicine allows room for providing health care services in the comfort of one's home, which is particularly useful in geriatric medicine and for managing long-term illness (Gagnon et al., 2006).

It is impossible to emphasize how telemedicine has narrowed the healthcare gap between industrialized and underdeveloped nations. Opportunities and different telemedicine programmes have shown that telemedicine has the ability to save the failing medical sector in impoverished nations and poor nations with scarce resources (Latulippe et al., 2017).

Some of the most recent developments on the African continent include WE CARE in Nigeria, Frontline SMS by Medic Mobile in Mali, Africa teledermatology initiative in Botswana (Kamsu-Foguem, MDNet by Vodafone in Ghana and the Weltel in Kenya.

Health disparities between telemedicine users and nonusers may be exacerbated by socioeconomic inequalities within the population of LMICs (Latulippe et al., 2017), even though telemedicine has been found to improve users' access to healthcare even in LMICs. In nations with limited resources, the proportion of the population living below the poverty line is more significant. Disparities in income, race/ethnicity, literacy, and other socioeconomic issues prevent certain people from accessing telemedicine services.

According to (Neter et al. 2012), the vast majority of telemedicine services, also known as eHealth, call for a reliable internet connection, specifically 4G, in order to function correctly. This contributes to the emergence of new health disparities. However, according to the United Nations (2015), only 35% of people living in underdeveloped nations are thought to have access to the internet. This number drops to fewer than 2% of those living in highly impoverished nations such as Guinea, Somalia, Burundi, and Eritrea. Additionally, the cost of an internet membership in poor nations with limited resources is significantly higher than in wealthy nations. To put this into perspective, an individual in Europe would spend only 1% of their monthly salary on 1GB of data, but an individual in Africa would spend almost 18%

of their income. 2017 report published by The Alliance to Save Money on Internet Access. Even though it has been demonstrated that mHealth can improve outpatient treatment, particularly for long-term conditions, a sizeable portion of the population of LMIC still needs mobile devices advanced enough to gain access to these mHealth services. This is a barrier that prevents mHealth from being implemented. The expansion rate of each country's mobile user base is slow, despite several African countries having extremely high mobile coverage rates. This indicates that a sizeable percentage of individuals will never be able to use mHealth services such as online consultations, diagnostic testing, and medicine prescriptions. In contrast, a considerably smaller percentage of people will always have access to these resources. As a direct consequence, there is an even more enormous disparity in the community's health. In addition, English and French are two of the few languages commonly used on the internet. Language barriers make it difficult for medical professionals in different countries to share information and collaborate on projects. Literacy rates are notably low in third-world countries. Even if numerous telemedicine services may be accessed, it is possible that many people will not be able to use them since they are only proficient in their native language. According to (Latulippe et al. 2017), the process of implementing and making use of telemedicine is significantly more straightforward and more economical than that of traditional medical care. Recent graduates from medical schools in developing nations would launch a telemedicine business rather than establish or work in a traditional hospital.

The widespread anticipation that local communities may be served remotely via advancements in telemedicine such as tele-surgery, tele auscultation, and tele-radiography shows that telemedicine may aid the migration of medical professionals. This growing dearth of healthcare staff is already restricting access to skilled physicians in some regions, and one direct impact of this shortfall is the overcrowding occurring in the few local health institutions with adequate resources.

Another drawback of telemedicine is that it mainly treats patients with long-term, non-communicable ailments such as skin, the heart, and wounds. Hersh et al. (2006) suggest that this could exacerbate health inequities in low-income countries. Infectious and communicable diseases remain the major causes of mortality in poor nation with limited resources, especially in rural regions with poor sanitation and hygiene practice, despite non-communicable illnesses being the primary health challenge of the twenty-first century worldwide (Mathers et al., 2017). This is especially true in places where basic amenities like clean water and soap are scarce.

Telemedicine is one technology that has made it possible for people in remote regions to receive better medical treatment. More people can now access medical treatment because of advancements in telemedicine. Telemedicine is one area that is seeing a rise in importance thanks to advances in information and communication technology. One alternative term for telemedicine is "telehealth." Recent developments in science and technology have enabled the delivery of medical care to people in a wide range of geographic areas. It is used to help people get the medical attention they need (Bashshuret al., 2000); this is due If the patient and the doctor are physically far apart. In a word, it is a means by which people can access medical data and care via remote means, such as the internet. (Kim et al., 2010).

Those with health needs in rural and underserved areas can benefit from telemedicine since it enables them to receive medical care from a distance. One technological advancement that

allows for more convenient remote medical care is telemedicine. The widespread need for medical care, and the restricted availability of it in rural and metropolitan areas, motivate the development of telemedicine. Since it is not a regular part of traditional treatment, it has yet to reach the widespread awareness it deserves (Weiss, 2008). Because of this, it is not apparent.

Successful implementation of telemedicine technologies depends on users' awareness of and capacity to work around these constraints. Knowledge, attitude, and acceptance on the part of healthcare professionals are some of the most significant issues facing telemedicine technology. In tackling these hurdles and accelerating the adoption of innovative technology, a thorough understanding of the elements that influence clinical staff's acceptance of telemedicine services in medical field is essential (Kim et al., 2010).

In reality, telemedicine's future viability heavily depends on healthcare practitioners' education and outlook. A fundamental obstacle to the universal telemedicine's adoption is users' need for knowledge, expertise, training, and other factors, including technical competence, initial costs, and worries about reimbursement (Judi et al., 2009).

However, the development and implementation of telemedicine depend on healthcare practitioners having an in-depth understanding of the technology (Hu et al., 2002). It is certain that when medical practitioners learn more about telemedicine, they will develop a more positive outlook. They will feel more comfortable using this technology as a result. Therefore, if professionals advocate for a modern technology's use, more people will have confidence in the technology's usefulness, and a more optimistic outlook will be realised (Levy et al., 2013).

According to Cramp's research published in "Principles of Telemedicine: a review and Introduction to the History of Technology" (Dargahi, 2005), professional acceptability and, most crucially, our healthcare clientele is critical to the future of telemedicine. Briefer wait times, reduced patient travel to clinics, decreased dependency on hospitals and other medical facilities, and lower total expenses are just a few advantages telemedicine offers our present healthcare system. Another key advantage is the increased efficiency of all medical treatments. Some of the disadvantages of telemedicine include the need for an initial investment in equipment and setup, the absence of third-party payment, medical malpractice difficulties, and so on (Crump, 1995).

Countries with poor medical infrastructure, limited resources, and a shortage of qualified medical professionals may benefit more from deploying telemedicine (Khalifehsoltani et al., 2010).

Finding novel and inventive approaches to aid in attaining healthcare goals has become necessary with the development of contemporary medical care systems and the increasing need for skilled surgeons and doctors. El-Mahalliet al. (2012) advanced the idea of implementation of telemedicine as a practical method of spreading accessible, high-quality medical treatment.

Telemedicine has the potential to be especially useful in countries with inadequate healthcare infrastructure, few resources, and a shortage of trained medical experts (Khalifehsoltani et al., 2010).

Because of the progression of contemporary medical care systems and the increasing demand for skilled physicians and surgeons, it has gotten critical to create one-of-a-kind and creative

strategies to assist in accomplishing healthcare objectives. El-Mahalliet al. (2012) called for telemedicine use as a means to increase access to high-quality medical treatment for a more significant number of individuals. Telemedicine is still mostly unheard of in the developing world, even though it is all the rage in the wealthy world. According to Leu et al. (2000), properly using telemedicine in the medical sector can address universal issues, such as the availability of cost-effective and high-quality medical delivery. For telemedicine to fully realized potential, it is crucial to cultivate positive attitudes towards it among patients and those in the medical sector. Research shows that 65% of mobile device users have installed at least one medical application. According to McGillicuddy et al. (2013), users are receptive to electronic monitoring of their well-being and the concept of having their health in their hands.

Telemedicine and e-health are in their infancy in the underdeveloped world, say (Shittu et al. 2007). In contrast, the avanced world continues to reap the benefits of modern technology through improved online record-keeping and remote monitoring of chronic health concerns. Research conducted in Libya found that just 39% of doctors there thoroughly comprehend telemedicine, while 12% need to familiarise themselves with it (El Gatitet al., 2008).

The healthcare industry has significantly benefited from the development of telemedicine, information technology, e-health, and telehealth over the past few decades (Bashshur, 2002). The advent of new technologies has brought about shifts in every industry. Modern advanced technologies have imparted the development of medicine and medical services (Bashshuret al., 2009).

As a result, a new subfield of medicine has emerged in which doctors, hospitals, clinics, and insurance and finance experts work together in a digital setting to enhance healthcare equity and quality while decreasing costs. There is enormous potential for increasing the efficiency and efficacy of medical institutions by implementing telemedicine (Ryu, 2009).

It has been determined that telemedicine has the potential to alleviate medical problems in developing countries by facilitating the transfer of healthcare knowledge from hospitals, universities, and other academic institutions to rural areas with limited access to healthcare professionals, high healthcare costs, and limited resources (Wamala et al., 2013).

Innovations in healthcare delivery employing mobile technologies like cell phones, email, video conferencing, and other applications for telemedicine and telehealth are precious in underserved locations. Telemedicine is the practice of using information and communication technology to facilitate medical services remotely. Telehealth is utilised to provide support for patient, professional health-related education, public health, and health management where consumers are geographically separated from one another (Ryu, 2012) (Wootton, 2001). Telehealth and telemedicine are essential in patient-centred medical services in diagnosing, managing, and future treatment planning chronic diseases (Alaboudiet al., 2016).

There are many obstacles to the widespread adoption of telemedicine, especially among physicians and other health professionals, and these obstacles can vary by institution or location

(Alaboudiet al., 2016). Besides, many barriers to implementing telemedicine have yet to be addressed in the literature (Cresswell et al., 2013).

Statement of Problem

The quick adoption of technology in the modern healthcare environment has changed how medical services are provided. Telemedicine, a dynamic strategy that uses digital platforms to bridge the gap between patients and healthcare practitioners, especially in remote or underserved areas, is one of the important technologies that has gained importance.
The problem at hand, "Knowledge, Attitude, and Use of Telemedicine Among Healthcare Professionals," is a pivotal area of investigation." The adoption and spread of telemedicine depend heavily on the involvement of the medical community. Telemedicine technologies' ability to improve patient care and healthcare systems depends on people's acceptance of them, familiarity with them, and how they use them (Bashshur et al., 2016).

Recently, the utilisation of telemedicine has seen a rise in popularity among medical professionals in a variety of healthcare facilities all over the world. Some factors recognised as contributing to this phenomenon are unrestricted access to medical care and the understanding and attitudes of medical professionals towards telemedicine. Despite the fact that the industrialised world continues to reap the benefits of this technology through the promotion of remote monitoring of long-term health concerns and an effective online record-keeping system, telemedicine and e-health are still in their infancy in the developing nations. According to research by (Shittu et al., 2007). Only 39% of physicians in Libya have complete comprehension of telemedicine, while 12% need to be made aware of the technology.
Furthermore, (Abodunrin et al., 2009) conducted a study to evaluate health professionals' e-Health and telemedicine knowledge and perceptions at the LAUTECH Teaching Hospital., Osogbo, Nigeria. The study found that health professionals needed more knowledge of telemedicine and e-health, with most of the health professionals showing interest in rendering telemedicine services. Also, according to this study, health professionals needed more knowledge of telemedicine and e-health. A study on “physicians' knowledge and perception of telemedicine technology” was conducted by (Ayatollahi et al. 2013). According to the survey findings, most clinicians' understanding of telemedicine technology could have been better or extremely low (1.75 0.51) on a scale of one to ten, with one being the lowest. They concluded that ongoing training in the application of telemedicine would be the most effective method for expanding the understanding of medical practitioners' knowledge of telemedicine since it would be consistent and repetitive.
In addition, a study was carried out by Banjoko et al. (2008) to investigate the attitudes of a selection of Nigerian healthcare professionals towards telemedicine and e-health. 81% of those who participated in the survey said incorporating telehealth into Nigeria's healthcare infrastructure would be advantageous and relevant. According to previous research, most healthcare professionals need to learn more about telemedicine service and its importance in enhancing adequate healthcare service delivery. This is why the implementation of telemedicine in Bayelsa State, Nigeria, and other developing nations has met with limited success and poor utilisation. Telemedicine has enormous potential, but despite this, its use in developing nations has been met with limited success and poor utilisation. This study will

help clinicians become more aware of the benefits of telemedicine services and elicit information on the existing state of telemedicine practice in Bayelsa state.

Aims and Objectives of the Study

The study aims to assess and evaluate the attitude, knowledge and use of telemedicine among health professionals in Bayelsa State.

Objectives of the Study

1. To assess the knowledge of health care professionals towards telemedicine
2. To assess the attitude of healthcare professionals towards telemedicine
3. To determine the use of telemedicine among healthcare professionals
4. To determine the relationship between the years of experience and the knowledge of telemedicine among healthcare professionals.

Research Questions

1. What is the level of knowledge of telemedicine among healthcare professionals?
2. What is the attitude of healthcare professionals towards telemedicine services?
3. Are healthcare professionals using telemedicine technology in their service delivery in the federal medical Centre?
4. Is there any relationship between the years of experience and the knowledge of telemedicine among health care professionals?

Significance of Study

The study holds substantial significance due to its potential contributions to both the field of healthcare and the broader society. The study's outcomes can have far-reaching impacts on various aspects, as outlined below:

Enhanced Healthcare Delivery and Access: The study can inform initiatives to optimize the integration of telemedicine into healthcare workflows by identifying knowledge gaps, attitudes, and usage patterns among healthcare workers. This improvement in patient care, particularly for individuals living in distant or impoverished locations, can increase healthcare access and equity.

Making Informed Decisions: Healthcare organizations, lawmakers, and regulatory authorities can use the knowledge from this study to help them make informed decisions about the introduction of telemedicine. Guidelines that assure safe, efficient, and moral telemedicine activities can be created using evidence-based suggestions.

Effective Resource Allocation: Making the most of healthcare resources requires an understanding of how telemedicine is used. Healthcare practitioners can better manage their time and resources, which will result in better patient outcomes and lower healthcare costs, by identifying clinical settings where telemedicine is most useful.

Tailored Training Programs: The study's conclusions can be used to create healthcare professionals' specific training plans. The successful incorporation of telemedicine into practice can be facilitated by addressing professionals' questions and knowledge gaps.

Strengthened Patient-Provider Relationships: Strategies to make sure that patient-provider relationships stay strong even in virtual contacts can be informed by a deeper understanding of healthcare professionals' attitudes regarding telemedicine. This can increase patient happiness and trust, leading to better healthcare experiences.

Research Advancement: The study can add to the expanding body of knowledge about the adoption of telemedicine and its effects. Gained knowledge can be used to develop more precise study questions and investigate additional variables that affect the use of telemedicine and its results.

Public Health Preparedness: The ongoing threats to the world's health, such pandemics, underline the value of telemedicine as a way to deliver medical care while reducing direct physical contact. The study's conclusions can influence public health preparedness plans by revealing how prepared healthcare workers are to use telemedicine in emergencies.

Global Health Impact: The study's recommendations may be beneficial on a global level because telemedicine shows potential for enhancing healthcare delivery in both developed and developing nations. Telemedicine use has the potential to improve health outcomes globally and reduce healthcare inequities.

In conclusion, the significance of the proposed study rests in its potential to alter how healthcare is delivered, have an impact on policy choices, maximize resource allocation, and progress both research and patient care. This study can ultimately result in improved healthcare access, quality, and results for individuals and communities by illuminating the understanding, attitudes, and utilization of telemedicine among medical professionals.

Justification of the Study

The healthcare industry has seen fast technological innovation, which has fundamentally altered how medical services are provided. Particularly telemedicine has a great deal of potential to get over geographical limitations, improve patient access to care, and improve healthcare delivery. However, the ability of medical practitioners to properly use these technologies and their readiness, willingness to do so are prerequisites for the successful integration of telemedicine into ordinary clinical practice. Therefore, it is both necessary and urgent to conduct a systematic investigation into the telemedicine knowledge, attitudes, and usage trends among healthcare professionals.

Despite increased awareness, there are still gaps in healthcare practitioners' knowledge of the range, potential, and restrictions of telemedicine. Astudy carried out by (Abodunrin et al., 2009), at the LAUTECH Teaching Hospital in Osogbo, Nigeria, to access the understanding and attitudes of health professionals about e-Health and telemedicine discovered that, health

professionals need more knowledge of telemedicine and e-health, with most of the health professionals showing an interest in providing telemedicine services.

Similarly, (Zaypragassarazan et al., 2016) assessed the telemedicine knowledge, attitudes, skills, and awareness of healthcare professionals working in Indian teaching hospitals. Based on their research, they concluded that even though the participants' experience and knowledge of telemedicine technology are limited, the awareness, knowledge, attitude, and skills of telemedicine among health personnel faculty working in teaching hospitals in India suggest that a sizeable number of the nation's healthcare professionals are conversant with the technology. According to the studies discussed before, there is an immediate requirement for education and training in telemedicine on the part of practising physicians, nurses, chemists, medical laboratory scientists, and any other professionals who provide healthcare services. Therefore, it is of the utmost importance to raise awareness, educate and teach healthcare service providers such as practising physicians, nurses, chemists, medical laboratory scientists, and everyone else who works in the healthcare field about telemedicine and the problems that can arise. Given the significance and value of telemedicine services, there has not been a previous study conducted on the knowledge, attitudes, and practices (KAP) of telemedicine among medical personnel in FMC Bayelsa; hence, there is a pressing requirement for such a study to be conducted.

Limitations of the Study

Time factor and work schedule of the study participants

Introduction to literature review on telemedicine

A country's "medical system" is the infrastructure for diagnosing, the health of the nation. As medical technology and science advance, healthcare systems are also changing. The medical community is swiftly adopting new technologies; for example, the rise of modern surgery has led to modern hospitals (Eriotis et al., 2008). Increases in therapy costs are a direct effect of progress in medical technology. The pricey tools necessary to treat illnesses and wounds are sometimes beyond the financial means of many medical facilities, particularly hospitals. Some complex treatments, such as cardiac bypass surgery, surgeries, trauma care, and other intricate procedures, require expert medical teams and elaborate facilities. Such equipment is only available in specialised hospitals and clinics staffed by highly trained medical professionals. Therefore, people who live in rural settings frequently have to travelled afar distance apart to receive quality, expensive and thorough medical care (Rasid et al., 2005). "telemedicine" refers to using an interactive audiovisual medium to transmit medical data for consultation and, occasionally, the performance of distant medical treatments or tests. In a country, the size of Nigeria, telemedicine is seen as essential, but it can only be implemented with technological advancement that provides reliable power and the means to repair the necessary equipment. On a smaller scale, the current technology might be used to do so (GSM or the worldwide system for mobile communications). Medical practitioners in different countries can consult with one another in real time about a patient's condition using satellites and videoconferencing equipment or even just talking on the phone.

Said it is a remote medical service delivery that uses communications technology. This includes diagnosis, treatment, prevention, education, and research (Adewale, 2004). Recent years have seen a rise in healthcare studies focusing on user resistance and adoption of telemedicine technology (Kim et al., 2010).

Theoretical/framework

Numerous studies on people's purpose and use of various technologies have been undertaken over the years. Scholars have attempted to examine different Technology Acceptance Evaluation Models (Musa et al., 2005) to provide an explanation for the high rate of adoption and utilization of telemedicine among medical professionals. Research has been conducted to determine which among the two models are most relevant to the topic telemedicine (Venkatesh et al. 2003), "Unified Theory of Acceptance and Use of Technology (UTAUT) and Davis's 1989 Technology Acceptance Model (TAM).

TAM explains computer usage behaviour by clarifying the links between perceived usefulness and usability and users' attitudes, intentions, and actions. (Davis, 1989).

TAM seeks to provide a generic explanation of the elements that impacts computer adoption that is also theoretically supported in order to account for user behaviour across a broad spectrum of end-user computing technologies and user demographics. (Davis,1989). According to (Davis, 1989), one of TAM's primary objectives is to provide a basis for identifying how individuals' experiences have shaped their thoughts, feelings, and decisions. TAM argues that two beliefs, in particular, are particularly relevant for computer acceptance behaviours: perceived use/usefulness and perceived ease of use. The UTAUT model's constructs have also been the subject of some attempts at analysis. The concept may seem complicated, but it tackles several serious problems, such as the impact of social pressure and supportive environments on people's plans to change their behaviour. The essential tenets of UTAUT, according to its proponents, that is, performance expectancy, effort expectancy, and social effect, are the main elements influencing intention to use and are backed by much evidence. Evidence supported the centrality of age, sex, voluntariness, experience, and a strong moderating influence in UTAUT.

The UTAUT model will be used for this research because it applies to a broader range of topics, such as enabling situations, and because it illustrates the influence of moderating factors on behavioural intention and usage in a straightforward manner. Over time, various things and measurements have been invented, and studies into people's intentions and technology usage have been carried out, (Musa et al., 2005). An effort has been made to investigate in greater depth a number of Technology Adoption Assessment Models developed by academics to explain the level of adoption and utilisation of telemedicine among medical professionals and other healthcare workers. The Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (TAM), which were both developed by Venkatesh et al., have been analysed by researchers as part of an effort to discover which fundamental constructs are best suited to the subject of the current study.

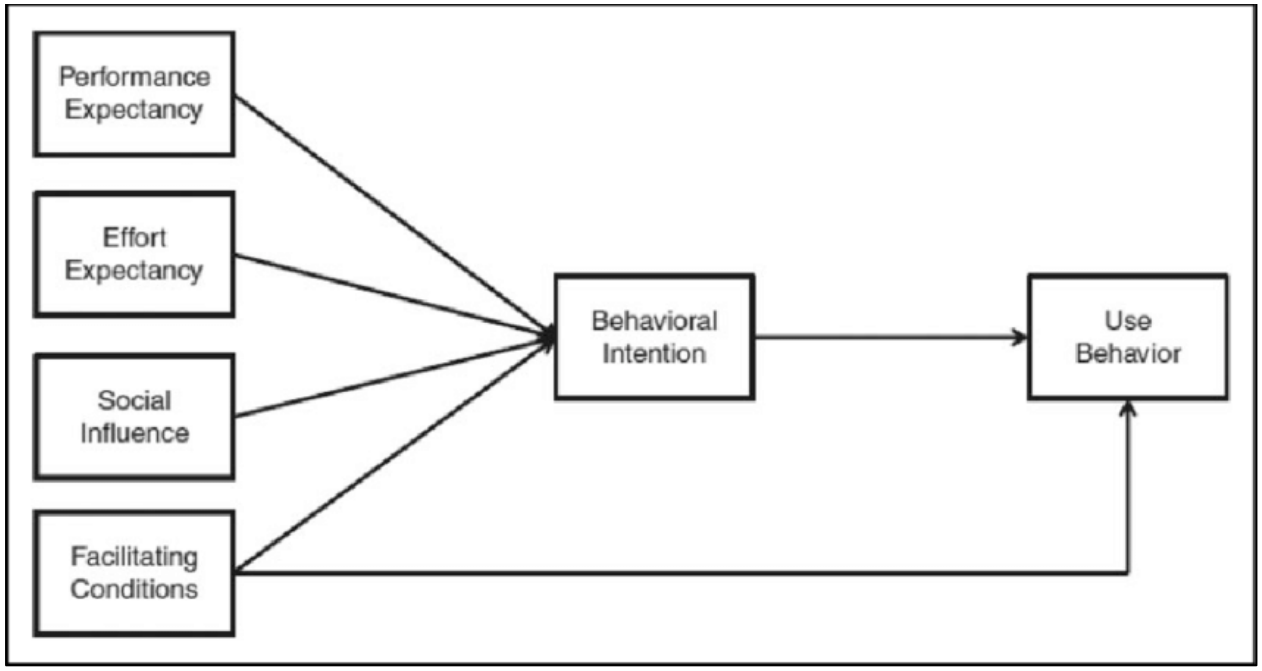


Figure 2.1 Diagram showing TechnologyUTAUT Model
Source: Venkatesh et al., 2003

Conceptualization of the Theoretical Frame Work

Effort Expectancy

Attitude is how someone feels about doing something, in this case, using telehealth technology to provide medical data. A positive or negative evaluation of some attitude object constitutes an attitude, according to the definition provided by (Elias et al. 2012). Both patients and healthcare professionals must view the usage of telehealth devices favourably. Substantial empirical data indicates that attitude significantly predicts behavioural intention (Ajzen et al., l980; Davis et al., l989; Pavlou et al., 2006).

Performance Expectancy

performance expectancy is the extent to which a person believes increased productivity will result from using the technology (Venkatesh et al., 2003). Medical professionals' hopes that telemedicine will boost their efficiency and productivity while facilitating more inter-professional cooperation across great distances is what we call "performance expectancy" in telemedicine. The theory from (Venkatesh et al., 2003) suggests that gender and age will moderate the effect of behavioural intention on the correlation between performance expectancy and conduct. Users' positive behavioural intentions are influenced by their effort anticipation (Venkatesh et al., 2003).

Social Persuasion

Social influence is the extent to which a person agrees that influential others think they should adopt a new approach (Venkatesh et al., 2003). Their peers in the medical community and the healthcare industry may influence their decision to use the technology:
Users' intent to change their behaviour in response to telemedicine will be influenced by the social context in which they find themselves (Venkatesh et al., 2003). Social influences on behavioural intent to utilize telemedicine are mitigated by users' prior experiences with the system (Venkatesh et al., 2003).

Facilitating condition

Facilitating condition refers to the extent to which a person believes that an administrative and technological framework is in place to aid the use of the technology (Venkatesh et al., 2003). The availability of telemedicine-friendly gear, software, and communication networks is one example of a facilitating circumstance. To what extent do behavioural intentions and actual behaviour differ depending on the enabling condition?

Intentional Behavior

(Venkatesh, et al., 2003) Assert that behavioural intention will have a major favourable impact on how people use the system.

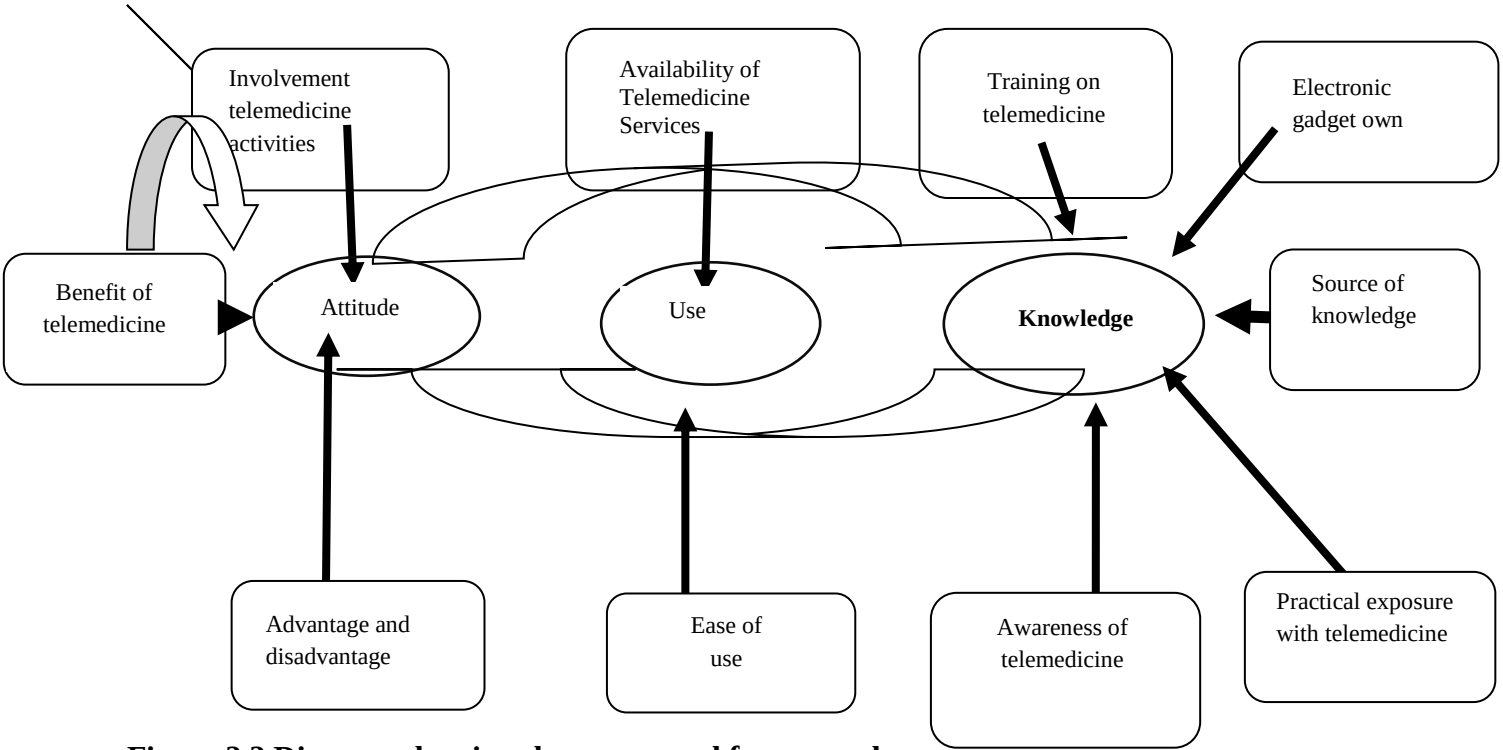


Figure 2.2 Diagram showing the conceptual frame work.

Empirical Review

A study was carried out by (Ayatollahi et al. 2013) to investigate physicians' knowledge of and perceptions of telemedicine systems. It was suggested that most doctors, who accounted for 96.1 percent of the sample, have a poor or very low degree of understanding regarding telemedicine technology (1.75 0.51). They believed that the best way to increase their understanding of telemedicine would be through regular training (3.88 0.68), and the data supported this belief, also they had inadequate awareness of the disadvantages of telemedicine and a moderate level of awareness of its benefits. Dentists had less knowledge of telemedicine technology than other groups, and as a result, they were less enthusiastic about its benefits than nurses, general practitioners, and specialists. in conclusion, healthcare professionals' inadequate understanding of telemedicine appears to have shaped how they view the technology. Therefore, giving healthcare personnel greater information about emerging technologies in healthcare, like telemedicine, might help them establish more accurate perceptions.

(Ashfaq et al., 2020). 224 medical professionals took part in the study, and all of them were specialists in one of the following disciplines: internal medicine (27.6%), paediatrics (9.8%), cardiology (6.6%), gynaecology (5.35%), neurology (5.7%), and other specialities (44.6 per cent). Twenty-eight point one per cent of the doctors thought telemedicine helped deliver speedier medical care, while twenty-three point two per cent thought it would help with the "white coat syndrome." Eighty-seven-point-seven per cent of the doctors were aware of what telemedicine was. twenty-three-point-two per cent of them thought it might help with the "white coat syndrome." 42.9% of respondents stated that telemedicine invaded patients' privacy and hampered the relationship between doctors and patients. Also, 34.8% of the doctors who participated in the study agreed that national rules should be established for the use of telemedicine, and 33.5% of the doctors agreed that it was essential for patients to be informed about the legal consequences of telemedicine. It was believed that poverty and a lack of education accounted for 90.6% of the most significant obstacles to telemedicine in developing nations. In conclusion, it was discovered that the level of knowledge on telemedicine held by clinicians in Karachi was about average. The vast majority of participants, on the other hand, were in favour of the perceptions and attitudes concerning introducing and implementing this new technology, with the primary focus being raising awareness.

Three-and-a-half per cent of respondents knew a lot about telemedicine, and 64 per cent had a positive outlook on it, according to a survey (Biruk et al., 2018). However, 66% of respondents agreed or strongly agreed that telemedicine poses a threat to patient information confidentiality and privacy. 54% of respondents felt that telemedicine increases the quality of clinical judgment. Sixty-one per cent of respondents showed an awareness of the time-saving advantages of telemedicine (Bashir et.al 2013). The objective of the present study is to assess the understanding and attitudes of healthcare workers concerning telemedicine in King Fahad Medical City, Saudi Arabia. Data analysis showed that 237 (63.7 percent) of the healthcare personnels who took part in the study had little to no awareness of telemedicine. 25.3% of

individuals possessed substantial knowledge, compared to (11%) participants who had a fair comprehension of the technology. With a mean score of 3.26, the participants' overall perception of telemedicine was favourable. The average attitude scores among the various occupations varied significantly (P 0.001), with doctors scoring 3.69, nurses rating 3.07, and allied healthcare professionals scoring 3.31.The coefficient of determination (R2) was applied to determine the range of attitudes about telemedicine. And was utilized to assess the diversity in attitudes about telemedicine, and it was discovered that nationality (4.7%) and education (12.4%) had the least influence on these attitudes. In conclusion, healthcare professionals are essential for the ongoing success of telemedicine. Nevertheless, despite their favourable attitudes toward telemedicine, the majority of the medical personnel who took part in the study knew little about it. There were attitudes that varied between various groups of medical practitioners. Therefore, in order to ensure the correct deployment and continuation of telemedicine, specialized educational programmes for medical personnel must be developed.

(Albarrak et al., 2019), carried out a study titled an evaluation of Saudi Arabia's Riyadh region doctors' telemedicine knowledge, perceptions, and willingness. The purpose of the study was to evaluate physicians' understanding and opinions about telemedicine and its potential uses, also to gauge their openness to incorporating telemedicine into clinical practice. Results from the study indicated that 391 medical professionals (301 men, 77.0%) and 90 women, or 23.1%) participated in the survey. Roughly 50% of the sample report never owning or regularly using a laptop or desktop computer at home. Notably, 89.2% of them have at least two intelligent devices. About half of the respondents consider themselves "very familiar" with telemedicine. Almost eighty-three per cent of doctors agreed that continuing education was necessary for telemedicine use (P 0.01). Participants have a fundamental understanding of telemedicine. Over 90% of respondents say telemedicine can save money and time.

Based on the research title telemedicine service implementation in Pakistan in the period COVID-19 pandemic (Ahmed et al., 2021). Overall, the survey found that 46.5 per cent of COVID-19 participants were open to using telemedicine in some capacity. During COVID-19, improving people's general openness to telemedicine will be essential by addressing concerns like usability, mentality, and the quality of the doctor-patient connection. Focusing on healthcare providers' attitudes and working to strengthen the doctor-patient bond can get them more comfortable with telemedicine's use. In conclusion, despite the drawbacks, telemedicine has huge advantages in the COVID-19 era, and it is practical to introduce telemedicine services in underdeveloped nations. To enable telemedicine and other e-health services, poor nations must invest in internet and technology access. This will not only help to contain the pandemic but will also support the development of a more effective healthcare system in the years following the epidemic.

(Boringi et al., 2015). Most people who participated in the study Information and Awareness of Teledentistry among Dental Personnel - A Cross-Sectional Study needed adequate information and awareness on teledentistry. Most participants in the study agreed that teledentistry is a practice of dentistry that applies various media tools with limited application

in dentistry and does not raise any legal issues, but only 7.23 and 9.38 per cent of postgraduates knew what teledentistry was.

According to the findings of a study by (Assaye et al., 2020) titled "Knowledge, Awareness, and Associated Factors of Telemedicine Services among Medical Personnel Working at Amhara Region Referral Hospitals, northwest Ethiopia," conducted in Ethiopia. According to the findings, 56.4% of healthcare professionals had a high awareness of telemedicine services, and 56.4% had a good knowledge of telemedicine. The response rate was 411 (97.2%). Information sharing culture [AOR=3.01, 95% CI: 1.89, 4.80], having IT support staff [AOR=1.87, 95%CI: 1.06, 3.29], the internet as information source [AOR=1.80, 95%CI:1.1, 2.94], awareness [AOR=1.35,95% CI: 1.03, 2.40], and being male [AOR=1.73,95% CI:1.06, 2.81] were significantly connected with the respondents' knowledge of telemedicine delivery.

(Petimani et.al 2022) conducted a study titled Knowledge, Attitudes, and Practices of Telemedicine Among Healthcare Personnel in the Period of the COVID Pandemic. This study was a cross-sectional analysis of the knowledge, attitudes, and practices of telemedicine among healthcare practitioners during the COVID pandemic. There were 96 replies; 61 (63.5%) were male, while 35 (36.5%) were female. 63.5 per cent of medical staff were familiar with the word "telemedicine," 22.9 per cent of participants were well informed of the concept of telemedicine but were not yet using it, and 13.5 per cent of participants were familiar with the concept and were already using it. Regarding the methods of communication used in telemedicine, 42.7% of the respondents chose video calls such as WhatsApp, Skype, and handouts. This was followed by 27.1% of the respondents preferring personalised websites (Healzapp/HODO), 17.7% preferring text messages such as FAX, Email SMS, and 12.5% preferring audio phone calls.
Concerning the issue of informed consent, 59.4% of respondents stated that consent is required, but 40.6% of respondents stated that consent is assumed when the patient initiates the call. In terms of the difficulties associated with telemedicine, 83.3% of the people who took part in the research confirmed that it is not possible to perform physical medical examinations, 76% of them agreed that there would be connectivity issues, 55.2% of them were concerned about patient safety, and 54.2% were concerned about medico-legal issues.

Knowledge, Attitudes, and Perceptions Regarding Telemedicine Use among Young Adults in Manila, Philippines (Umanyam et al., 2022). The standard variation of knowledge scores was 25.53 points, with an average of 41.55 points in the period of the COVID-19 Pandemic. This indicates that the respondents' awareness of telemedicine was moderate at best. The study found that respondents had an average attitude toward telemedicine of 67.67 and a standard deviation of 17.19 points. Finally, with a mean score of 65.91 and a standard deviation 13.88, they were indifferent about telemedicine.
Even though respondents' familiarity with telemedicine technology was low, most held a favourable view of it.

According to research carried out by (Zayapragassarazan *et al*. 2016), titled "Awareness, Knowledge, Attitude, and Skills of Telemedicine among Health Professional Faculty Working in Teaching Hospitals in India."The primary goal of the research was to evaluate the telemedicine awareness, knowledge, attitude, and skills within medical personnel working in India's Puducherry Region teaching hospitals. Result showed that the respondents' level of telemedicine knowledge was determined to be good, with 41% having high knowledge, 35% having fair knowledge, and 24% having insufficient information. In terms of attitudes about telemedicine, 39% of the participants have a positive opinion, 31% have an average attitude, and 30% have a negative perspective. Further study into the telemedicine-related skills of the participants revealed that 19% of them are experts or highly skilled, 25% have average skilled, including beginners or learners, and 56% are not skilled at all in using telemedicine and the related equipment. The study's findings indicate that while many respondents have a favourable view about telemedicine, even though their experience and knowledge of the technology are limited. Training and education about telemedicine and the barriers linked with its use are urgently needed for the teaching staff, practicing doctors, residents, medical students, and other medical workers.

(Chau et al., 2002), the Researchers examined how well the theory of attitude and motivation (TAM) model, the theory of planned behaviour (TPB), and a combined model (TAM-TPB) explained doctors' reasons to embrace telemedicine. This research takes a theoretical comparative approach to the question of whether or not doctors will embrace telemedicine. In order to compare the two models' overall fit, explanatory power, and causal linkages, we analyzed doctors' feedback. The outcomes show that TAM may be preferable to TPB for measuring doctors' innovation acceptance. There is no appreciable gain in explanatory power from using the integrated model. The study's results suggest that doctors' opinions on the "perceived usefulness" of TAM play a role in whether or not they adopt telemedicine. This study reveals that doctors are pragmatic in their assessments of new technologies and are more likely to adopt (or employ) them if they are seen as advantageous to their practices.

The TAM was expanded by (Croteau et al., 2002) to consider four more elements influencing doctors' plans to adopt telemedicine. The variables of "situational support" and "perceived effort" were utilized to furtherance the concept of "perceived ease of use" concerning TAM. TAM's "Intention to use" is explained further with the help of "image" and "Perceived voluntariness." The study's participants were two groups of doctors planning to implement telemedicine during the survey. Doctors involved in clinical, academic, and research work at a major urban medical institution comprised one group. These medical professionals lacked the expertise to effectively use a teleradiology and teleconferencing system that relied on the internet. Group B consisted of rural-based physicians who had recently completed training and implemented a telemedicine network linking 43 regional facilities. The results revealed that both groups' plans to adopt telemedicine system are connected with the variable "perceived usefulness" positively.
As a group, for instance. In group A, where doctors lacked prior training, the variable "perceived effort" substantially affected "perceived ease of use," which makes sense. While the "perceived effort" variable did have a significant relationship to "perceived ease of use,"

the variable "situational support" did not. When additional two variables were included to expatiate the TAM "intention to use" variable, neither the "perceived voluntariness" nor the "image" variable had a significant impact on doctors' intentions to adopt the system telemedicine. Intense opposition from German physicians delayed the proposal by more than five years after Germany implemented an extensive telemedicine infrastructure.

(Orro et al., 2011) By expanding the TAM model to include four more variables (subjective norms, habit, facilitators or facilitating conditions and compatibility), pilot research on the usage of teledermatology was conducted in Spain. Overall, 171 medical professionals participated in this survey. The results showed that two variables from the original TAM, "perceived utility" and "perceived simplicity of use," were significant in predicting doctors' plans to start using teledermatology. Adding the four variables strengthened the model, but "facilitators or facilitating conditions" were particularly significant.
By adding the "financial incentive" variable to the original model UTAUT, (Adenuga et al. 2017) were able to research the elements that affect the telemedicine system usage. The findings revealed that the "financial incentive," variables "performance expectancy," and "effort expectancy" from the UTAUT original, as well as "facilitating conditions," had a substantial impact on the behavioural Nigerian doctors' intention to use the system telemedicine.

It was found in a study (Abodunrin et al., 2009) entitled "The Knowledge and Perception of e-Health and Telemedicine among Health Professionals in LAUTECH Teaching Hospital, Osogbo, Nigeria," that while most medical professionals were in favour of the services, they lacked sufficient knowledge about telemedicine and e-health to implement them effectively. As a result, it is crucial to boost health workers' access to energy and modern forms of communication.
The attitudes of selected Nigerian healthcare professionals toward telemedicine and e-health were assessed in a 2008 study (Banjoko et al., 2008). Doctors, nurses, pharmacists, lab scientists, radiologists, and senior nursing and medical students were among the 200 healthcare professionals participating in this research. Their expertise and outlook were evaluated through interviews and a semi-structured questionnaire. Only 42 people (21%) knew about the planned national telehealth program, and 83 (41.5%) knew little or nothing about telehealth. One hundred and forty-one (70.5%), plus 138 (69%), would recommend telehealth services to others. While 57% of those polled wanted telemedicine to be its standalone program, 67% thought it should be part of the existing three-tier of health system. Incorporating telehealth into Nigeria's healthcare system was seen as helpful and relevant by 162 (81%) respondents. Given the current paucity of information, this result underscored the need for broad stakeholder participation and public education before formulating government policy on telemedicine. There is a need for workforce development in order to implement this programme, which has the ability to bring specialized healthcare deliveries to those unreached and improve the skills and knowledge of medical personnel in rural places via remote learning.

The use of telemedicine in both urban and rural hospitals was studied by (Marcia et al., 2014). Statistical data obtained from 4,727 hospitals were analyzed by the Healthcare Information and Management Systems Society (HIMSS) in 2013. Sixty per cent of rural locations and 68 per cent of metropolitan areas did not have or were starting to provide telehealth services. Only 34% of people in rural areas and 32% in metropolitan areas used telehealth services. Only 61.4% of hospitals that offer "live and operational" telehealth services have more than one department or program up and running, while 38.6% have three or more. Fewer services were available at rural hospitals. While there were some disparities between rural and urban hospitals regarding which department adopted telemedicine first, the overall rate of telehealth adoption was similar. 37 Cardiology, stroke, and heart attack programs were more likely to be operational in urban hospitals than in rural hospitals (74 per cent vs 62 per cent), as were neurology (44 per cent vs 21 per cent) and obstetrics/gynaecology/NICU/paediatrics (38 per cent vs 25 per cent).
However, departments of radiology (17.7% vs 13.9%) and emergency/trauma care (8.8% vs 6.3%) were more likely to have functional telehealth implementations in rural hospitals. In conclusion, based on the study's findings, it was determined that the degree of telemedicine use had a substantial impact on the healthcare provision in federal medical centers in north central region of Nigeria. The results from the research suggested that manpower development was necessary for this program's potential to deliver specialized medical care deliveries to those that would not otherwise be able to access them as well as enhance the expertise of medical personnel in remote places via distance learning.

Healthcare providers' attitudes regarding telemedicine in a brand-new academic medical center were investigated in a 2007 study (Shittu et al., 2007). Through a prospective mail survey, researchers at LASUTH and LASUCOM administered a modified structured questionnaire to a cross-section of the medical community. Fewer than two-thirds (60.9%) of participants were aware of this relatively modern telemedicine concept in the healthcare sector. Half of all doctors are worried about telemedicine's ethical and medico-legal implications, regardless of their personal beliefs. The most influential factors favouring a willingness to telehealth system usage included familiarity with telehealth system applications (28.1%), perception of telehealth system advantages (14.1%), and reduced obstacles to telehealth system. The vast majority of survey takers expected telemedicine would enhance both patient convenience (23.4%) and the quality of care (14.1%). Telemedicine should be available to patients, particularly for severe and long-lasting conditions.
Research into the state of telemedicine preparedness in a selection of Western Nigerian states was conducted (Justice et al., 2012). Considering the readiness of various factors related to e-Health, which includes structural, need change and engagement. The respondent’s response rates were statistically analyzed using descriptive methodology. The investigation was conducted to determine how well-prepared general public, patients and the management of western region in Nigeria are for e-Health. Overall, the results show that (i) health managers are not structurally prepared, (ii) the patients and general public are generally in agreement, (iii) healthcare professionals are generally in agreement, but the adoption of the invention will be impacted by structural, social influence, and engagement factors. Therefore, it is

imperative that governments at all levels embrace and promote the widespread adoption of electronic medical records (EMR) as a new, real tool in the administration of health information and the establishment of frameworks for efficient telemedicine services. Any healthcare system that wants to survive must have this. To address the current gap in the healthcare system, it is preferable to offer telemedicine a chance in the healthcare delivery system.

(El Gatit et al. 2008) found that while 39.1% of doctors were familiar with telemedicine in some capacity, 48.8% had a solid understanding of the topic. The study also found that physicians' perspectives on telemedicine were crucial to the telemedicine system development, with Libyan doctors' familiarity with the system having an effect on their views of its utility. Doctors' low knowledge about telemedicine seems to have played a crucial role in influencing their perceptions of the system. Therefore, giving medical workers additional knowledge about emerging technologies, like telemedicine, can aid in getting a more accurate image of their perspectives.

Medical practitioners' perceptions of the benefits and risks of telemedicine were found to have a substantial impact on whether or not healthcare organizations adopted the practice (Hu et al., 2002).

The Social Security Organization (SSO) is one of Iran's most prominent medical coverage providers. In addition to the Ministry of Health, this organization provides healthcare to the country's citizens. The organization's partner hospitals and clinics are responsible for providing free healthcare to the insured. Due to the SSO's expansive service area and sizable member population, telemedicine's potential benefits should be considered. However, before implementing telemedicine in SSO-affiliated hospitals and clinics, it is essential to study doctors' familiarity with and opinions of the practice, (Davari et al.,2012).

Epidemiological Data

In low-resource areas, mobile phones have much potential for health care delivery. (Patterson 2014) created a smartphone app that allows non-doctors to diagnose epileptic episodes. There were no incorrect diagnoses in a pilot study with Nepalese health staff who used the app on a small number of patients. This could be a way to enable health personnel to aid the millions of people with untreated epilepsy who live in resource-poor countries (Patterson, 2014).

Dermatology, cervical cancer screening, oral medicine and radiology where the four medical fields where mobile phone telemedicine was trailed in Botswana (Ndlovu et al., 2014). As a result of positive feedback from the pilot project's participants, the government has decided to roll out the whole program. "Ownership" of the program at the local level is seen as essential for its continued success (Ndlovu et al., 2014), as is the backing of senior management.

According to (Piette et al., 2014), collaborating with the Bolivian Ministry of Health is essential for expanding the reach of a mobile telemedicine system application in the country. All of these case studies emphasize that there is the need to expand telemedicine programmes from pilot projects, work with medical professionals at the local level rather than imposing telemedicine system from on high, and get the relevant Ministry of Health support (Pietteet al., 2014).

The RAFT network is a well-known example of telemedicine in poor nations since it provides educational and therapeutic services to sites in South America and African nations. Instructional activities include video lectures per week for postgraduate and continuing medical education. The RAFT initiative initially used expensive satellite communications for video distribution, but in recent years has shifted to using low-bandwidth Internet connections (Bedianget al., 2014).

A tele-education network was born in South Africa due to a failing government telemedicine program. Each year in KwaZulu-Natal, approximately 1000 hours of lectures are delivered by videoconference via ISDN transmission (Mars, 2014). Finally, the organization known as EHAS has given video-based telemedicine services in South America. They built long-range WiFi transmission to ensure sufficient bandwidth for video delivery (Prieto-Egido et al., 2014).

Telemedicine video transmission alternatives using no- or low-cost web-based solutions. Skype was employed in a pilot study in Jordan about tele-psychiatry (Jefee-Bahloul, 2014), and the file-transfer features of the LogMeIn web service were put to use in a study of tele-ultrasound between France and Togo (Adambounouet al., 2014). Non-real-time (store-and-forward) telemedicine is common more in these circumstances, not only because it is usually more affordable but also because the non-synchronous interaction between the parties makes it easier to coordinate. This is even though visual telemedicine is possible in poor nations. Perhaps the longest-running network of its kind, the Pacific Island Health Care Project has used online and electronic communication since the late 1990s. According to Person (2014), many pediatric situations that would have been transferred to a large medical center in Hawaii could have been treated thanks to teleconsultation locally.

(Andronikou 2014) shared his knowledge of three different store-and-forward programs used in pediatric tele-radiology. He concluded that while tele-radiology has the ability to address the radiologist shortage in disadvantaged areas, developing a suitable method is met with difficulties. Medical information, including the transfer of medical images, in order to cut expenses, the "Store and Forward" technique of transmitting patient data was introduced in stages in accordance with the availability of funding. Due to the state of the country's communications infrastructure, all three hospitals in Senegal could connect via ISDN lines at this time.

HEALTH NET is the most advanced Africa-wide effort that strives to enhance the practice of telemedicine among health professionals, having been deployed in 20 countries throughout the continent. The computer-based global healthcare professional network, SATELLITE, offers Health Net to its customers. SATELLITE is a non-profit Boston’s based, Massachusetts. Using a combination of a Low-Earth-orbit satellite and phone lines, it provides access to email to more than 10,000 medical professionals in Sub-Saharan Africa. Email with higher capacity and Internet connections are offered by SATELLITE and other firms in areas with the necessary telecommunications infrastructure, allowing for the easy and cheap transmission of medical images and other large files via email.

The patient digital photos and their tests, like x-ray films and electrocardiograms, are included in these email attachments alongside written summaries of the patient's findings.

"Save and forward" telemedicine is cost-effective and enables expert support in managing complicated cases but does not permit real-time interaction. Modern digital cameras are inexpensive (US$300-800), lightweight, compact, and user-friendly. They can produce high-resolution photographs suitable for dermatology (1900x1400 pixels or better). With some tweaks, this technique could be helpful in ultrasonography and pathology. Numerous historical and contemporary telemedicine initiatives are active in Sub-Saharan Africa. The origins of some of these programs can be tracked back to the middle of 1980s. Doctors' partnerships with burn surgeons from Tanzania, Uganda and Mozambique have all used HealthNet to share ideas on patient care and reconstructive surgery techniques. Health workers in the Gambia who earlier travelled 700 kilometers to collect data for a clinical trial each week now transmit this information through email thanks to HealthNet. In the Delivery of Healthcare, Ethiopian doctors utilize HealthNet to plan consultations and referrals, saving sick patients the trouble of making long trips without guaranteeing they would see a doctor. Medical warnings, HealthNet is used by Vanga Hospital staff in Zaire to send dispatches to health groups in the North on a regular basis to update them on the trypanosomiasis treatment process.

History of Telemedicine

The telephone and telegraph development prepared the groundwork for contemporary telemedicine. Telemedicine was first used in combat during the American Civil War; this included ordering medical supplies and receiving medical consultations. The transmission of casualty and injury reports was also facilitated by telegraph. One of the earliest recorded examples of telemedicine occurred in the first part of the twentieth century when electrocardiograph data was relayed via telephone cables (Einthoven, 1906) (Craig et.al., 2005).

Over the past half-century, the developed world has amassed considerable experience with telemedicine. In 1948, radiological pictures were transmitted electronically from one Pennsylvania township to another via a telephone line that stretched 24 miles. Canadian radiologists refined this earlier telemedicine system application by creating a teleradiology system for use in the Montreal area a few years later. The Nebraska Psychiatric Institute was an early adopter of telemedicine, beginning its use in 1959; this is the case (Jung, 2012). It had a televised connection with Norfolk Hospital, 12 miles away. Clinicians and patients could have two-way conversations (Ramos, 2010).

In the 1960s, the space technology and military companies, along with a few pioneering individuals using readily commercial equipment available, paved the way for the present practice of telemedicine (Craig et al., 2005).

Some of the earliest examples of telemedicine used television to facilitate consultations between specialists at psychiatric institute and general personnel at a state mental hospital and provide expert medical advice from a major teaching hospital to an airport medical center (Dwyer, 1973).

According to (Craig et.al., 2005), the pioneer public health monitoring networks were set up in the Middle Ages, when word of the bubonic plague swept over Europe. The paper claims that during the middle of the nineteenth century, improvements in national postal services

enabled the delivery of more individualized healthcare services over greater distances. Also, starting around this time, doctors started diagnoses and treatment plans (Craig et al., 2005).

Telemedicine system has made significant development in the industrialized nations since then. In industrial countries, many services have already been adopted, ranging from simple forms to complex virtual reality services. These services can be applied and used everywhere but are most commonly employed in locations where physicians and specialists in certain conditions are scarce. Furthermore, several successfully executed initiatives and pilot projects are in the works that will transform the way healthcare is delivered (Bashshur, 2000).

The fundamental drivers of telemedicine during the previous decade have been the rapid development of ICTs and the public's increased access to and usage of ICTs, both of which have resulted in a plethora of new possibilities in the healthcare provision. This has been the case in underprivileged communities in industrialized and underdeveloped nations (Wootton et al., 2005). The widespread interest in telemedicine application among healthcare providers is mainly due to the rapid decline in the cost of ICTs, which has allowed healthcare organizations to envision and implement modern and more efficient ways of delivering healthcare (Craig et al., 2005). Applications of Web-based tools (such as email, online conferences and teleconsultations,) and multimedia methods (such as video and digital imaging) have been added to telemedicine due to the rapid pace of ICT advancements made possible by the advent and widespread usage of the internet. As a result of these advancements, a diverse array of telemedicine applications has been created and are now in widespread use. Most telemedicine services, which often focus more on clinical management and diagnosis, are available in industrialized settings, including North America, Scandinavia, Northern Ireland, Australia, and the United Kingdom (Craig et al., 2005).

Patients with acute and chronic illnesses benefit from the increased use of biometric measuring instruments, such as those used to track heart rate, blood glucose levels, and blood pressure. Some believe that the shift of health care from hospitals and clinics to people's homes, made possible by telemedicine system, will greatly impact the delivery of healthcare services in the industrialized nations (Heinzelman et al., 2005).

Healthcare providers in poor nations or settings with low infrastructure might use telemedicine apps to link with specialists, tertiary hospitals and referral hospitals. Many barriers prevent the widespread adoption of low-cost telemedicine systems, despite evidence that they are feasible, clinically beneficial, sustainable, and scalable in such contexts and among underserved groups (Wootton, 2008).

Application of Telemedicine in Public Health

Geographic information systems and other technological advancements are helping epidemiological surveillance applications in telemedicine reach new heights.

- It can shed new light on spatial gradients in illness prevalence and incidence and provide helpful information regarding population health assessment.
- It also offers valuable details about various populations that are more at risk because of their risk factor profiles.
- It helps to differentiate and define the risk factors of the population.
- It also helps in interventions designing and evaluating the efficacy of various interventional

tactics.

• It helps in epidemics prediction.

• It is an essential technology for both local and international real-time surveillance of disease.

• GIS offers the fundamental framework and analytical tools for doing spatial-temporal climate modelling; understanding the spread of vector-borne diseases is aided by adequate knowledge of the environment and disease transmission.

Recently, this has involved the use of remote sensing techniques.

• A GIS-based approach to data collection, retrieval, analysis, and management differs from conventional disease surveillance and reporting approaches.

It makes it simpler to collect and combine heterogeneous data from many sources so that it can be used to inform public health program development, policy choices, interactive health communication, and disease prevention.

Telemedicine and information technology can be utilized to educate, persuade, and inspire people are groups that promote healthy living, health-related concerns, and good health.

Agendas for primary, secondary, and tertiary health promotion and prevention of illness can be advanced and supported by various methodologies and applications.

• It makes it possible to make informed judgments by making information available to a specific group and the broader public and providing inhabitants of rural areas with easy access.

• It makes it possible to make informed decisions. Additionally, it simplifies the dialogue between healthcare professionals and patients about prevention, diagnosis, and treatment.

Of medical condition. The patients/clients are thereby given a more comprehensive range of options.

• Healthy practices can be successfully promoted and upheld in the community.

• Peer information sharing and emotional support are further benefits. Examples include online Internet tools that let people connect, share knowledge, and provide and receive emotional support if they express specific health concerns, needs, or issues.

• It encourages self-care and domestic care techniques.

Classification of Telemedicine

Telemedicine episodes can be categorized based on the nature of the client-expert contact and the information shared. Depending on the timing of the interactions, telemedicine is categorized as either store-and-forward (known as asynchronous) or real-time (known as synchronous) (Allely, 1995).

1. In store-and-forward telemedicine, asynchronous telemedicine, information is shared between many parties using previously recorded sessions at different times. For instance, a patient or referring doctor can describe their medical issue in an email and receive a diagnosis and treatment plan from a specialist (Allely, 1995).

2. In synchronous telemedicine, all participants are physically present at the exact moment, so data can be shared in real-time, much like in a video conference. Text, speech, video, and still

photos are valid data transmission modes in real-time and non-real-time telemedicine—the fields of teledermatology and foundational telemedicine methodologies (Allely, 1995).

3. Telepathology and teleradiology are two examples of remote patient monitoring that use electronic data collection and transmission to a clinician in another location (typically via a data processing service) to facilitate care delivery and ancillary services. By subscribing to this service, doctors can monitor their patients' medical histories even after they have sent them home or to another facility for treatment.

4. mHealth refers to using mobile devices like smartphones, tablets, and personal digital assistants to improve healthcare delivery, patient engagement, and public health. Targeted text messages that promote healthy behaviour, mass warnings about sickness outbreaks, and applications that aid patients self-diagnose illnesses are just a few examples of applications. As smartphone penetration rises, mHealth has emerged as a rapidly developing telehealth option.

2.7 Telemedicine is used in different medical fields. Among the most popular telemedicine solutions, specialities are:

Telecardiology

Telecardiology delivers medical care by electronically transferring cardiac information from the location of patient to a consulting location. Patient encounters, and doctor consultation is made possible via transmittig of imaging studies such as radiographs, electrocardiograms, coronary angiograms, echocardiograms, laboratory results, and ultrasounds via interactive video consultations that include the use of a medical history and stethoscope; and the use of store-and-forward data for subsequent or confirming consultations. Telecardiology is included in home health services when patients' cardiac information is recorded, stored, and sent to healthcare personnel for interpretation, analysis, and clinical decision-making (Armstrong et al., 2002).

Telecardiology is one of the fastest-growing specialities that can be provided using telehealth technologies. Acute and emergent cardiovascular problems, especially in children, can be triaged, diagnosed, and treated quickly with the help of diagnostic tools available at the first phases of patient evaluation. Real-time and store-and-forward echocardiography have revolutionised the local treatment of juvenile and adult cardiovascular patients by allowing for earlier diagnosis and management (Shanit et al., 1996).

When gauging the need for and interest in a telecardiology services, it is crucial to employ general planning and development strategies well-suited to creating such a service. It may be necessary to apply in-person time for new patient workups not quickly done through telecardiology (seeing follow-up patients through telecardiology) to maintain an outreach service where cost expenditures are more significant than revenue plus added value of maintaining the current service, to use in-person time for outreach where on-site outreach is not practical or feasible, to see follow-up patients through telecardiology, or to increase productivity. Telecardiology can be used by the referring site (patient site) to: increase access for residents; introduce speciality services to the area through collaboration; and, depending on the quality of care and the patients' opinions, decrease patient out-migration.

Tele-dermatology

The utilisation of telehealth technologies is well suited for the clinical speciality of dermatology. Due to the visual nature of the tele-dermatology practice, it is among the more popular implementations of store and forward and interactive telemedicine. Using a variety of telehealth technology, dermatologists may offer patients with illnesses like hair, nails and skin high-quality care. In addition, it is possible to educate healthcare professionals and patients in underserved areas about cutaneous disorders and how to treat them. The use of tele-dermatology has increased during the past few years. The Special Interest Group on Tele-dermatology of the American Telemedicine Association surveyed telehealth initiatives in 2003, reflecting this (John et al., 2003). Even though there are now 3.3 dermatologists for every 100,000 people, up from 1.6 in 1965, the American Academy of Dermatology's Board of Directors declared in 2002 that services demand has exceeded the availability of dermatologists (Dermatology World, October 2002.). Kimball and Resneck argue according to the report that telemedicine system can reach underprivileged communities. Some believe that the shortage is not present but rather a problem with maldistribution; this is made worse by the rapid development of cosmetic and laser dermatology, which has decreased the number of medical dermatologists accessible and made it more challenging for people with common skin issues to receive care. According to logic, providing dermatology treatments via telemedicine ensures that people in underserved areas have equivalent access to care, but it will also put more pressure on dermatologists who are already in the field. A general healthcare professional can exchange a patient photo of a skin lesion, such as a mole, rash, or other skin anomaly, for distance diagnosis using store-and-forward technology and live interactive services. With the help of tele-dermatology, doctors from remote places where dermatologists are not readily available can offer specialised services.

Teleradiology

Remote work made possible by technology is often viewed as a poor substitute for physical presence (Armstrong et al., 2002) (Gaspar et al., 2008) (Olson et al., 2002). However, the application of teleradiology software to establish a modern kind of group of radiology for night radiology has aided advances in production, lifestyle, and interpretation quality.

The "nighthawk" radiology groups emergence in the United States and the spread of teleradiology applications are discussed by (Gaspar et al., 1998). The evolution of Nighthawk radiology groups, a recent class of radiology group that focuses on performing night reads, has dramatically affected how radiological services are provided in the United States. According to radiologists' observations and interviews, nighthawk radiology provided several advantages without jeopardising the standard of remotely provided radiological services.

(Armstrong et al., 2002) discovered that nighthawk radiology groups developed in response to a specific set of historical conditions rather than as a result of a planned reengineering program. While the study of nighthawk radiology may seem specific, its lessons can be applied across many fields where mobile workers face quality challenges. The modernisation of quality assurance measures and the expert nature of radiology work was crucial in assuring the high standard of care maintained when radiology deliveries in the US were offshored and

outsourced via teleradiology. At least 60 years of experience have been logged in teleradiology. Instead of digitising film, majority of the systems now apply direct digital capture, allowing photographs reading overnight in other nations. Personnel in radiology department have advocated for the Digital Imaging and Communications in Medicine (DICOM) data transmission and storage standard. Research shows that by the late 1990s, teleradiology consultation availability with personnel in the radiology department had a significant effect on plans of diagnosis and treatment. Thanks to teleradiology, there was a decline in the out-of-town transfers of people with head injuries (Liang et al., 2008).

Telepathology

Pathology is practised remotely utilising imaging technology and telecommunications in telepathology, a specialisation of telemedicine. However, the primary mode of data transmission in telepathology is visual, making it distinct from other forms of telemedicine (Gabriel et al., 2010). Weinstein et al., 2007, defined telepathology as the distance primary diagnosis, case conference, consensus diagnosis, or specialist consultation of electronically transmitted, digitalised, static, or real-time images gathered applying distance robotic microscopes. Therefore, telepathology involved the collection of cytological, histological, and macroscopic pictures for consultation, diagnosis, or CME (Baruah, 2005).

This method was first implemented in hospitals to meet the urgent need to diagnose frozen section material by tissue pathologists (Nordrum, 1996). (Wells et al. 2000) note that telepathology has come a long way from its early days, with practitioners remotely viewing high-quality, real-time colour images and controlling every aspect of a robotic microscope during consultations that typically last only a few seconds. Telepathology technologies are increasingly used for diagnosis at distance (permanent and intra-operative frozen sections), specialised consultations and enhanced instructional input. Technically speaking, second opinions are conceivable and very user-friendly (Weinstein et al., 2001). This includes remote consultations from anywhere in the world. Most studies suggest that its precision is comparable to conventional light microscopy. Certain well-off countries have prioritised implementing telepathology software into their healthcare systems to provide better care. These and other advantages have influenced their choices. From the sluggish data transfer of analogue phone lines, telepathology connections have moved to the lightning-fast transmission of current wireless system. The primary telepathy's feature is the capacity for two-way communication. It might be a hybrid technology with both dynamic and static parts, or it could employ a real-time approach (dynamic). Store-and-forward technology is the most widely used than other types since they are less expensive and need less specialised technology. Many people sent pictures in via email or posted them online. Store and forward telepathology have difficulties as a result of the disjointed images nature; considerable diagnosis errors are linked to incorrect selection of field by the pathologist submitting it (Weinstein et al., 2007). While the real-time method offers the advantage of improved engagement, it also requires more time and money and is, therefore, not a perfect substitute for in-person counselling. However, dynamic telepathology system utilising full motorised robotic devices has revolutionised the science, and there is a high degree of concordance (99-100%) between light microscopy diagnosis and telepathology. Weiss-Carrington, et al., 1999;

Dunn et al., 1999). Because of the significant developments that have taken place in virtual microscopy and digitized imaging over the past couple of years, it is now possible to create "virtual slides." This refers to a process of scanning an entire slide at a very high resolution, and viewing the resulting image by several pathologists without loss of any resolution. This real-time telepathology that is non-robotic eliminates the usual sample inaccuracy associated with static telepathology and does not require expensive equipment. The large amount of storage space required for images, usually around 150 MB (Baruah, 2005), is the primary obstacle that must be overcome. Because of the size of these files, it is vital to be able to analyse colour photographs at a variety of magnifications. Telepathology is not as common as teleradiology, but the digitalisation of the slides of pathology has enabled this service. Many individuals raised concerned of sending these enormous files via firewalls, but lately, numerous models have been developed in which the image is stored on a server and can be viewed from a remote location without the need of sending them.

Research has revealed that telepathology is beneficial in several different ways. One study found that a specialised pathologist who provided their services through telemedicine was more effective than an on-site staff pathologist. According to Liang et al. (2008), the diagnosis could be made with a higher degree of accuracy in 74% of the cases.

Tele-pharmacology

A pharmacologist's involvement and collaboration with other members of the healthcare team are crucial due to his or her expertise in medication prescribing, administration, and pharmacodynamics as well as in utilising the current drug-related information systems. The usage of tele-pharmacology, which makes a specialized pharmacological team (and information system) on call 24 hours a day and accessible to various medical specialists via remote multimedia link, looks ideal for a health care system.

Long-distance pharmacy services have been widely utilised. Thanks to computers, Tele-pharmacy enables doctors to review, enter, and dispense prescriptions remotely. Combining video, evaluating medications, and video chatting allows the complete pharmacy visit to take place digitally with a patient. Recent research, including 47 cancer patients, tele-pharmacy reduced travel by 27,000 kilometres (Gordon et al., 2012). Researchers found that tele-pharmacy helped clinicians catch prescription mistakes in about 19% of patients at six rural hospitals (Cole et al., 2012).

Several branches of medicine make use of telemedicine. The following are some of the most common areas of focus for telemedicine services:

Telepsychiatry:

Telepsychiatry and telepsychology applications are generally well-accepted by both patients and physicians, and both diagnostic and therapeutic outcomes are comparable to conventional face-to-face contact due to the fact that physical examination is not often required in psychiatry. Tele-psychiatry enables licensed psychiatrists to treat patients remotely and is primarily effective in controlling behavioural health. According to research, psychological assessments were administered to participants face-to-face and through videoconference, with

alternate test formats and guidelines used as a check. In rural and urban settings, 200 adult participants underwent testing, including those with cognitive impairment and healthy controls. Results from both the in-person and videoconference situations were found to be remarkably similar.

Tele-oncology:

Both in rural or isolated locations of highly industrialized and developed nations as well as in poor nations with scarce resources, access to high-quality cancer care is frequently lacking. Tele-oncology, or the use of medical telecommunications in oncology, has the ability to improve the access to and the standard of clinical cancer care, as well as teaching and training. Tele-oncology includes pathology, radiology, and other related fields. Its implementation in the underdeveloped world calls for a strategy customized to the needs, objectives, and available resources. We think that tele-oncology will be most successful in achieving its goals if it is applied in a systematic, regular, and long-term manner. Here, we examine tele-oncology projects that may lessen the disparity in access to cancer care across institutions with limited and abundant resources and provide recommendations for the creation of tele-oncology initiatives in low- and middle-income nations.
Cancer patients may receive more convenient and easily accessible care thanks to tele-oncology. It provides both live video platforms and equipment for storing and sending photos for diagnosis, enabling patient consultations with oncologists.

Tele-obstetrics:

This technology enables obstetricians to handle prenatal care remotely. One example is taking a baby's heart rate at one facility and sending it to an obstetrician at another for diagnosis.

2.8 Telemedicine in Nigeria

Despite the numerous advantages of telemedicine already being covered, telemedicine in Nigeria still encounters numerous challenges and roadblocks, some of which are:
1. Slow adoption of telemedicine, there is a pressing need to develop telemedicine through education, and this depends heavily on our understanding of the technology.
2. Rural and distant communities have limited or no connectivity: There should be access to quick and dependable internet in the majority of cases so as to improve telemedicine usage in healthcare, also Even if the cost of telemedicine has decreased, many people, particularly those in Nigeria's rural and distant villages and even in the urban areas, still cannot afford it. In spite of the limitations, Nigeria, a developing nation, can as well benefit more using telemedicine than some industrialized and developed nations. The primary goal of this new technology is to fill the gap in access to expert medical care. In real sense, substantial resources the government spends on frequent trips by its officials outside the country can be minimised. Additionally, hospitals in Nigeria could benefit from the increased availability of trained Nigerian doctors in the diaspora. Another possibility is a multiplier effect, whereby

recent medical graduates could remain in the country and work for foreign hospitals remotely rather than moving for better employment elsewhere; this may mitigate the effects of brain emigration.

2.8.1 Brief History of Telemedicine System in Nigeria

Telemedicine became available in the country through mobile units or vans driven by the Federal Ministry of Health and outfitted with satellite receivers. It is now even more important for a less costly, effective and more practical model development because of the challenging topography of Nigeria's hinterlands and the frequent flooding, insufficient electricity supply, and shortage of competent personnel to maintain and run these units.

The Nigerian ICT industry has made significant strides since the worldwide standard for mobile telecommunications (GSM) arrived there in 2001, and GSM networks are being used to supply services that are heavily reliant on technology.

In 2007, Nigeria officially adopted telemedicine after a pilot program was initiated by the country Ministry of Health and NASRDA (National Space Research and Development Agency) at six different federal medical centres and two separate teaching hospitals and across the country's geopolitical regions.

The University College Hospital in Ibadan and the University Teaching Hospital in Maiduguri were the two teaching hospitals used, while, Yenagoa, Makurdi, Owo, Birnin-Kebbi, Gombe and Owerri were the federal funded hospitals.

Private organisations, like Lagos's Lagoon Hospital and Benin's Igbinedion University Teaching Hospital, have all accepted the technology. Also introduced was a satellite-equipped mobile unit/vehicle for use in the pilot program.

The Mobile Doctor concept was invented in 2010 by a telecoms service provider. Customers could chat with a trained doctor or medical staff member for N100 (about 68 cents) each minute. Due to the high expenses, this service has yet to be widely used.

As part of activities making up their corporate social responsibility, telecommunications corporations might play a more vital role in execution which would be more economical and cheaper and having a higher rate of penetration in the rural communities.

The current teaching hospitals and primary care facilities, which are frequently understaffed, could be equipped with telephone networks to receive and forward calls with a lower cost via service providers and be reachable by patients in rural areas and clinicians or qualified medical workers.

The hospital made available several different methods for potential patients to get in touch: mobile equipment, landlines, tele-centres, and mobile kiosks. Depending on the caller's symptoms, a hospital employee answers the phone and decides whether or not to transmit the call to a doctor for further evaluation, treatment, or advice. Depending on the situation, a nurse may arrange a doctor's appointment and also refer patients, or a medical counsellor may offer health information and advice. Due to the widespread adoption of GSM and the fact that patients incur no additional expenses when visiting a hospital or other health facility, the proposed model is more economical. Long wait times and hospital crowding might be reduced, and patients could maintain open lines of communication with their designated doctors and other healthcare providers. In addition, calling or texting should be billed at the

national call rates rather than the exorbitant speciality call costs that most service providers currently impose.

Despite telemedicine's existence dating back to before the 20th century, innovations and improvements in ICT have made its widespread implementation more straightforward and accessible. It is now easy for anyone globally to submit any medical information to ask for medical aid. Doctors and other medical professionals can collaborate on patient care through videoconferencing, teleradiology, telenursing, telepathology, and telepharmacy (Kituyi et al., 2012).

According to (Matawalli et.al., 2014), telemedicine can be classified into three primary categories: store-and-forward, remote monitoring, and (real-time) interactive services. These are the three primary categories that telemedicine can be broken down into. *Telemedicine* is a service that can be of tremendous use to people who live in rural or isolated places. Examples are towns, far-flung places, and the fact that it is currently utilised in almost every medical field. Patients who live in such locations have the opportunity to be examined by a clinician or specialist, who can accurately and comprehensively do examination without stressing the patient to travel to regular distances or wait the customary amounts of time, as is the case with visits to conventional hospitals or general practitioners (Miller et.al., 2002).

2.9 Barriers to Telemedicine in Nigeria and Other Developing Countries in Africa

Telemedicine still needs to be used even if its practical implementation in the health ICT strategy framework is anticipated to increase by 2030. These barriers to effective telemedicine adoption were categorised by Adenuga et al. as being technological, financial, organisational, and human problems.

Technology accessibility: Even though more than 50% of Nigerians have access to the internet, there is a problem with the country's telecommunications infrastructure. For instance, 3G and 4G networks are primarily available in metropolitan regions; as a result, the government should collaborate with the telecoms sector to expand internet connectivity in rural areas. Electricity and a practical, high-quality internet connection are necessary for any telemedicine service to run successfully.

According to research, these difficulties were more noticeable in rural locations, which are most needed for telemedicine services (Saguaro et al., 2019). Due to these obstacles, clinicians and patients may be less interested in using telemedicine systems.

Organisational difficulty: Because telemedicine in Nigeria is still in its infancy, there needs to be more awareness among doctors and other healthcare professionals. Because stakeholders that should be funding telemedicine are unaware of its key advantages, Tornqvist stated that this information gap is a significant barrier. It is advised that healthcare practitioners hold seminars, conferences, and workshops to spread the word and raise awareness of the advantages of telemedicine among the public and the government.

Organizational obstacles:

Healthcare organizations within the Community of Sahel-Saharan States (CSSS) must ensure that any new medical technology is applied effectively to build a functional value chain system. Our analysis showed that critical obstacles to the effective uptake of telemedicine in the CSSS region included a need for more knowledge about the telemedicine system, difficulties balancing stakeholder interests, and an effective work organization. Even though there is telemedicine infrastructure in places like Ethiopia, Somaliland, and Djibouti, more is needed, according to various literature. One major obstacle was the need for more clinicians with extensive knowledge of telemedicine applications (Kifle et al., 2006); this resulted from insufficient telemedicine training and expertise, which caused the system to be used inconsistently (Biruk et al., 2018). These frequently lead to problems with parity in service quality and may impact how telemedicine systems are implemented successfully. Various analyses of the literature in this area revealed that low level of healthcare professional competency, poor service quality, poor strategic planning, ,and a lack of buy-in from institutions and healthcare professionals primarily caused the bulk of the problems. The absent of professional competency was also mentioned in Uganda and Kenya as a significant obstacle (Kiberu et al., 2019, Mulwa et al., 2017, Isabalija et al., 2011, etc.). Data input errors and service quality issues were evidence of this (Murererehe et al., 2017). (Kiberu et al., 2019). Another area for improvement in nations like Rwanda and Kenya was operationalizing the telemedicine system's need for more strategic planning.

Also, moral concerns include copyright protection, secrecy, and privacy. Telemedicine training is necessary for a strong, innovative, and cutting-edge healthcare delivery system in Nigeria, as Obikunle notes. In Ghana and Nigeria, legal and regulatory restrictions are frequently centred on numerous security issues and the absence of an e-policy framework. According to the analysis, most doctors and patients are still determining whether telemedicine will harm patients' personal information and the confidentiality of their medical records (Kissi et al., 2019). It was discovered that there are some security issues with using the internet to transmit health information. Patients may be reluctant to use telemedicine because they fear sharing their medical information due to what appears to be a lack of e-policy in this area. Due to the insufficient government support for the implementation of telemedicine (Abodunrin et al., 2009), the worry was even justified. The apparent absence of a coordinated national policy environment to control the system (Ajala et al., 2015) may also impact how successfully telemedicine is adopted in the ECOWAS.

Due to inadequate regulations, patients and healthcare professionals have been deterred from using telemedicine services.

Human barriers: According to Teppler, there is a propensity for fraud by providers who may overbill or charge more than is necessary, as well as provider impersonation. These impersonators may also use phishing and pharming techniques, as well as the installation of malware on the victim's teleconsultation device. According to our analysis, personal obstacles included conflicts of interest, resistance to change, job demand, and the rate of illiteracy. According to a study, medical professionals in Mali believed telemedicine technology might replace some of the benefits traditional healthcare practices provide ((such going for training

and refresher courses) and can make it more difficult to hire new employees (Bagayoko et al., 2014).). These elements were undoubtedly viewed as deterrents to the intrinsic motivation of physicians, and they may impact their resistance to and use of the system. The analysis also revealed that some Ghanaian doctors opposed telemedicine (Nyame-Asiamah, 2019) because of the lack of buy-ins, which is typical when new modifications are implemented. Additionally, Nigerian medical professionals perceived telemedicine systems as an additional effort with no additional rewards to motivate them
(Adenuga et al., 2017). The majority of issues, according to the research in this field, were brought on by inadequate strategic planning, subpar service delivery, a lack of buy-in from institutions and healthcare professionals, and a shortage of expertise. The absence of professional expertise was also cited as a major barrier in Kenya and Uganda (Isabalija et al., 2011; Kiberu et al., 2019). (Mulwa et al.,2017). The incompetencies were demonstrated by many data input errors and poor service quality (Murererehe et al., 2017). (Kiberu et.al., 2019) Another area for improvement in nations like Rwanda and Kenya was operationalizing the telemedicine system's need for more strategic planning. The literature review revealed that Lack of e-readiness among healthcare professionals, implementation gaps, employee turnover, inadequate internal communication, and lack of commitment may be the result of management's inability to adequately predict future obstacles and provide pro-active solutions. (Nchise et al., 2012), (Randu et al., 2019).

Haman Barriers As Highlighted in Some African Regions

Community for South African Development (SADC)

The primary barriers to healthcare professional competence in this region include a lack of education, concerns about using telemedicine systems to make bad medical decisions, and a lack of e-awareness or readiness (Bholah et al., 2015; Dinis et al., 2009; Gulube et al., 2001; Mauco, 2014; Parham et al., 2010) in countries like South Africa, Zambia, Mauritius, Botswana, and Low buy-ins from medical staff, particularly from the South African Health Professional Council, reflected these (Correia et al., 2017; Gregory &Tembo, 2017).
It is also crucial to recognize that healthcare specialists' failure to support telemedicine use fully may be due to their lack of confidence in users' (clinicians') capacity to manage patients' care effectively and handle medical problems. Additionally, our analysis revealed that telemedicine project duplication and fragmented execution was a significant hurdle in South Africa 265 (Ncube, 2019; Fortuin &Molefi, 2006). These frequently led to difficulties in determining progress and sustainable growth paths.

Community of Sahel-Saharan States (CSSS)

The literature review highlights two major individual-related impediments to the adoption of telemedicine in nations like Ethiopia and Djibouti (perceived danger to professional control and insufficient training and experties). According to earlier research, healthcare workers believed telemedicine practice threatened their autonomy and would result in inability to influence how a patients are treated (Xue et al., 2015) (Bertani et al., 2012). 1 This is because

telemedicine systems call for healthcare professionals to confer with other subject-matter experts to agree on diagnosing, treating, and managing patients correctly. Thus, perceived threats to autonomy can make it more difficult to use technology effectively.

Economic Community of West African States (ECOWAS)

The literature showed that conflicts of interest, resistance to change, job demand, and illiteracy rate were the main personal obstacles. A poll of medical professionals in Mali found that some of the advantages of conventional medical processes (such as traveling for training and refresher courses) might be replaced by telemedicine technology, which might prevent hiring more employees (Bagayoko et al., 2014). These factors were certainly seen as being a hindrance to the intrinsic motivation of doctors and may have an effect on how resistant they are to the system and how they use it. Additionally, the investigation showed that some Ghanaian doctors were against telemedicine (Nyame-Asiamah, 2019). This happens because there were no buy-ins, which are usually present when new changes are made. Additionally, telemedicine systems were seen by Nigerian medical experts as an additional burden that did

Financial Limitations; The investigation showed that the most significant financial barrier in the countries of this region was the cost of telemedicine, ICT infrastructure, and equipment maintenance (Frimpong et al., 2017; Mars, 2010). (Nyame-Asiamah et al., 2019). According to the literature, public healthcare is predominated in this region, especially in Ghana and Nigeria, this is due to the fact that most health systems are often underfunded and lacking in resources (Ajala et al., 2015), this ultimately limits the ability of public healthcare to pay for the startup costs of telemedicine**.** Our analysis revealed that further Considering that the is the high operational costs, which can lead to higher service fees. Furthermore, most of the population that requires telemedicine services are primarily low-income individuals living in outlying regions.

Nigeria's and other developing countries' infrastructures must adequately use modern internet technologies. Nigeria and many other developing countries face challenges to telemedicine adoption due to a lack of funding and inadequate computer access (Pradhan, 2004).

Where telemedicine can be employed is fundamentally constrained by the unpredictable nature of electric power sources, the general absence of Internet connectivity outside of big cities, and information and communication equipment inappropriate for tropical environments (Khazei et al., 2005), Unreliable access, computer infections, and insufficient capacity continue to be problems when and where there is no internet connection. Internet traffic jams can make imaging take longer, low image quality can make remote diagnosis less effective, and insufficient bandwidth can make real-time video conferencing impossible (Zhao et al., 2002). Even with the foundation in place, there are no widely accepted standards for software interoperability, and there is always a chance that hardware or computer systems will fail. (Kifleet al., 2006).

In developing nations, the expense of telemedicine is also a natural and perceived impediment to its application and adoption. For developing nations with low income or restricted funding, the costs of equipment, transportation, maintenance, and training of local workers for introducing and maintaining telemedicine initiatives can be prohibitive (Durrani et al., 2009). Additionally, the overall cost-effectiveness of particular telemedicine projects may not have enough evidence to back it, and it may be unknown how such techniques would affect the economy in different contexts (Swanepoel et al., 2010).

The use of telemedicine in developing nations may be constrained by local expertise, knowledge, and resources. More computer-literate professionals with experience managing computer services and the time it takes to learn computer-based peripheral medical tools may stymie adoption (Sood et al., 2005). Despite the potential need for distant learning, it may be difficult to meet local educational demands given regional differences in diagnostic and therapeutic resources as well as literacy and linguistic abilities. Additionally, while telemedicine may enhance professional diagnosis, treatment options are constrained by practical problems such local medical staff training, the availability of medical supplies and equipment, and getting medications to patients (Kvedar et al., 2006).

Another setback is social disparities between locations, which limit the applicability of telemedicine cooperation in Nigeria and developing countries and challenge cultural attitudes on health and wellness. The overlooking of incompatible cultural subsystems that limit ex knowledge from one cultural context to another is a primary contributor to telemedicine failure. Medical practitioners in developed countries may be inexperienced with the facilities and alternate management choice available in developing countries, and vice versa, as a result, telemedicine exposes patients to the danger of receiving inaccurate or incomplete medical information. Productively integrating telemedicine may not be accessible without a thorough awareness of the local context (Geissbuhleret al., 2003).

Limited telemedicine knowledge and experience.

The amount of expertise now presents among medical professionals on using various forms of telemedicine successfully and realistically still needs to be higher. This lack of knowledge about telemedicine, in turn, prevents the creative exploration of new practical and valuable telemedicine application modalities. As a result, one of the biggest obstacles to implementation is training medical professionals in this new method of providing health care through telemedicine (Tanriverdi et al., 1999; Turner, 2003; Whitten, 1995). Before telemedicine to be successfully implemented and benefit those involved, special competence is also necessary. In light of this, "tele-competence" was coined to define the qualifications and skills professionals must possess to perform this specialized work (Turner, 2003). Being an expert in health communication for telemedicine requires tele-competence. According to (Turner, 1999), such health communication aptitude involves a three-stage process in particular. Tele-competence, therefore, include (i) establishing and Planning, (ii). Learning and use (iii). Formalizing procedures.

Unfortunately, attaining this level of proficiency is a significant barrier to the deployment of telemedicine because resources like money and extensive training are only sometimes available to support this kind of campaign. To this purpose, telemedicine may not be a practical or cheap solution in some medical settings with few resources.

2.10 Factors Facilitating Telemedicine Development

1. Governance

Designing and implementing e-Health services requires substantial and challenging intersectoral collaboration among stakeholders with various backgrounds, interests, and goals. The successful implementation of telemedicine services depends on encouraging efficient and open collaboration, which must be fostered by establishing strong governance practices.Developing the legal frameworks necessary to manage confidentiality, liability, and cross-border jurisdiction in telemedicine requires the assistance of governing organizations. Once telemedicine services are implemented, regulatory authorities must oversee and accredit practitioners. However, the demand for eHealth and telemedicine programs frequently precedes governance structures (WHO, 2009).

2. Policy and Strategy

On a national and international level, telemedicine policies and strategies can create visions and goals for telemedicine solutions' application, provision, control, standards, and ethics. Such policies assist in facilitating and enabling the adoption of telemedicine by providing a structure and method for the planning and development of services as well as a standard by which the development and results of telemedicine services are successfully measured. (WHO, 2009).

3. Scientific Development

Scientific institutions' involvement in the development of telemedicine has various potential advantages. These organization can invest in creating and evaluating a variety of telemedicine initiatives and making sure that telemedicine is applied and evaluated carefully. Teaching hospitals can contribute to the training of the next wave of medical specialists. The involvement of scientific institutions can increase the likelihood that telemedicine innovation and application will be documented and shared to those eager to further its development and use. (WHO, 2009).

4. Evaluation Processes

The advancement of any medical area, including telemedicine, depends on rigorous review methods. Given the absence of empirical evidence on the use of telemedicine, conducting assessments and publishing outcomes may be especially crucial. These evaluations can facilitate the development of reliable information for national telemedicine policy and strategy, streamline telemedicine implementation, and assess the potential for project improvement and transferability. (WHO, 2009).

2.11 Applications of Telemedicine

Four main categories for telemedicine applications were identified by Grigsby (1997):
1. Management of specific diseases
2. Use within specific specialities
3. Classification according to technology
4. Types of clinical problems.

Treatment of a specific illness

Telemedicine is defined as its use in the management of different illnesses, conditions, or pathologies within the context and scope of specific illnesses (Turner, 2003), such as those linked to cardiovascular (Wirthlin et al., 1998), dermatological (Lesher et al., 1998), and respiratory (Nuccio, 2004) diseases. In these situations, a precise diagnosis is made, and the illness is then treated with the best telemedicine services available. Prior studies have demonstrated that persons with persistent and disabling diseases support and welcome increased access to telemedical technologies (Tetzlaff, 1997).

Use within specific specialities.

Teleophthalmology, telepsychiatry, telepathology, and tele-dermatology are terms and techniques used in specialized primary-care consultations and specific medical difficulties (Street et al., 2000). (2003) Turner et al. Additionally, teleconsultations are utilized in the fields of dermatology, intensive care, cardiology, rehabilitation, and mental health (Field, 2002). (Grigsby et al. 1997). In other words, specific medical issues with telemedicine are caused by the integration and usage of telecommunications devices in the context of each of the aforementioned medical fields.

Classification according to technology

This section outlines the different communication and technological forms that telemedicine can take, such as phones, fax machines, video transmission, camera light boxes, videoconferencing, multimedia, electronic mail (e-mail) services, remote monitoring systems, and interactive television devices (Turner,2003). Recent research has found more modern telemedicine technology, including order input systems and intelligent alerts (Nuccio, 2004). These technologies are designed to provide medical care because they are technical tools that send crucial patient information to medical staff during a clinical emergency; intelligent alarms are telemedicine systems in particular. This is done to close the gap between the availability of knowledge and services in underdeveloped areas. Inventory management solutions called order entry systems enable patients and providers discuss their medical needs (i.e., medication refills (Thames, 2003).

Types of clinical problems

(Grigsby 1997), The techniques used in telemedicine communication are referred to as assigning telemedicine based on the particular clinical situation. Therefore, when considering telemedicine in the context of specialties like teleradiology and telepathology, what is usually involved in these circumstances is the electronic transmission of diagnostic medical images and clinical data from a location of unspecialized medical service to a clinician with a high level of specialization. (Turner, 2003). Once the expert clinician receives the data in this kind of circumstance, they can examine it to decide on the best course of treatment. The novice practitioner might then request assistance and direction on managing the patient under the direct observation of the specialist after the specialist has made a decision. Healthcare institutions in small, remote areas that lack experienced practitioners can get advice from professionals anywhere in the world with the help of this type of interface. 2.2.6 Telemedicine's impact on the provision of medical services.

OTHERS:

Follow-up visits

When using health software for routine follow-up visits, telemedicine applications are more effective for patients. But it also makes follow-up more likely, reducing missed appointments and improving patient outcomes (Kifleet al., 2006). (Kifleet al., 2006).

Remote chronic disease management

As the prevalence of chronic diseases increases, the health system is faced with formidable obstacles. Given that it makes it easier and more affordable for patients to manage their health, it is a great option for telemedicine software (Ann, 1999).

Remote post-hospitalization care

A telemedicine program for patients with congestive heart failure experienced a reduction of 30-day and six-month hospital readmissions by 73% and 50%, respectively (CDC, 1998).

Preventative care support

Losing weight and giving up smoking are important steps in reducing your risk of heart disease and other disorders. Telemedicine can be a useful tool for connecting patients and healthcare professionals to make sure they get the assistance they need (CDC, 1998)

School-based telehealth

When children are sick at school, they could visit the school nurse or get taken by their parents to an urgent care facility. Health care providers and school systems can work together to conduct distant visits from the classroom. The medical professional can determine how serious the circumstance is and can teach or reassure parents (Ann, 1999).

Assisted Living Centre Support

Previously, telemedicine software have shown that telemedicine software can keep patients who need to live in assisted living facilities out of the hospital. Hospitalization is the only option when issues arise, even in less urgent circumstances, typically at night or on the weekends. Telemedicine enables on-call physicians to conduct a remote examination to determine whether hospitalization is necessary (Ann, 1999).

2.12 ADVANTAGES OF TELEMEDICINE

2.12.1 Advantages of Telemedicine for Patients

Lower Costs

Telemedicine users reportedly spend less time in the hospital, which reduces costs. Additionally, shorter distances could result in savings on ancillary expenses like daycare. Telemedicine, among other things, reduces costs associated with visiting the hospital for consultations. Through telemedicine, one can consult a healthcare professional from the comfort of their own home, workplace, or anywhere else. According to a study, employing telemedicine can save healthcare expenses by up to 30%. (Charles, 2000; Moser et al., 2003).

Improved and Increased Access to Care

Access to care for people with impairments is made easier through telemedicine. It may also be beneficial to other groups, like the elderly, those who live in remote areas, and people who are incarcerated. Patients in remote areas can also take use of specialized services, such as post-operative monitoring or mental health care, that they might not otherwise be able to receive without making a long trip for an appointment. Additionally, patients have easier access to primary, dental, and mental health care in federally designated underserved areas (Chauhan et al., 2020). Telemedicine eliminates the need for patients to travel a great distance and wait for a doctor consultation. Some folks plan their hospital trips in advance because they anticipate spending the entire day there.

Preventive Care

Patients may find it simpler with telemedicine to receive preventive care that will help them live longer, healthier lives. This is particularly true for those individuals who are unable to access competent treatment due to their financial circumstances or geographic limitations. In a 2012 study of adults with coronary artery disease, preventive telemedicine, for instance, was found to improve health outcomes (Amuta, 2020).

Convenience

Patients can receive care through telemedicine in the comfort and privacy of their own homes. It might be unnecessary for someone to schedule childcare or take time off work as a

result Patients can contact a healthcare provider using telemedicine from any location in the world. You don't have to leave the house or wait in traffic to see a doctor (Amuta, 2020).

Slowing the Spread of Infection

Being treated in a hospital requires being near individuals who might be ill. For those with underlying disorders or compromised immune systems, this is extremely hazardous. Telemedicine aids in preventing and controlling the spread of illness at the hospital by reducing patient interaction with one another (Charles, 2000).

Telemedicine allows patients to get care in the privacy and comfort of their own homes. This may eliminate the need for a person to take time off work or arrange daycare. Telemedicine allows patients to reach out to healthcare giver from anywhere in the world. There is no need to leave the house or sit in traffic to see healthcare professionals (Amuta, 2020).

Going to the hospital for treatment entails being in close proximity to people who may be sick. This is especially risky for persons who have underlying illnesses or have weakened immune systems. By decreasing patient interaction with one another, telemedicine helps to prevent and control the spread of infection at the hospital (Charles, 2000).

2.12.2 Advantages of Telemedicine for Healthcare Providers

Medical professionals that offer telemedicine services may benefit in a number of ways, including:

Lower Overhead Costs

The overhead costs of medical professionals that offer telemedicine services may be cheaper. For instance, they might be able to purchase an office space with fewer exam rooms or pay less for front-desk help (Moser et al., 2003).

Additional Source of Income

Healthcare practitioners may find that telemedicine allows them to attend to more patients, which boosts their income (Moser et al., 2003).

Less Exposure to Disease and Infection

Healthcare personnel don't have to worry about getting exposed to any germs when they consult with patients remotely (Chauhan et al., 2020).

Patient Satisfaction

If patients don't have to go to the hospital or wait for care, they may be happy with their healthcare provider (Villines, 2020).

Fewer Cancellations or No-Shows up

By facilitating more convenient appointment times for patients, telemedicine can lower the number of cancellations or no-show ups. A healthcare provider can get in touch with a patient before or during the visit if they forget their appointment (Villines, 2020).

Support Healthy Lifestyle

Telemedicine enables medical professionals to support their patients' healthy lifestyle decisions, such as stopping smoking (Villines, 2020).

2.13 Disadvantages of Telemedicine

On the other hand, telemedicine might not be suitable for everyone or in every circumstance. There are certain potential drawbacks when telemedicine is employed in place of conventional care.

Disadvantages for patients

Insurance Coverage

Some insurance providers do not cover telemedicine. For instance, only 26 states in the US currently require insurance to pay for or reimburse telemedicine expenses. On the other hand, these laws are always changing (Villines, 2020).

Cybersecurity

Like any other technology that involves electronically communicating patient data, telemedicine systems are susceptible to hacks and breaches. Healthcare businesses continue to be one of the main targets for online criminals and terrorists (Villines, 2020).

Prolonged Treatment

Because a healthcare provider cannot provide life-saving care or laboratory tests digitally, the initial adoption of telemedicine for emergency care may create a delay in treatment (Villines, 2020).

Inability to Prescribe Medications

Not to be confused with e-prescribing, many states forbid internet prescriptions until a doctor-patient relationship has been established. State restrictions on what constitutes a physical examination vary, but it may be necessary for a patient to undergo one before a doctor can write a prescription for them (Villines, 2020).

2.13.1 Disadvantages for healthcare providers

Licensing Issues

Depending on the state in which they are licensed and the state where the patient resides, healthcare providers may not be authorized to practice medicine across state lines due to different state legislation (Villines, 2020).

Technological Concerns

Making the right digital platform choice can be challenging. Delivering high-quality medical care could be difficult if there is a poor relationship. Healthcare practitioners must make sure the telemedicine software they use is safe and complies with all privacy laws (Villines, 2020).

Inability to Examine Patients

Healthcare providers must rely on patient self-reports during telemedicine encounters. Professionals may need to ask more questions to gather a complete health history, and if a patient forgets to mention a significant symptom that was present during in-person therapy, treatment may be put at risk (Villines, 2020).

Equipment and Technical Training

Training is required for providers on how to use telemedicine technology. Additionally, there are equipment costs to take into account, like encounter management software and integrated telemedicine carts. For outlying hospitals, the early expenditures of telemedicine may be prohibitive (Villines, 2020).

2.14 Benefits of Telemedicine

Previous studies have demonstrated that, when done appropriately and effectively, telemedicine contacts can benefit patients by lowering sickness morbidity, reducing spending and time away from work, and improving treatment outcomes due to quicker diagnosis and therapy (Castro et al., 2014).

Similar to this, health practitioners who use telemedicine may gain knowledge for future disease management through the development of their skills and expertise as a result of encounters with medical specialists. As a result, telemedicine has the potential to improve productivity and decrease pointless or inappropriate referrals, which would be advantageous for the entire healthcare system by lowering costs related to cars and gas, wasting resources, clogged clinics, and unfavorable health outcomes that impede economic progress (Castro et al., 2014).

Telemedicine increases collaboration. the quality-of-care patients receive improves as a result of increased collaboration and productivity among medical staff due to telemedicine. According to a survey of intensive care unit nurses, 79% of respondents said that tele-ICU

systems help nurses provide better patient care, and 75% said that using them enhances their professional performance.

The evidence suggests that telemedicine is more cost-effective because it requires fewer follow-up appointments. There is proof that using telemedicine lessens the need for follow-up visits, which lowers the cost. According to one study, 6% of patients who used telemedicine needed a follow-up for a comparable problem, compared to 13% of patients who visited a doctor's office and 20% of patients who visited an emergency room. (Davis et al. 2006).

2:15 Summary of Literature Review

The theoretical framework use for this research work is the Unified Theory of Acceptance and Use of Technology (UTAUT) Venkatesh et al (2003). This theory was considered after thorough reviewing of literature.

The theory tackles concern like perceived effect and demonstrates in detail how moderating factors affect behavioural intention and use. Studies on people's intents and use of technology have been conducted over time, along with the development of various tools and metrics. In an effort to better understand the amount of acceptability and utilization of Telemedicine by physicians and healthcare professionals, a closer examination of numerous technology adoption assessment models created by academics has been made (Musa et al., 2005).

The literature review covered the different types of telemedicine, the history and challenges of telemedicine in Nigeria, the advantages of telemedicine, the obstacles to telemedicine, and the use of telemedicine in various medical specialties, including teledermatology, telepharmacy, telepsychiatry, etc.The literature also covers telemedicine's benefits and drawbacks, impediments to the deployment of telemedicine in Nigeria and other developing nations, particularly in Africa, as well as potential solutions to the problems that have been identified. Some of the obstacles preventing utilization include a lack of professional involvement and the absence of facilities.

Health care is evolving toward the application of telemedicine, as evidenced by a study of empirical investigations linked to this topic, including one done at the Lagos State University Teaching Hospital (LASUTH) and the Lagos State University College of Medicine (LASUCOM), This paper examines the range of telehealth applications in both urban and rural hospitals as well as the understanding and opinions of some Nigerian healthcare professionals on telemedicine and e-health. Through this evaluation of the literature, it was determined that medical schools' telemedicine policies and curricula needed to be reviewed in order to promote the use of telemedicine in the provision of medical services. Methodological process will be described in the following chapter.

CHAPTER THREE

METHODOLOGY

The methods employed in conducting this study are highlighted in this section, the study's design, location, population, inclusion and exclusion criteria, instruments, sampling strategies, data collection procedures, analysis strategies, ethical considerations, timeline, and budget.

3.1 Study Design

The research study adopted a cross-sectional descriptive design of medical staff (clinicians) at Federal Medical Centre Yenagoa in Bayelsa state to evaluate their familiarity with and opinions on telemedicine.

3.2 Study Area

The study was conducted at the Federal Medical Centre in Ovom, Yenagoa, Bayelsa State. Bayelsa State is situated in Southern Nigeria in the core Niger Delta region between Delta State and River State, with eight Local Government Areas, including Yenagoa, where the study was conducted (Alagoa et al., 2009). It has a total area of 10,773 km2 (4,159 sq mi) and is also the smallest in Nigeria by population (1,704,515) according to the 2006 population census. The state has a total of 311 hospitals, according to Nigeria Health Facility Register (HFR 2022). Occupants of the state are primarily civil servants, traders and farmers. FMC Yenagoa is one of the 52 public tertiary hospitals in Nigeria. It was established on 9th September 1999. The hospital's establishment was due to the federal government's policy to sight FMC in all states that do not have a federal teaching hospital. The hospital is the foundation of healthcare in Bayelsa state. The hospital is a 450-bed hospital. According to Integrated Payroll and Personnel Information System (IPPIS 2021), the hospital's clinical staff strength is 1010.

3.3 Study Population

the study comprises healthcare professionals, namely pharmacists' doctors, nurses, and medical laboratory scientists in the Federal Medical Centre Yenagoa, Bayelsa state.

3.4 Inclusion and Exclusion Criteria

3.4.1 Inclusion Criteria

The study included healthcare professionals, namely doctors, nurses, pharmacists, and medical laboratory scientists currently working in FMC Yenagoa.

3.4.2 Exclusion Criteria

1. The study excluded doctors, nurses, pharmacists and medical laboratory scientists on leave at the time of data collection.
2. The study also excluded healthcare professionals on out of station posting.

3.5 Study Tools

The study employed a structured questionnaire administered by the researcher and a staff of the institution. See the questionnaire in (appendix 1) the questionnaire was structured to elicit responses from participants on their knowledge, attitude and use of telemedicine.
The questionnaire for this research work was divided into four sections:
(1) Respondent's demographic information; in the first section,
Participants were asked to provide information about their personal and professional backgrounds
(2) level of telemedicine knowledge; The second section contains 11 statements that were used to assess the respondents' telemedicine knowledge; each statement was responded to with a simple "Yes" or "No" response
(3) Attitude toward telemedicine, Section three comprised five statements designed to assess respondents' attitudes about telemedicine; a response with a mean score above zero (0) is accepted as a positive attitude Response, while a mean score less than zero (0) is rejected. Meaning a negative attitude.
(4) use of telemedicine; The fourth section comprised questions that accessed the use of telemedicine. This section was graded using frequencies and percentages.

3.6 Sample size determination

Using Cochrane formulae (1963) a cross-sectional descriptive study for a population of less than 10000 was used, the minimum sample size of 130 was estimated.
Using the formula below:

$$n = \frac{(Z\alpha/2)\,Pq}{d2}$$

Where: n= minimum sample size (population < 10,000)
Zα/2= standard normal deviate of 1.96 at 95% confidence level (two-tailed test)
P= prevalence of telemedicine in a previous study done in 2015 by Boringi et al. = 9.38% (0.0938)
q= 1-P =1-0.0938 =0.09062
d= degree of accuracy desired/ margin error allowable of 5% (0.05)
Therefore:

$$n = \frac{1.96 \times 1.96 \times 0.0938 \times 0.9062}{0.05 \times 0.05}$$

$$n = \frac{0.32654}{0.0025} = 130$$

Assuming a Non-response rate of 20%

20/100 x130 =26
130 + 26= 156.
total Sample size
= 156

3.7 Sampling techniques

The study's participants were selected using a stratified sampling method. Sample units were allocated to the various strata by proportion, and then samples were drawn randomly from each stratum consisting of healthcare professionals (doctors, nurses, chemists, and medical laboratory scientists).

3.8 Data collection

A self-designed questionnaire was used to compile the data. For privacy reasons, the questionnaires were not identified. After the researcher and a member of the institution's clinical staff were briefed on how to deliver and fill out the questionnaires, the questionnaire was given to each responder individually, and the researcher gave all the necessary explanations were given to the respondents to guide the filling of the questionnaire. The duration for data collection was two weeks.

3.9 Data Analysis

After data collection, it was observed that four of the data collected were not correctly filled, and two were missing. The 150 questionnaires were analysed using SPSS version 22.0 for descriptive statistics of simple standard deviation, mean percentage, and frequency. Pearson correlation was used to test and evaluate the statistical association between the participants' years of experience and their knowledge of telemedicine responses. The study results are presented in tables, figures and bar charts.

3.10 Validity/reliability of study tools

Validity: Following a thorough review of literature, the questionnaire provided information about the backgrounds of healthcare professionals and evaluated their level of telemedicine knowledge, attitude, and use. The questionnaire was subjected to Face and content validity by the research supervisors to ensure the instrument's suitability and was finally written by the researcher integrating the corrections pointed out by the supervisor.
Reliability: Thirty clinicians were used to conduct test-retest to ensure the instrument's reliability; the test-retest data was entered into a spreadsheet, and the researcher did the necessary data cleaning.

3.11 Ethical Clearance

Verbal informed consent was collected from respondents, and the researcher received ethical clearance from the Federal Medical Centre Yenagoa as well as the research ethics committees of the University of Port Harcourt.

CHAPTER FOUR

RESULTS AND DISCUSSION

The outcomes of the data analysis are presented in this chapter. First, the researcher presented the respondent's socio-demographic data, followed by their telemedicine-related knowledge, attitude, and practice. The response rate was one hundred and fifty-six (156) questionnaires. However, 150 correctly filled questionnaires were retrieved and analysed, giving the response rate of 96%.

4.1. Results and Analysis

4.1.1 Socio-demographic Characteristics of the Respondents

Table 4.1.1

Variables	Frequencies (n=150)	Percentage (%)
Age		
Less than 20	8	5.3
21-25	35	23.3
26-30	26	17.3
31-35	37	24.7
36 and above	44	29.3
Sex		
Male	70	46.7
Female	80	53.3
Religion		
Christianity	142	94.7
Islam	6	4.0
Traditional	1	0.7
Others (specify- atheist)	1	0.7
Profession		
Doctor	40	26.7
Nurse	50	33.3
Medical laboratory scientist	31	20.7
Pharmacist	29	19.3
Years of experience		
less than a year	17	11.3
1-5 years	44	29.3

6-10 years	46	30.7
11-15 years	26	17.3
16-20 years	9	6.0
21 years and above	8	5.3

Table-4.1.1 shows the socio-demographic variables of the respondent. it shows that (29.3%) of the respondent where within the age group of 36 years and above, followed by 30-35 years of age group (24.7%). And only 5.3% respondents were below the age 20 years group. Distribution of the gender of the respondents, out of 150 respondents (80) 53.3% of the respondents are female and (70) 46.7% are male. An overwhelming majority of the respondents (142) 94.7% are Christians, while (6) 4% are Muslims, respondent who practice traditional religion (1) 0.7% and an Atheist (1). 0.7% Analysis of the profession of therespondents shows that (50) 33.3% are nurses, (40) 26.7% are doctors, (31) 20.7% are medical laboratory scientist and (29) 19.3% are pharmacist. Considering the years of experience of the respondents, (46) 30.7% had 6-10years of on-the-job experience, while (44) 29.3% fall with the range of 1-5years experience, (26) 17.3% of the respondents have 11-15 years' experience, (9) 6.0% have 16-20 and (8) 5.3% have less than 21years experience and above each.

Respondent Knowledge of Telemedicine.

Table 4.1.2a Respondent Knowledge of Telemedicine.

Variables	**Frequencies (n=150)**	**Percentage (%)**
Telemedicine is the delivery of health care services, where distance is a crucial factor, by all health care professionals using information and communication technologies.		
Yes	142	94.7
No	8	5.3
Telemedicine provides health care service where distance is a barrier		
Yes	133	88.0
No	18	12.0
Telemedicine can help capture data and store patient information for future use		
Yes	131	87.0
No	19	12.7

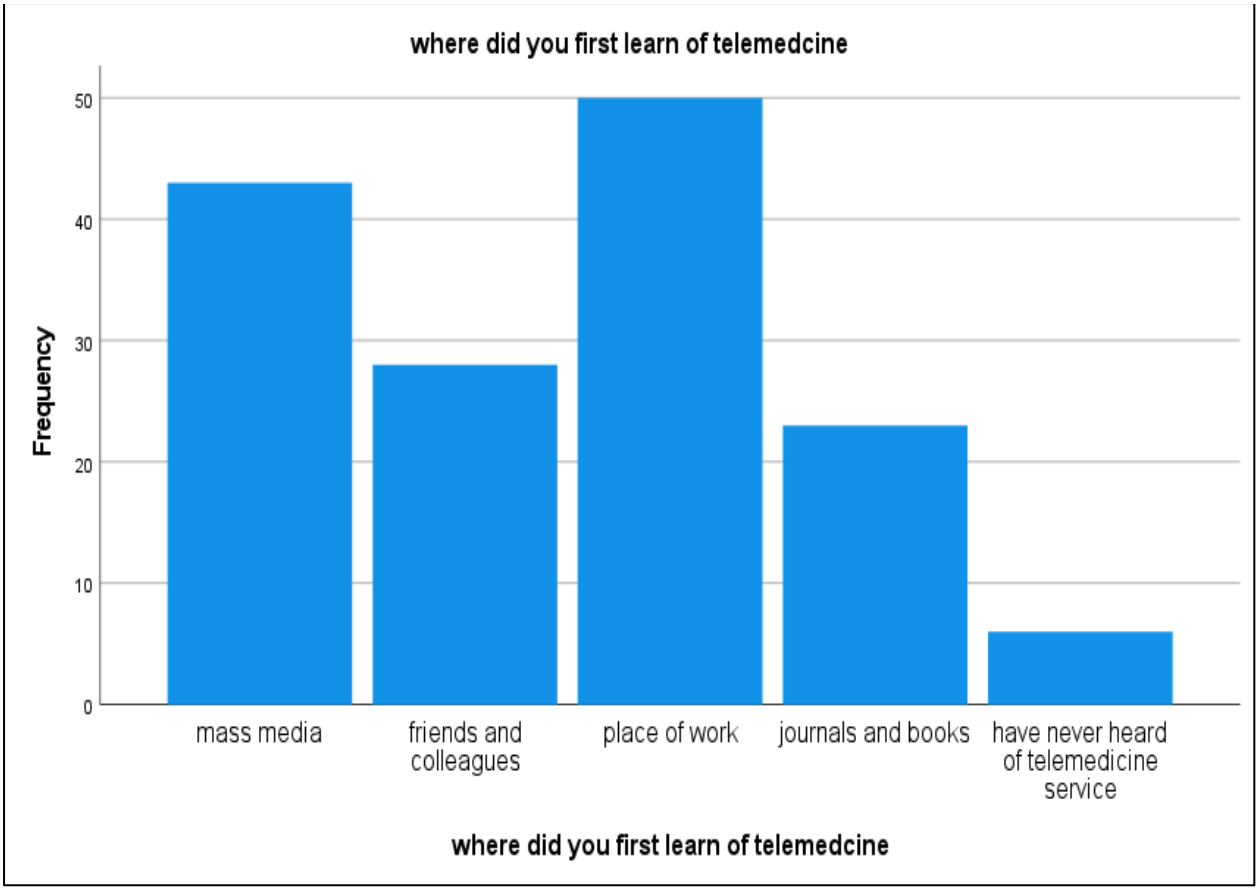
Telemedicine service is of no benefit to health care system especially in developing country		
Yes	30	20.0
No	120	80.0
Telemedicine hinders access to quality health delivery		
Yes	53	33.5
No	97	64.7
Telemedicine allows you to offer emergency service		
Yes	124	82.7
No	26	17.3

Table 4.1.2b Respondent Knowledge of Telemedicine.

Variables	**Frequencies (n=150)**	**Percentage (%)**
Telemedicine service is cost effective for the management of chronic illness		
Yes	108	72.0
No	42	28.0
Telemedicine enhances uninterrupted access to health care services and information's		
Yes	115	76.7
No	35	23.3
medical application of telemedicine technologies is a barrier to health services		
Yes	41	27.3
No	109	72.7
Telemedicine improves patients care by shortening the waiting time and prompt intervention		
Yes	129	86
No	21	14
Where did you first learn of telemedicine		

Mass media	43	28.7
Friends and colleagues	28	18.7
Place of work	50	33.3
Journals and books	23	15.3
I have no idea of what telemedicine is.	6	4.0
Computer/internet skills		
Advance	31	20.7
Average	57	38.0
Beginner	45	30.0
No skills	17	11.3

Table 4.1.2 shows the knowledge of the respondent on telemedicine services. (142) 94.7% of the respondents, who make up the vast majority, are familiar with the definition of telemedicine. In response to the topic of whether telemedicine offers health care services where distance is a hindrance, (133) 88% of participants agreed, while (18) 12% disagreed. Also, most of the respondent (131) 87% agreed that telemedicine can help capture data and store patient information for future use. The respondents' responses on the question, telemedicine service is of no benefit to health care system especially in developing country shows that (120) 80% knows the benefit of telemedicine service. The question Telemedicine hinders access to quality health delivery shows (97) 64.7% of the respondents in agreement while 33.5% (53) of the respondent disagreed. Majority of the study participants (124) 82.7% agreed that Telemedicine allows you to offer emergency service while (26) 17.3% disagreed. from the respondent's point of view (108) 72% responded positively that telemedicine service is cost effective for the management of chronic illness. Majority of the respondents (115) 76.7% agreed that Telemedicine enhances uninterrupted access to health care services and information's while (35) 23.3% are not in agreement. Majority of the respondents (109) 72.7% viewed that telemedicine enhances uninterrupted access to health care services and information's while (41) 27.3% disagreed to the above statement. Telemedicine improves patients care by shortening the waiting time and prompt intervention (125) 89% said yes while (21) 14% said no. (43) 28.7% of the respondent got there first knowledge of telemedicine from Mass media, (28) 18.7% got their knowledge from friends and colleagues, while (50) 33.3% got their knowledge from their Place of work and (23) 15.3% Journals and books and finally (6) 4.0% I have no idea of what telemedicine is all about (31) 20.7% have advance computer and internet skill, while (57) 38% have average computer/internet skill, (30) 30% are beginners and (17) 11.3% have no skill


where did you first learn of telemedcine
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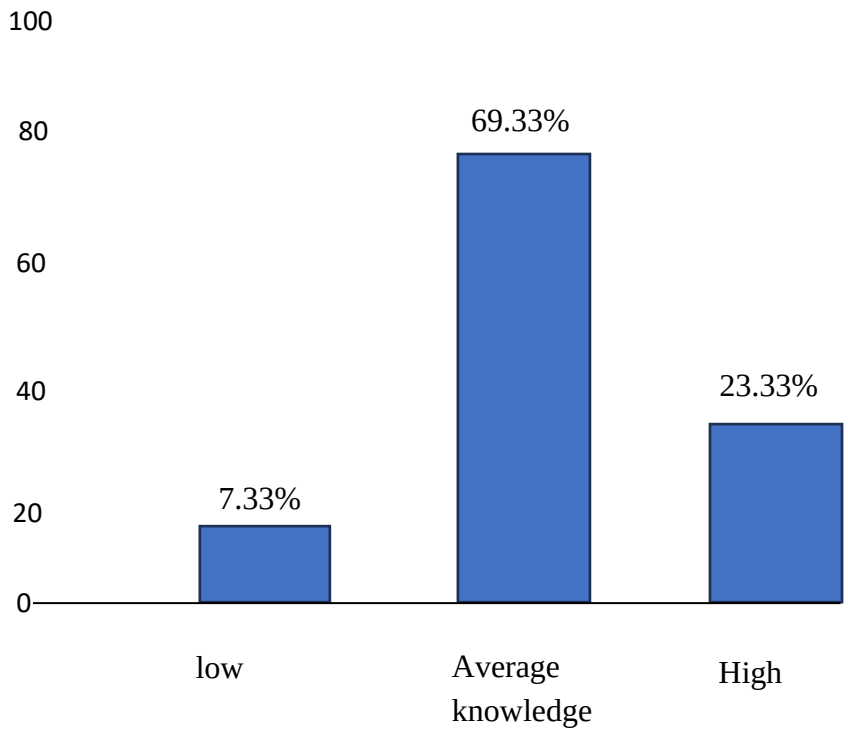
where did you first learn of telemedcine



Score of knowledge 0-49% low, 50%-70% average, 80 and above, high

Table 4.1.3 Respondents Attitude Towards Telemedicine Services

Variables	SA	A	U	D	SD	Mean (x)	Comment
Telemedicine is necessary for quality health care delivery.	83	58	5	3	1	(1.33)	positive attitude
Telemedicine cannot substitute Physical Examination.	60	60	10	15	5	(1.37)	positive attitude
Telemedicine is expensive and not suitable for developing country like ours.	22	33	21	45	29	(2.11)	positive attitude
Telemedicine services result in Confidentiality issues.	27	45	33	37	8	(2.65)	positive attitude
Telemedicine services can increase the Chances of misdiagnosis?	33	51	23	29	14	(1.28)	positive attitude
grand mean (1.75)							

SA=(strongly agreed), A=(A greed), U= (Undecided) SD(Strongly Disagreed) and D=(Disagreed) (criterion mean is 0)

Table 4.1.3 shows questions related to attitude of health care professionals (clinicians) towards telemedicine in the federal medical center Yenagoa Bayelsa state. From the table above each of the question and responses has a mean value above 0, and the total grand mean is 1.75. this shows that all the items 1,2,3,4,5 have their mean value above the criterion mean value 0 and are accepted as positive attitude towards telemedicine.

Table 4.1.4 Use of Telemedicine Services

Variables	frequencies (n=150)	Percentage (%)
Are you currently rendering telemedicine service?		
Yes	61	40.7
No	89	59.3
If Yes		
As private practice	26	17.3
At your place of work	23	15.3
Both	13	8.7
How long have you providing telemedicine service?		
Less than a year	11	7.3
1-3 years	34	22.7
4-6 years	11	7.3
7 years and above	8	5.3
Never rendered telemedicine service	86	57.3
In what situation do you apply telemedicine service?		
Emergency	18	12.0
While at home	8	5.3
When distance is a barrier	40	26.7
Only at work	8	5.3
None of the above	50	33.3
All of the above	26	17.3
What means of communication do you use while rendering telemedicine services?		
Phone call	22	14.7
Text message	5	3.3
Social media e.g., WhatsApp	19	12.7
Zoom	12	8.0
All of the above	53	35.3
None of the above	39	26.0
Which electronic device is most suitable for telemedicine service delivery?		

Mobile phone	23	15.3
Laptop	24	16.0
iPad	5	3.3
Smart television	7	4.7
All of the above	56	37.3
None of the above	35	23.3

Table 4.1.4 shows that more than half (89) 59.3% of the respondents are currenting not rendering telemedicine service, while (26) 17.3% render telemedicine services as private practice, (23) 15.3% render telemedicine service at their place of work and (13) 8.7% render telemedicine service both as private practice and at their place of work. Also, table 4.1.4 shows that (89) 59.3% of the respondents have never rendered telemedicine service and (31) 20.7% of the respondents have been rendering telemedicine services for 1-3years, while (11) 7.3% of the responds have been rendering telemedicine services for the past 4-6years and less than a year respectively. When asked in what situation do you render telemedicine service, (40) 26.7% went for when distance is a barrier followed by (26) 17.3% who went for all of the above and (18) 12.0% when distance is a barrier, (n) 33.3% when for the none of the above. (53) 35% of the study participants agreed that all the mentioned means of communication for telemedicine service is correct while (39) 26% disagreed to all the mentioned means of communication in telemedicine services, and phone call (22) 14.7% had the highest score as a single form of communication in telemedicine service. Furthermore, (56) 37.3% of the participants accepted all the mentioned devices as device used for telemedicine service, 15% went for mobile, 16% went for laptop, 4.75% went for smart television and 3.35% went for iPad while 23.3% of the study participate opted for none of the mention device option as tool for telemedicine service.

Table 4.1.5 Relationship between years of experience and knowledge of telemedicine

Variable	**n**	**mean**	**Sd**	**r**	**decision**
Knowledge	150	2.93	1.283	-.112	reject
Years of experience	150	6.7000	1.68192	-.112	

n= number of respondents, mean of respondents, SD = Standard deviation of respondents, r=Pearson correlation

Pearson correlation was employed to analyze the relationship between years of experience and knowledge of telemedicine and from the result obtained in table 4.1e above the (r) is -.112 which indicates a weak correlation. Conclusion: there is no relations between the participants years of experience and their knowledge of telemedicine.

4.2 Discussion

The study which was a hospital-based descriptive cross-sectional survey was set out to investigate and assess healthcare professionals' knowledge and attitude toward telemedicine in Federal Medical Centre Yenagoa, from December 2021 to June 2022. Telemedicine has been described as the use of information and communication technology (ICT) to improve patient outcomes by increasing access to care and medical data., a term created in the 1970s that means "healing at a distance" (Strehle et al., 2006). in an attempt to expand access to medical professionals, telemedicine can lessen the variation in diagnosis, treatment, and clinical care across geographic regions. Teleconsultations can save time and money by cutting down on travel time and recommendations by 80.8%, according to a survey conducted in rural parts of the Brazilian state of Minas Gerais in 2009-2010 (Alkmimet al., 2012). Telemedicine has been shown in numerous research (Jueet al., 2017) to reduce healthcare expenses considerably, cut wait times, and increase health resource use efficiency.

While telemedicine is all the rage in first-world countries, it is still mostly unheard of in those less fortunate. If appropriately implemented, this technology can address global issues, including the lack of affordable, high-quality healthcare services (Leu & Kinzer, 2000). For telemedicine to reach its full potential, patient and healthcare provider attitudes must be established. Research shows that 65% of smartphone owners have installed a health-related app; this demonstrates that users are receptive to health as something that can be monitored digitally and kept in one's pocket (McGillicuddy et al., 2013).

While the developed world takes advantage of the benefit of this technology by encouraging remote monitoring of chronic health issues and an efficient online data storage system, telemedicine in the underdeveloped world is still relatively new and under-utilized (Shittu et al., 2007).

In Libya, just 39% of doctors have a solid grasp of telemedicine, while 11% need to learn what it is (El Gatitet al., 2008). While Abodunrin et al.,2009) conducted a study to evaluate the perceptions and knowledge of health professionals towards e-health and telemedicine at the LAUTECH Teaching Hospital in Osogbo, Nigeria; they found that the majority of health professionals were interested in providing telemedicine services despite having a limited understanding of the technology. This study aims to shed light on the understanding, attitude, and use of telemedicine among health professionals in Yenagoa, Bayelsa state, Nigeria, even though its deployment has met with limited success and poor utilisation.

4.2.1 Socio-demographic Characteristics of the Respondents

in this study, the total number of the study participats was one hundred and fifty (150); most were females, while the rest were males. The higher number of female respondents in this study conforms with the study of (Abodunrin et al.,2009) in Lautech Teaching Hospital, Nigeria, where the number of female respondents was 58(53.2%) and male 51(46.8%). The similarity in these two-research outcomes is that the professional with the highest number of respondents was the nursing profession. WHO (2020) affirms that females dominate the health sector, especially nurses. However, the result of this study, having the majority of the

respondent's females, contradicts the report of a previous study which recorded a higher number of male respondents than females in Ethiopia (Biruk et al., 2018).

Analysis of the respondents' profession shows that most were nurses, followed by doctors, medical laboratory scientists, and pharmacists, respectively. As highlighted in this study, the majority of the respondents were nurses, which is in line with the previous report of (Biruket,al 2018) where the majority of the respondents were nurses but in contrast with the report by (Abodunrin et al., 2009) in Lautech Teaching Hospital Osogbo, where a high number of the respondents were doctors. Also, in contrast to this present study, (Shittu et al. 2007) reported medical laboratory scientists as the significant respondents among healthcare professionals. The professional difference in the studies listed above could be influenced by staff strength and the respondent's work schedule.

It was observed from this study that the vast majority of those surveyed were Christians, followed by Muslims, traditional religions, and atheists. The higher number of Christians, followed by Muslims, is similar to the report of (Abodunrin et al., 2009) in Lautech Teaching Hospital, Nigeria, where they recorded the highest numbers of respondents in the study of Christians followed by Islam. The higher number of Christians, as highlighted in this present study, is not unusual because the most predominant religious practice in the southern part of Nigeria is Christianity, and most of the residents in the state and staff of the hospitals are Christians. Considering the respondents' years of experience, those with 6-10 years of on-the-job experience had the highest score, followed by those with 1-5years experience, 11-15 years of experience, 16-20yrs. Finally, those with 21 years of experience had the lowest score. The previous report (Biruk et al., 2018) that health professionals have less than five years of work experience is in sharp contrast with the report of this study, which reveals that the majority of the respondents had 6-10 years of job experience.

4.2.2 Respondent's Knowledge of Telemedicine.

The findings from the study indicate that "telemedicine" was a phrase that the vast majority of respondents were familiar and that the term refers to the delivery of health care services despite physical distance barriers, and agreed that telemedicine could aid in data capturing and storing patient information for future use. There are parallels between this work and those of (Abodunrin et al.,.2009) (Idowu et al., 2004). It is possible that the time that has passed since the last study on telemedicine was conducted at LAUTECH accounts for the difference between the current study's high level of knowledge and that of the previous study. The respondents’ responses that telemedicine service is of no benefit to the health care system, especially in developing countries, show that an overwhelming majority of the respondents know the advantage of telemedicine service. This high level of knowledge about telemedicine among health professionals in a developing region like Bayelsa state, Nigeria, contrasts sharply with the study conducted in Libya, where only 39% of physicians thoroughly understand telemedicine. In comparison, 12% need to be aware of the technology (El Gatitet al., 2008). The differences in this level of knowledge could be the time difference in the study. Also, technology is evolving, and more people are becoming aware of the importance of ICT through seminars, training, journals, and workshops; this could account for the knowledge gap. As observed in the study, a significant number of the study

participants got their knowledge of telemedicine from their Place of work, followed by respondents that got their first knowledge of telemedicine from Mass media, information from friends and colleagues, information from Journals and books and finally, few per cent of the respondents have no idea of what telemedicine is all about. The high number of respondents that got their knowledge from their Place of work and the low level of respondents with no idea of what telemedicine is in this study is proof of advancing technology among health professionals in Federal Medical Centre Yenagoa, which is advantageous for the adoption and implementation of telemedicine in the facility. Considering that the area of this study is still a developing nation, one will expect that the knowledge about telemedicine will be low among health professionals. However, the study proves such an idea to be wrong. It contradicts the report (Biruk et al., 2018) in Ethiopia that most respondents needed to be more knowledgeable about telemedicine's many facets. Even fewer had never heard of telemedicine. However, the report of this study supports the study of European regions with a higher number of healthcare professionals having good knowledge of telemedicine (Mairingeret al., 1996). The study contradicts the reports of (Biruket,al2018) in North West Ethiopia,wherein the respondents' coworkers made up the majority of the sources of telemedicine information. In this era of modern technology, there is no doubt that mass media has played a crucial role in informing health professionals about telemedicine, as revealed by the result of the study where 43(28.7%) respondents got their first knowledge of telemedicine from Mass media.

Almost ninety-six (89.7%) of the 107 respondents in 2009 research by (Abodunrin et.al., 2009) at Lautech Teaching Hospital could use a computer. However, only around half of them had any formal computer education. This finding is corroborated by the fact that the majority of respondents in this study have intermediate levels of computer and internet literacy, with a smaller proportion possessing advanced levels of literacy. Health professionals' proficiency with computers, a precondition for providing effective telemedicine services, shows that technology is progressing rapidly in the industry.

4.2.3 Respondents’ Attitude Towards Telemedicine Services

It was revealed from the study that each of the questions and responses has a mean value above 0, and the total grand mean is 1.75; this shows that all items 1,2,3,4,5 have their mean value above the criterion mean value of 0 and are accepted as a positive attitude toward telemedicine.

The participants in this study had a generally positive attitude towards telemedicine, but they also had serious worries about confidentiality difficulties and the likelihood of misdiagnosis rising.. In fact, (n=45) of the respondents agreed that telemedicine services result in confidentiality issues, and (n=51) thought telemedicine services could increase the chances of misdiagnosis. 64% of healthcare professionals in India believe that patient privacy and information confidentiality are barriers that affect telemedicine services, as was previously reported by (Dongreet al., 2021) in a study conducted in India. Additionally, a research study by (Petimani et.al., 2022) reported a similar finding of 55.2% of the respondents having concerns about confidentiality and 83.35% having concerns about the effect of telemedicine on physical examination. The similarities in the findings of the studies are an affirmation that

confidentiality issues can arise from telemedicine services and that patients' privacy can be invaded through the wrong channelling of information or even hacking of the patient's database by hackers. The healthcare provider may face legal trouble because of his or her duty to safeguard the confidentiality of patient or client information. The current study's findings suggest that much effort is needed to address concerns about confidentiality and misdiagnosis among healthcare professionals before telemedicine can be widely adopted in the state. This study's findings corroborate those of a similar study done in North West Ethiopia by (Biruk etal2018), which found that survey participants viewed telemedicine favourably. While telemedicine has been around for some time in wealthier nations and has profited from online record-keeping systems that are efficient and allow for remote monitoring of chronic health issues, it is still in its infancy in developing nations. (Shittu et al., 2007).

4.2.4 Use of Telemedicine Services

In agreement with similar work done (Petimani et al. 2022, in India), the current study shows that most respondents do not currently render telemedicine service, while only a small number of respondents render telemedicine services as private practice and at their Place of employment. This present report is also in conformity with an earlier report that while the developed countries continue to benefit from this technology, Telemedicine is still relatively new in the developing world, which also has the potential to profit from this technology by enabling remote monitoring of chronic health concerns and an effective online record-keeping system. (Shittu et al., 2007).

As revealed by the present study, this high number of respondents currently not rendering telemedicine service proves that the technology has yet to be widely accepted and implemented in Federal Medical Centre Yenagoa. Furthermore, the government's reluctance to train relevant healthcare professionals in the field of telemedicine and adopt it into public services could also be a hindrance to the development and implementation of the technology as a higher percentage of (17.3%) of the health professionals that are currently rendering telemedicine are doing so in private practice this also further demonstrates that the technology is still new and still not widely acceptable as a routine service in Yenagoa Bayelsa state. the current study also showed. The current study also showed that only a small minority of respondents had been providing telemedicine services for 1-3 years. The great majority of respondents had never provided telemedicine services, while a minute number of the respondents have been rendering telemedicine services for the past 4-6years and less than a year respectively. When asked what situation they render telemedicine service, most respondents went for when distance is a barrier, followed by those who went for all of the above. Those who went for an emergency and the majority of the respondents went for none of the above options. However, a few numbers

of the respondents have been practising telemedicine for up to three years, and 40(26.7%) of the study participants are familiar with the newly evolving concept of telemedicine practised in the healthcare system when distance is a barrier which is encouraging and a critical factor in the development, adoption, and application of telemedicine, this also shows that people will receive telemedicine well if adopted. Of the few respondents that have been rendering

telemedicine, 31(20.7%) of the respondents has been rendering telemedicine service for 1-3 years, 11(7.3%) of the respondents for 4-6 years, as seen in this present study are similar to the report of (Biruk et, al 2018) in North West Ethiopia where only 66(22.1%) of the respondents have been exposed to a telemedicine system. Phone calls had the highest number of respondents as a single form of communication in telemedicine service, lower than the report (85.9% of respondents) seen in a similar study in a Lagos teaching hospital (Shittu et al., 2007). The fact that most of the respondents in the present study agreed that all the mentioned means of communication (phone call, text message, social media, e.g., WhatsApp, Zoom) for telemedicine service is correct shows how well the health professionals are informed about telemedicine. However, 39(26.0%) of respondents needed to catch up and disagreed with all the mentioned means of communication in telemedicine services which is still a concern. Furthermore, the present study revealed that most respondents chose a laptop as the most suitable device for telemedicine services, followed closely by mobile phones, smart television, and iPad. However, more than an average number of the respondents accepted all the mentioned devices as devices used for telemedicine service.

In contrast, some of the study's respondents opted for none of the mentioned device's options as a tool for telemedicine service. All of the mentioned means of communication in this present study were accepted as telemedicine means of communication, which is in contrast to a previous report in a similar study by (Shittu et al., 2007) regarding available tools in Nigeria for telemedicine practice, where the mobile phone is seen as the only significant tool used mainly for counselling patients. The findings of this study are consistent with those of one carried out in India. (Petimani et al., 2022), where, even though respondents have a high level of knowledge.

Despite the respondents' extensive awareness about and favourable opinion toward telemedicine a significant number of respondents (35 out of 100, or 23.3%) disagree that the devices mentioned can be used as a tool for telemedicine service. This indicates that much work remains to be done in the institution in education and training before telemedicine can be fully adopted and implemented. There needs to be a greater awareness, which can be increased through seminars, workshops, and other types of training.

4.2.5 Relationship between years of experience and knowledge of Telemedicine

According to the results of a prior investigation carried out by the same researchers (Parvin et al., 2016) on the knowledge, attitude, and practise of e-health among doctors working at specific selected, Dhaka's private medical facilities the respondents' rank and the number of years of experience they had were also associated to the degree of knowledge they possessed. Most responders with a strong understanding of telemedicine (62.5%) were consultants with much professional experience. The findings of (Parvin et al., 2016) starkly contrast with our current study's conclusions, which revealed no correlation between the participants' years of experience and their knowledge of telemedicine. The discrepancy in findings between the prior study and this one is due to a difference in professional backgrounds, as the previous study was conducted only among medical professionals.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of Findings

The following is a summary of the study's findings: According to the study's findings, among the 150 participants, female made up the majority of the respondents. This finding conforms with the study of (Abodunrin et al., 2009) in Lautech Teaching Hospital, Nigeria. However, it differs from the previous report of (Biruket,al.,2018), which recorded the highest number of male than female respondents.

Analysis of the profession of the respondents shows that the majority were nurses, followed by doctors, medical laboratory scientists, and pharmacists. This finding is in line with the previous report (Biruk etal.2018), where the majority of the respondents, 158(53.0%), were nurses, but in contrast with the report of (Abodunrin et, al,2009) in Lautech Teaching Hospital Osogbo, where the majority of the respondents 46(42.2%) were doctors. The highest number of Christian respondents recorded in this study, followed by a few numbers Muslims, is in line with the previous report of (Abodunrin et.al., 2009) in Nigeria, where they recorded 68(63.0%) Christian and 39(36.1%) Muslim respondents. This high number of Christian respondents was expected as the majority of the residents in the region are Christians which might have been reflected in the study's outcome. The previous report of (Biruk et.al., 2018) that health professionals with less than five years of work experience 221(74.2%) as the majority is in sharp contrast with the report of this study which reveals that the majority of those surveyed, 46(30.7%) had 6-10years job experience.

In contrast to a study done in Libya, where only 39% of physicians have a solid understanding of telemedicine and 12% need to be made aware of the technology (El Gatitet al., 2008), health professionals showed high awareness of telemedicine. Previous reports (Abodunrin et al., 2009), (Idowu et al., 2004) corroborated the study's results that a large proportion of respondents (142, or 94.7%) were familiar with the concept of telemedicine, that 133, or 88%, were informed that telemedicine provides health care services where distance is a barrier, and that 131, or 87%, were in agreement that telemedicine can help capture data and store patient information for future use. In contrast to what was reported by (Biruk et al.,.2018) in Ethiopia, where the majority of information sources about telemedicine were from colleagues,According to this study's findings, the majority of respondents acquired their expertise from their place of employment. In line with the results of this study, the vast majority of respondents (57%) had at least intermediate computer/internet skills, while only 32% had advanced skills. (Abodunrin et.al.,2009) conducted a similar study at Lautech Teaching Hospital, they found that 96 (89.7%) of the study participant have some computer literacy, less than half of the respondents had formal computer training.. This high number of computer literates among health professionals shows that the technology can quickly be adopted in the facility.

According to the results, the mean of both the questions and the answers is more significant than zero, with the grand mean at 1.75. All components (1, 2, 3, 4, and 5) with a mean value more significant than the criterion mean value of 0 indicate a favourable outlook on telemedicine.

The participants in this study had an overall favorable attitude towards telemedicine, but they also had significant concerns about the issues of confidentiality and increasing chances of misdiagnosis, that 45 of them agreed that telemedicine services result in confidentiality issues, and 51 of them thought that telemedicine services could increase the chances of misdiagnosis which is in line with a previous report by (Dongre et.al., 2021) in a study in India.

While telemedicine continues to reap benefits in the developed world by promoting efficient online data storage and record-keeping system, remote monitoring of chronic health issues, it is still in its infancy in underdeveloped countries, as evidenced by the fact that the majority of respondents in the present study 89(59.3%) were not providing telemedicine services. This high number shows that the technology has yet to be widely accepted in the facility. Furthermore, the current research demonstrated that the majority, 89(59.3%) of the respondents, have never rendered telemedicine service, which conforms to an earlier report that telemedicine is not common in this part of the world. Also, the present study shows that phone call 22(14.7%) had the highest number of respondents as a single form of communication in telemedicine service.

The fact that most of the respondents in the present study agreed that all the mentioned means of communication (phone call, text message, social media, e.g., WhatsApp, Zoom) for telemedicine service is correct shows how well the health professionals are informed about telemedicine. Contrary to the findings of (Shittu et al. 2007), who found that the mobile phone was the only significant tool used primarily for counselling, information sharing, consulting, and treatment of patients in Nigeria, the majority of respondents in the current study chose a laptop as the most suitable device for telemedicine services.

While (Parvin et.al.,2016) found that most respondents with good knowledge of telemedicine were consultants with more extended work experience, the current study found no such correlation between participant years of experience and telemedicine knowledge.

5.2 Conclusions

Conclusively, this study provides insight and updated information regarding the respondent's, attitude, knowledge and use of telemedicine. The findings of the study reveal that a good number of the respondents have good knowledge and a positive attitude towards telemedicine. However, more is still needed in good telemedicine facilities, education, training, and awareness and use of telemedicine in health care service delivery among health professionals for the technology to be fully implemented and adopted for use.

5.3 Recommendations

1. According to the study's findings, the majority of healthcare professionals have a positive attitude and good knowledge of telemedicine, yet their use of telemedicine technology is poor; therefore, telemedicine facilities should be made available (e.g., mobile phones, computers, free internet service and steady power supply) not just in FMC Yenagoa but in all the health facilities in the state with additional numeration to the health care professionals should be provided.

2. Telecom regulatory bodies, government agencies, and private businesses in Nigeria must work together to build a telemedicine system that competes with traditional healthcare.
3. The research findings indicate that worries regarding patient privacy were a significant barrier to telemedicine adoption. Due to the fact that telemedicine touches on both more general medico-legal issues like data protection, consent, informed consent, privacy, medical negligence, contracts, and medical ethics as well as more specialized medico-legal issues like e-advising, e-prescribing, and other related issues, it is necessary for appropriate bodies and government agencies to establish an appropriate legal framework and guidelines. The creation of a national telemedicine policy, or at the very least, the review and updating of prior policies, the inclusion of telemedicine services in the National Health Insurance Scheme, and the addressing of healthcare professionals' and patients' ethical concerns through a screening process that checks and eliminates substandard health Practices are some possible answers to these problems.
4. Through seminars, workshops, and other training, the institution's healthcare professionals can become increasing awareness of telemedicine and its benefit.
5. Continuous education and training in the institution is needed before telemedicine can be fully adopted and implemented.
6. For healthcare ptofessionals to accept telemedicine and telehealth applications and systems and to help them develop a sense of confidence with crucial tools, which will eventually lead to a willingness to work and the technological capability to participate in these applications and systems, there is a need for basic training and familiarity with the computer and associated communication systems.

5.4 Contributions to Knowledge

This work makes the following contributions to knowledge:
1. This work contributes to knowledge by providing up-to-date information and data about the knowledge of telemedicine. It helps to create awareness about the technology among healthcare professionals in Federal Medical Centre Yenagoa, Bayelsa state.
2. This work aids in identifying the institutional gap and barriers to telemedicine development, application, and adoption.

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APPENDIX 1
Proposed Researched Questionnaire
Masters of Public Health,
School of public health
University of Port Harcourt
July 2 022

QUESTIONNAIRE ON KNOWLEDGE, ATTITUDE AND USE OF TELEMEDICINE AMONG HEALTH CARE PROFESSIONALS IN THE FEDERAL MEDICAL CENTRE YENAGOA.

Dear Respondent,
I appreciate you for the time and willingness to participate in this ongoing research. The questionnaire has been designed with you in mind to obtain your response regarding telemedicine services delivery in federal medical center.
The information you provide is confidential and as such will not be used outside the scope of this research.
Yours sincerely.

PELESAI FOSTINA

SECTION A: DEMOGRAPHIC DATA

1. Age (a) less than 20[ ] (b) 21-25 [ ] (c) 26-30[ ] (d) 31-35[ ] (e) 36 and above[ ]
2. Gender: male [ ] Female [ ]
3. Religion: (a) Christianity [ ] (b) Islam [ ] (c) Traditional [ ] (d) others [ ]
4. Profession: (a) Doctor [ ] (b) Nurses [ ] (c) Medical Laboratory Scientist [ ] (d) Pharmacist [ ]
5.. Years of experience: less than 1year [ ] 1-5 [ ] 6-10 [ ] 11-15 [ ] 16-20 [ ] 20 years and above [ ]

SESSION B: KNOWLEDGE OF TELEMEDICINE

You are required to tick yes or no to the questions in each box

S/N	QUESTION	YES	NO
1	Telemedicine is the delivery of health care services, where distance is a crucial factor, by all health care professionals using information and communication technologies.		
2	Telemedicine provides health care services where distance is a barrier		
3	Telemedicine can help to capture and store patient information for future use		
4.	Telemedicine service is of no benefit to health care system especially in developing country		
5	Telemedicine hinders access to quality health service delivery		
6	Telemedicine allows you to offer emergency services		
7	Telemedicine service is cost effective for the management of chronic illness		
8	Telemedicine enhances uninterrupted access to health care services and information's.		
9	Medical application of telemedicine technologies is a barrier to health care services		
10	Telemedicine improves patients care by shortening the waiting time and prompt intervention		

11) Where did you first learn of telemedicine (a) mass media [ ] (b) friends and colleagues [ ] place of work[ ] (d) journals and books[ ] (e) have never heard of telemedicine service [ ]

12) Computer/internet skills (a) Advance (b) Average (c) Beginner (d) No skills

SESSION B;ATTITUDE TOWARDS TELEMEDICINE

For each of the following statement, please indicate by ticking in the box your option. (a) Strongly Agreed (**SA**), (b) Agreed (**A**) (c) Udecided (**U**)
(d) Disagreed (**D**), (e) Strongly Disagreed (**SD**)

S/N	QUESTIONS	**SA**	**A**	**U**	**D**	**SD**
12	Telemedicine is necessary for quality health care delivery					
13	Telemedicine cannot substitute physical examination					
14	Telemedicine is expensive and not suitable for developing country like ours.					
15	Telemedicine service result in confidentiality issue					

16	Telemedicine service can increase chances of misdiagnosis					

SESSION C; **USE OF TELEMEDICINE**

For each of the following statement, please indicate by ticking the appropriate box

17. are you currently rendering telemedicine service? [yes] [no] if yes (a) as a private practice? [ ] (b) at your place of work? [ ] (c) both [ ]

18. how long have you been rendering telemedicine service? [less than a year]

[1-3 yrs] [4-6yrs]... [7yrs and above] [never rendered telemedicine service]

19. in what situation do you apply telemedicine service? [emergency] [while at home] [when distance is a barrier] [only at work] [none of the above] [all of the above]

20. what means of communication do you use in rendering telemedicine service?

[phone call] [text message] [social media e.gwhatsapp] [zoom] [all of the above] [none of the above].

21. which electronic device is most suitable for rendering telemedicine service?

[mobile Phone] [laptop] [ipad] [Smart television] [all of the above] none of the above].

RESEARCH ETHICS COMMITTEE
FEDERAL MEDICAL CENTRE, YENAGOA.
CLEARANCE CERTIFICATE

Application Form Number: **FMCY/REC/ECC/2022/JULY/471**

Project Title: **KNOWLEDGE ATTITUDE AND USE OF TELEMEDICINE AMONG HEALTH CARE PROFESSIONALS IN THE FEDERAL MEDICAL CENTRE, YENAGOA BAYELSA STATE.**

Principal Investigator: **PELESAI FOSTINA**

Department/Institution: **DEPARTMENT: SCHOOL OF PUBLIC HEALTH, UNIVERSITY OF PORT HARCOURT CHOBA, RIVERS STATE.**

Date Considered: **5th July, 2022.**

Chairman: **Dr. Madubuike Chinyere** Signature & Date: 05/07/2022

Notes: This ethical clearance certificate is valid for only this research protocol.

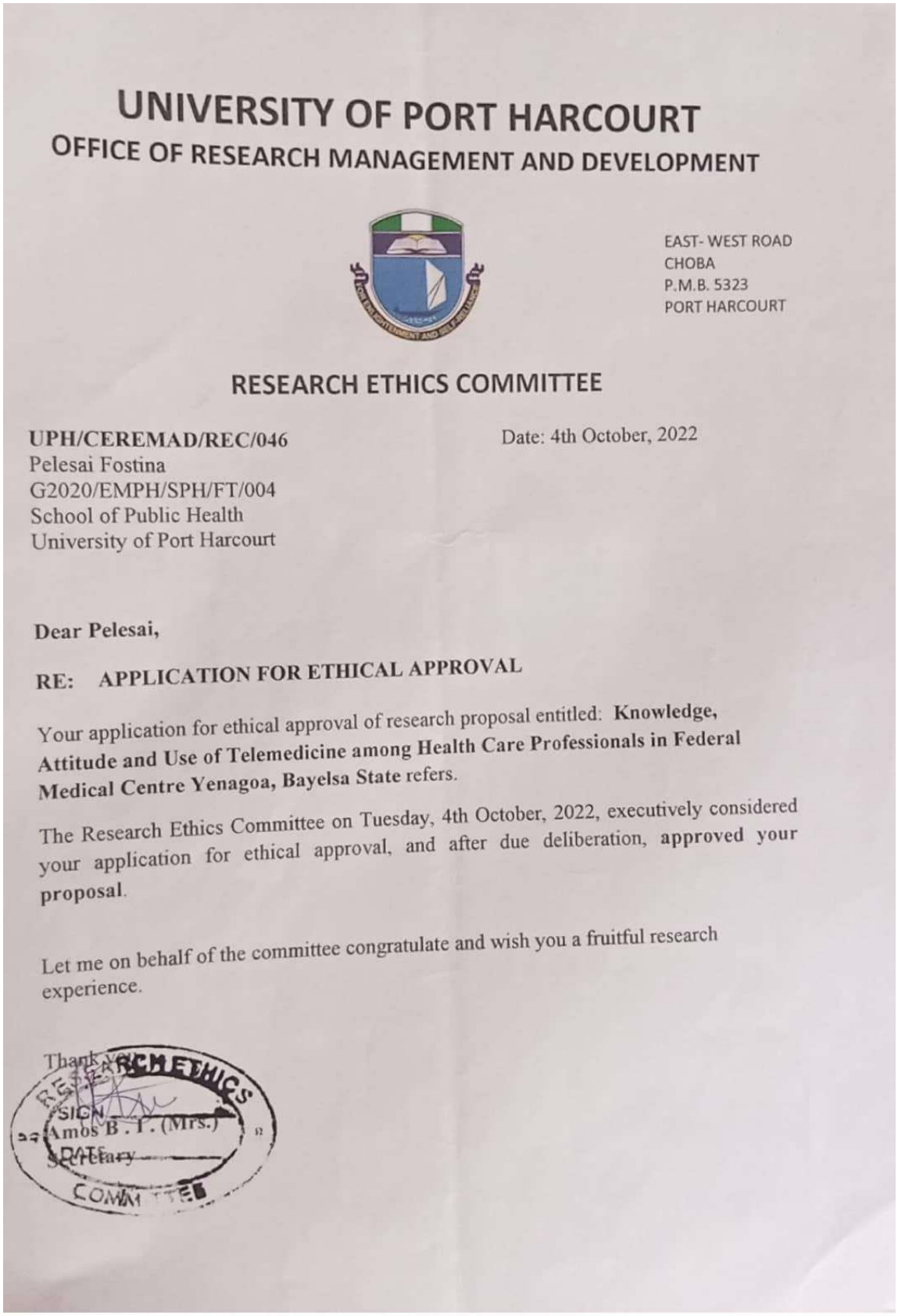
DECLARATION BY INVESTIGATOR(S)

Protocol Number:

To be completed in duplicate and one copy returned to the Secretary, Research and Ethics Committee Federal Medical Centre, Yenagoa.

I/we fully understand the conditions as stated in the ethical aspect of this project design and I/we guarantee that, I/we will ensure compliance with these conditions. Should any departure be contemplated from the research procedure as approved, I/we undertake to resubmit the protocol to the Research and Ethics Committee.

Signature: ..... Date: 06-07-2022



UNIVERSITY OF PORT HARCOURT
OFFICE OF RESEARCH MANAGEMENT AND DEVELOPMENT

EAST- WEST ROAD
CHOBA
P.M.B. 5323
PORT HARCOURT

RESEARCH ETHICS COMMITTEE

UPH/CEREMAD/REC/046
Pelesai Fostina
G2020/EMPH/SPH/FT/004
School of Public Health
University of Port Harcourt

Date: 4th October, 2022

Dear Pelesai,

RE: APPLICATION FOR ETHICAL APPROVAL

Your application for ethical approval of research proposal entitled: **Knowledge, Attitude and Use of Telemedicine among Health Care Professionals in Federal Medical Centre Yenagoa, Bayelsa State** refers.

The Research Ethics Committee on Tuesday, 4th October, 2022, executively considered your application for ethical approval, and after due deliberation, **approved your proposal**.

Let me on behalf of the committee congratulate and wish you a fruitful research experience.

Thank you

SIGN
Amos B. T. (Mrs.)
DATE
Secretary

RESEARCH ETHICS COMMITTEE