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Home Care and Mobile Health Services Provision for Rural Dwellers: A Conceptual Framework of Poverty Alleviation and Rural Development

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ABSTRACT

Health-related issues remain a continuous point of discussion globally among policymakers, health experts and researchers because there is no one-time solution to health problems. This study intends to link home care and mobile health services to illuminate the poverty-stricken society on alleviating poverty through smart health services. First, we conducted a literature review on mobile health and rural nursing. Second, we embarked on a thoughtful analysis to include influential materials not found in the literature reviewed. Third, we analysed the external influences and grouped them accordingly. Fourth, we integrate the factors into a conceptual model showing external and internal factors. Fifth, we analysed the role of mobile technology in rural nursing and finally developed practice recommendations. This study explores the urgent need for home care health services for rural dwellers with three pertinent questions: (1) How can home care and mobile health services enhance social development? (2) How can government policies impact home care mobile health services for rural dwellers? (3) Why are home care and mobile health services necessary for rural dwellers? The study employs the concepts of home care and mobile health services with an insightful literature review and integrated theories to probe poverty permeation and health inequality. It is expected that introducing home care and mobile health services will lead to easiness and convenience for rural dwellers and give assurance as they have access to treatment in the confines of their homes and the language they understand with the aid of smart nurses and smart technologies.

Keywords: Home care, Mobile Health Services, Poverty Alleviation, Smart Health Services.

INTRODUCTION

Health-related issues remain a continuous point of discussion globally among policymakers, health experts and researchers because there is no one-time solution to health problems (Rashid *et al.*, 2022; Ubong *et al.*, 2023). The healthcare service in-home care is among the most critical, complex, and vital health sectors in the modern world (Nyashanu *et al.*, 2022). Home care can be considered under three subdivisions: Home-physician health care services, Home-private duty nursing care services and Home-Personal care and companionship services. The three types of home care provide various services, which entail helping the seniors manage their daily lives, handling complex medical conditions or situations with chronic patients with injuries, chronic health issues, patients recuperating from a medical setback, caring for the aged or people with special needs or a disability. Doctors, nurses, and therapists provide the three types of home care to improve the health condition, quality, and longevity of several lives every minute of each day. Conceptually, there needs to be a link between home care, mobile health, and poverty alleviation. This study intends to link home care and mobile health services to illuminate the poverty-stricken society on alleviating poverty through smart health services. The use of digital technologies, particularly mobile and wireless technologies, to improve and enhance global health needs and objectives has been associated with terminologies such as mobile health or mHealth (WHO, 2011). The healthcare industry is among the topmost data-intensive and data-driven industries globally because data is generated continuously and churned out from private and public healthcare providers, laboratories, and pharmacies alike. Huge data affects information creation, storage, retrieval, and transmission, posing a major challenge in healthcare delivery. However, the possibility of integrating mHealth into extant healthcare services has been considered in the literature (Labrique *et al.*, 2013; Ruxwana, 2007; UN, 2012), as well as in low and middle-income countries (Mehl and Labrique, 2014; Ruxwana, 2007; UN, 2012) which has the potential of impacting the lives peoples living in such regions. The potential of employing digital technologies to improve and support the delivery of healthcare solutions (Akter and Ray, 2010; Odendaal *et al.*, 2015) has been established.

Poverty, on the other hand, is compared to a disease that needs an instant cure. Poverty is spreading like wildfire in Sub-Saharan Africa, especially in Nigeria, and it is a multidimensional complex issue nationally influencing rural dweller negatively. Unstable leadership roles, porous financial handling, greed, and insubordination can be traced to escalating poverty in a country where lawlessness is the norm (Sam, 2014). Nigeria, with a population of 225,107,750 million as of 29.09.2023 (Worldometer, 2023), constitutes 46.48% of the rural dwellers in 2022, according to World Bank collection of development indicators is combating unpalatable health-seeking behaviour that is increasing the mortality rate daily because of insufficient medical care. According to Reed and Mberu (2014), Nigeria's population exceeds other countries in Africa, and the vast demography of Nigeria strikes equilibrium with its challenges. In Nigeria, among the affluent population, a few of the home care treatment in certain quarters has become so critical that home care treatment has been plagued with missed diagnoses, lapses or breaches in patient health history, lack of security and confidentiality, improper applications of treatment, failure to respond and adapt to new conditions or health issues that arise during treatment.

According to Iyalomh and Iyalomhe (2012), this alarming situation has exceeded the stethoscope's reach. The WHO statistics (Sun et al., 2013) revealed 71.4 years of life expectancy, 5.9 million mortality rates and about 16,000 deaths daily. Meanwhile, 56% of communicable, maternal, and perinatal conditions characterize the causes of untimely death globally. The severity of road traffic injuries and lackadaisical attitude to health care are highly prevalent in the African region. The rural dwellers in these regions depend on traditional medication and alternative medicine to tackle maternal mortality, newborn and child mortality, communicable diseases, non-communicable diseases, mental health, substance abuse, road traffic injuries and death from environmental pollution. These health-related challenges are part of the 17 Sustainable Development Goals accepted by the world leaders in 2015. A broad connection between health and wealth calls for the quick attention of policymakers and health practitioners.

The theory triangulation of critical social, innovation diffusion and rural nursing theories is applied to examine how home care and mobile health services are a booster of poverty alleviation. The previous researcher focused on mobile health services in China based on a comparison of age (Deng et al., 2014), acceptance of mobile health services with interest in models comparison (Coyte and McKeever, 2016), an overview of Canadian home-care utilization and how the program overcome the initial resistance (Wodchis, Austin, and Henry, 2016), longitudinal study of high-cost users of health care (Wodchis, Austin and Henry, 2016), swallowing and nutritional status of Japanese older people (Okabe et al., 2016), home care scheduling problem (Braekers, Hartl, Parragh, and Tricoire, 2016) and home mechanical ventilation patients (Vitacca, et al., 2016). This study discovered the gap in country and methodology in-home care and mobile health services in Africa and Nigeria. The study integrates Critical Social Theory and Innovation Diffusion Dimension to extend rural nursing theory and contribute to medical literature. It offers a new meaning to home care and mobile health services as an antecedent of poverty alleviation and rural development.

This study is divided into five parts. The first section introduces home care and health services as an antecedent of rural development. The second section critically reviews existing literature on poverty alleviation, home care and mobile health services and relevant theories. The study's third section focuses on the conceptual framework of home care and mobile health services. The fourth section showcases the future of home care and mobile health services. The fifth section presents the contribution, policy implications and conclusion. The last part also reveals the study limitations and future research path.

Types of Home Care Services

To fully understand how mobile health services can be developed to improve home care services, the knowledge gap in the types of home care services must be bridged. As briefly described earlier in the introduction, the three home care services are home-physician health care, home-private duty nursing care, and home-personal care and companionship services. The home-personal care and companionship services entail helping the seniors to manage their daily lives in the areas of bathing, grooming, using the toilet, and dressing, meal planning and preparation, light housekeeping, laundry, running errands, medication reminders and picking up prescriptions, escort to appointments or meetings, helping with activities or hobbies, and general companionship. These services have become critical for people living with dementia or Alzheimer's disease.

Demographic projections reveal that people aged over 60 are living with chronic health conditions, injuries and disabilities, which will continue to increase (United Nations, 2006). The rapidly ageing population across the globe and the limited healthcare facilities are increasingly placing a high demand for home care and healthcare services. Earlier studies reveal the alarming increasing shortage of healthcare nurses and physicians, including home caregivers for seniors (Super, 2002) and registered nurses (Murray, 2002). In the past, robots have been recommended as a reasonable potential aid device that can assist in closing the widening gap between the number of healthcare professionals, services, and the ageing population's need and supply of healthcare services. The robot can be considered a mobile technology housed in a mobile body and can behave intelligently to recognise the environment around it (Ichbiah, 2005). Robots are delivering similar services executed by the three types of home care services: surgical robots for surgical operations (Howe, Matsuoka, 1999), rehabilitation robots that aid with rehabilitation therapy (Krebs et al., 2003), robots that assist the disabled and cognitively impaired maintain their independence (Tejima, 2001; Mataric et al., 2007), robots that motivate the aged and other age groups to exercise and lose

weight (Kidd and Breazeal, 2006), telemedicine robots used for telemedicine (Hou, Jia and Takase, 2003), and robots that deliver meals, medication and laundry (Ichbiah, 2005).

Comparatively, older people in high-income countries live comfortably in their home apartments and always desire to stay home if practicable (Tinker and Lansley, 2005), which differs from the older people living in low- and middle-income countries. Moving older people away from the comfort of their homes, loved ones, and their most admirable and familiar environments to a nursing home, clinic, or hospital generate psychological trauma aside from the fact that it is a more expensive option (Scopelliti et al., 2005). Governmental and non-governmental organisations, funders and researchers are working tirelessly through innovation to come about technological devices and care equipment that will enable the older generation living in the western cultures around the world to live comfortably and guardedly in a home setting. Though most of these devices and care equipment are inexpensive alternatives to moving older people to health facilities, hospitals, or nursing homes, due to poverty affecting low and middle-income countries, taking care of the older population poses a significant challenge.

Home-private duty nursing care involves skilled personnel due to their specialised training (e.g. registered nurses (RNs) or licensed practical nurses (LPNs), to confidently handle complex medical conditions or situations like tracheostomy care, ventilator care, respiratory treatments, catheter and ostomy care, gastrostomy (feeding tube) care, nasogastric (N-G) tube care, medication and injection administration, oversight of general health and preventative care to address any new medical conditions that may arise immediately.

Home-physician health care services are prescribed by a physician to help with rehabilitation after an illness, injury, hospital stay, or surgery or to help manage a chronic medical condition usually aimed at preventing an unwarranted hospitalisation. Home-physician health care services are provided through one-hour home visits from specialised clinicians and continue until recovery goals have been met. Home health care services are generally covered 100 per cent by the government in some high-income countries through national insurance policies for the elderly population. However, in most low and middle-income countries, the story is different. Most aged people in low and middle-income countries have no access to home care due to several factors discussed earlier.

HOME CARE AND MOBILE HEALTH SERVICES LITERATURE

Enormous studies both in the past and extant literature in rural nursing and healthcare, medical informatics, operational research, computers in human behaviour, ageing and healthcare, and emergency medicine reveal that home care and mobile health services have huge benefits.



Figure 1: Word cloud for Homecare and mobile health services.

Some of these studies addressed the perception and needs of service providers based on rural nursing theory, nursing intellectual capital from a social cognitive theory perspective, nutritional status of older adults receiving home care and choice of the tool by health providers based on a human activity readiness theory. Other researchers extensively revealed articles on mobile integrated healthcare and community paramedicine following the concept of an emerging emergency medical service and home healthcare routing and scheduling. The methodology employed by these researchers includes quantitative methods, qualitative methods, computational experiments, surveys, and mixed methods with insightful contributions synthesised.

EXTANT STUDIES ON HOME CARE AND MOBILE HEALTH SERVICES

Healthcare and nursing are dynamic fields characterised by continuous advancements and evolving practices. A comprehensive understanding of these disciplines requires exploring various research areas that address critical questions and challenges. This

essay provides a structured literature review summarising key findings and insights from recent studies across diverse healthcare and nursing topics. Each study offers valuable contributions to the field and collectively contributes to understanding the multifaceted nature of healthcare and nursing practices.

In their study, Lee and Charlene explored the perceptions and needs of service providers in rural healthcare settings. Employing a naturalistic inquiry approach with field research techniques, they delved into rural healthcare professionals' unique challenges. Their qualitative analysis revealed four major themes: the definition of health, distance and access to resources, the symptom-action-timeline process, and choice. These themes shed light on the complex interplay of factors influencing healthcare delivery in rural areas (Lee and Charlene, 2004). Also, Lin's research investigated the impact of cross-cultural competence on nursing intellectual capital and utilised quantitative methods. The study found that outcome expectation significantly influences nurses' cross-cultural competence, emphasising the importance of addressing outcome expectations in cross-cultural training programs. Furthermore, the research highlighted the positive correlation between nurses' cross-cultural competence and nursing intellectual capital, underlining the role of cultural competence in improving patient care (Hsien-Cheng Lin, 2015).

On the other hand, Lauder et al. (2006) proposed an intriguing conceptual framework combining social capital theories and transaction costs to understand nursing practices in rural healthcare settings. Although a conceptual paper, their work paves the way for future research into how these theories can provide a framework for measuring nurses' contributions to rural health care. Likewise, Furuta et al. (2016) conducted a prospective observational cohort study investigating the relationship between swallowing function and nutritional status in Japanese older adults receiving home care services. Their findings challenged conventional wisdom, revealing that oral health status is not directly associated with malnutrition, a vital insight for the care of elderly populations.

Further, Bryan et al. (2016) conducted a comprehensive literature review on Mobile Integrated Health Care and Community Paramedicine. Their review synthesised observations from existing program data, suggesting that these innovative systems may prevent congestive heart failure readmissions, reduce EMS frequent-user transport, and decrease emergency department visits. This review highlights the evolving landscape of healthcare delivery systems, while Sun (2016) quantitative study investigated the factors influencing tool choice in innovation diffusion. The empirical results revealed that tool experiences substantially impact specific tool readiness at the within-subject level. In contrast, user characteristics have weaker effects at the between-subject level. This research provides valuable insights into the dynamics of tool adoption in healthcare innovation.

Robling and his team conducted a mixed-method study to assess the effectiveness of a nurse-led intensive home visitation program for first-time teenage mothers. The results indicated that adding the Family Nurse Partnership to existing healthcare and social care yielded only short-term benefits to primary outcomes. This pragmatic trial offers insights into the complexities of nurse-led interventions (Robling et al., 2016). In advancing the discussion of home care, Christian et al. (2017) literature review focused on the routing and scheduling challenges in home health care (HHC). The review provided a comprehensive overview of current work in the field, highlighting recent advances and future research directions. It emphasised the critical trade-off between costs and client convenience, a central concern in HHC optimisation. Additionally, Vitacca et al. (2007) conducted a quantitative survey to assess the real-life burden experienced by home mechanical ventilation patients, particularly those with neuromuscular disorders (NM). This survey revealed essential insights into patients' challenges and informed strategies for improving their quality of life.

Braekers and his co-authors presented computational experiments based on real-life data to analyse the trade-off between costs and client inconvenience in-home care scheduling. Their findings highlighted service providers' considerable challenge in balancing costs and client convenience. The study suggests potential improvements in service levels without significant additional costs (Braekers et al., 2016). In contrast, Zhaohua et al. (2014) investigated the adoption of mobile health services among middle-aged and older users in China. Their survey findings identified factors predicting the intention to use mobile health services, shedding light on the role of perceived value, attitude, perceived behaviour control, and technological anxiety. This research deepened the understanding of technology adoption in healthcare. Progressively, Anita et al. (2019) conducted a mixed-method study exploring the readiness of rural older adults to adopt mobile health technology. Their research uncovered key facilitators, including ease of use, convenience, affordability, and barriers related to privacy and security concerns. These findings are crucial for designing technology-driven healthcare solutions that cater to older populations.

This literature review highlights healthcare and nursing research's diverse and evolving landscape. These studies collectively contribute to understanding the challenges and opportunities within these fields, providing insights into the complexities of healthcare delivery, patient care, and the adoption of innovative technologies. As healthcare evolves, these insights serve as valuable foundations for further research and improvements in healthcare practices and policies.

METHODOLOGY

The study adopts the six steps of methodology suggested by Marek (2014). First, we conducted a literature review on mobile health and rural nursing. Second, we embarked on a thoughtful analysis to include influential materials not found in the literature reviewed. Third, we analysed the external influences and grouped them accordingly. Fourth, we integrate the factors

into a conceptual model showing external and internal factors. Fifth, we analysed the role of mobile technology in rural nursing and finally developed practice recommendations. This study intends to explore the urgent need for home care health services for rural dwellers with three pertinent questions: (1) How can home care and mobile health services enhance social development? (2) How can government policies impact home care mobile health services for rural dwellers? (3) Why are home care and mobile health services necessary for rural dwellers? The study employs the concepts of home care and mobile health services with an insightful literature review and integrated theories to probe poverty permeation and health inequality.

Home Care and Mobile Health Services Conceptual Framework

Tablets, smartphones, and e-readers are relatively easy to use, and age does not have to be a barrier. Individuals of various age brackets, including older adults, are already accustomed to using everyday technology, such as those incorporated into automobiles, various electrical appliances, and automated teller machines (ATMs) (Depatie and Bigbee, 2013). Research and advancement in the healthcare delivery system have brought the knowledge to manage people with multiple chronic illnesses. Goins and Krout (2006) assert that rural youth and adults are more likely than their urban counterparts to have chronic illnesses and face more barriers in accessing health care. According to Milligan (2009), limited healthcare resources and the reduced availability of formal and informal caregivers, services and support for people living in rural communities result in many pressing healthcare problems that must be addressed. Innovative programs incorporating remote and home-based care solutions, developed with a focus on the unique needs of the rural populace to promote wellness and prevent and manage chronic illness, are possible solutions. Three theories were discussed to explain the intervention of introducing the health care delivery system in rural communities. They are Critical Social Theory, Innovation Diffusion Theory (Rogers, 2003) and Rural Nursing Theory (Long and Weinert, 1989). Each of these theories will be described along with their application to the study.

Critical Social Theory

According to Grams and Christ (1992), critical social theory (CST), as a form of science and inquiry, examines relationships of power and the underlying structures in society that produce population inequalities. Stevens (1989) gave examples of societal structures, such as the types of employment and wages made available to specific groups of people, distribution of wealth, access to education, and availability of healthcare services. CST assumes that societal, cultural, political, and economic circumstances are historically created, alterable, and not natural or fixed. This framework advocates for a type of consciousness that regards how these social structures operate to oppress some members of society while systematically privileging others. Therefore, it has an emancipatory intent and seeks to challenge conventional assumptions and social arrangements to move beyond the "what is" to the "what could be" (Thomas 1993). *Critical social theory* is an action-oriented theoretical approach that may be applied to nursing research and practice (Henderson, 1995). Critical social theory can be used to assess how socially derived power structures filter into healthcare practices in terms of how deficits in health are assessed and managed and how they affect communication between nurses and patients. Critical social theory can also examine how power relations in healthcare interactions affect communication between healthcare providers and patients (Mohammed, 2006).

Five Innovation Diffusion Dimension

To ensure a comprehensive assessment of the appropriate parameters to determine the potential for the uptake of this innovative health care delivery. Everett Rogers' diffusion of innovations was selected as one of the theoretical frameworks for the phenomenon being discussed. In this study, the innovation examined consisted of home care and mobile health services. IDT has been used in research investigating the diffusion of innovation in healthcare delivery (Depatie and Bigbee, 2013). The rate of adoption of an innovation, according to Rogers (2003), is highly dependent upon the quality or attributes of that innovation. Rogers argues that there are five key characteristics of innovations that affect their rates of adoption: 1) relative advantage, 2) compatibility, 3) complexity, 4) trialability, and 5) observability (p. 15). Relative advantage is "the degree to which an innovation is perceived as better than the idea it supersedes." At the same time, compatibility describes "the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters" (Rogers (2003), p. 15). Complexity refers to "the degree to which an innovation is perceived as difficult to understand and use," and trialability pertains to "the degree to which an innovation may be experimented with on a limited basis" (Rogers (2003, p. 16). The last quality of innovation, observability, is described by Rogers as "the degree to which the results of an innovation are visible to others" (Rogers (2003, p. 16). What is interesting about these five qualities is the connection between the successful diffusion of innovation and the community's values, norms, assumptions, and behaviours. Based on the five characteristics mentioned above, it is evident how much an innovation relies on its community, organisation, or system to be implemented successfully.

Rural Nursing Theory

The theory by Long and Weinert (1989) claims that rural healthcare perspectives vary significantly from those in urban and suburban areas. According to Lee and Winters (2012), many healthcare needs of rural dwellers cannot be adequately addressed by applying nursing models developed in urban or suburban areas but require unique approaches emphasising the special needs of this population. The authors stressed that the rural nursing theory base was developed through studies generalisable to rural persons living in sparsely populated areas and has been generalised to all rural populations, especially from the clinical perspective (Lee and Winters, 2012). Rural dwellers define *health* as the ability to work, be productive, and do common tasks.

This belief often leads rural dwellers to prioritise work priorities for healthcare. Time and distance to receive health care, as well as cost, are of concern to rural individuals. Many will self-treat to save time and money or wait until their health is severely compromised before travelling for care (Depatie, Bigbee, 2013). Shannon (1998) asserts that the theory for rural nursing evolved because of a recognised need for a framework for practice that considers the perceptions and needs of persons from whom care is being provided.

The theory reveals some key concepts or variables such as work beliefs and health beliefs (Long and Weinert, 1989), old-timer and newcomer (Long and Weinert, 1989), lack of anonymity, isolation and distance (Long and Weinert, 1989; Pierce, 2001), lack of access (Pierce, 2001), use of an informal network (Pierce, 2001), familiarity (Magilvy and Congdon, 2000) and self-reliance (Roberto, and Reynolds, 2001). The combined theory of critical social theory, innovation diffusion theory and rural nursing theory formed the integrated theories for home care and mobile health service programs, as evident in Figure 2.

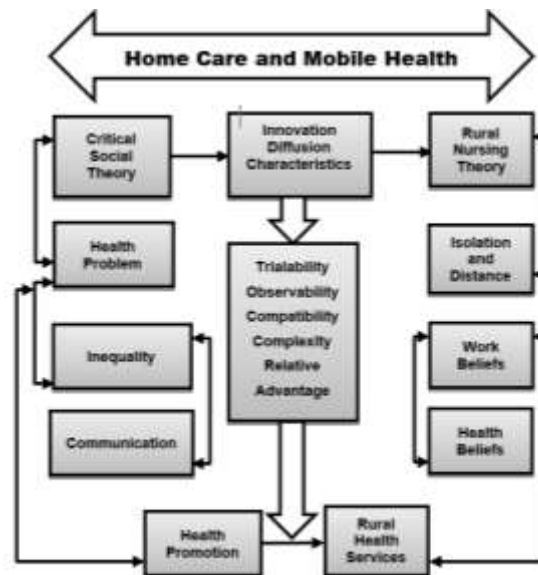


Figure 2: Integrated Theories for Home Care and Mobile Health Services.

INTEGRATED THEORIES FOR HOME CARE AND MOBILE HEALTH SERVICES

Developing an integrated theory base for home care and rural nursing is necessary. Many healthcare needs of rural dwellers cannot be adequately met using existing models, which require unique approaches emphasising the special needs of this population. This study's home care and mobile health services program model comprises Critical Social Theory, Innovation Diffusion Characteristics and Rural Nursing Theory as represented in Figure 2. The variables under the Critical Social Theory are health problems, inequality, and communication. Innovation diffusion characteristics are trialability, observability, compatibility, complexity, and relative advantage, while Rural Nursing Theory has isolation and distance, work beliefs, and health beliefs as variables. The combination of these theories and constructs is to gain health promotion and provide rural health services, which are the aim of the innovative model to address home care and health needs of the rural people.

Different health problems are witnessed massively in rural areas, associated with several factors such as pollution, lack of access to clean drinking water, drug use, and inadequate emergency services. These health problems require adequate health care services, which are likely not available for self-medication or traditional home care with herbs and concoctions due to the remoteness of the communities. The attempt to seek adequate medical attention may be hindered by the distance to the healthcare facilities and inequalities among the residents of the rural communities — the difference in social status, wealth and opportunity indicated in healthcare access that left most of the disadvantaged at the mercy of self-medication. Since information is the lifeblood of healthcare, communication systems are the heart that pumps it (Touissant and Coiera, 2005). Another critical factor in health communication is communicating promotional health information such as in public health campaigns, health education and between health care practitioners and patients. The dissemination of health information is to influence personal health choices by improving health literacy. Health communication will help to increase demand or support for health services and increase the rural dwellers' knowledge and awareness of health issues.

Health belief helps explain why individual patients may accept or reject preventative health services or adopt healthy behaviours. The health belief model proposes that people will respond best to messages about health promotion or disease prevention when the following four conditions for change exist: (1) The person believes that he or she is at risk of developing a specific condition, (2) the person believes that the risk is severe and the consequence of developing the condition is undesirable, (3) the person believes that a particular behaviour change will reduce the risk, (4) The person believes that barriers to the behaviour change can be overcome and managed (EuroMed Info, 2018).

Distance means the separation (space, time, and behaviour) between the rural participants and their healthcare resources (Ballantyne, 1998; Henson et al., 1998). Dealing with a gap when accessing healthcare resources was a part of these participants' lives. Specific areas of concern mentioned were obtaining specialist care, prescription medications, and emergency care. The distance patients must travel to obtain treatment has long been recognised as a primary determinant of healthcare facilities. The distance factor is especially significant in rural settings where the density of western-type health facilities is often low, where most patients are likely to make the journey for treatment as pedestrians and where there are viable and usually more accessible alternate sources of medicine.

All these serves as a pointer to health promotion, that is, any planned combination of educational, political, environmental, regulatory, or organisational mechanisms that supports actions and conditions of living conducive to the health of individuals, groups, and the entire community. IDT has been used in research investigating the diffusion of innovation in healthcare delivery (DePATIE and Bigbee, 2013). The adoption rate of innovation, according to Rogers (2003), is highly dependent upon the quality or attributes of that innovation. As explained above, the five key characteristics of innovations are relative advantage, compatibility, complexity, trialability, and observability. These characteristics contribute to health promotion, having seen the effect of the innovation. Innovation Diffusion characteristics will help promote health and improve rural health services.

Acceptance of Mobile Health Care: Important Dependent Factors

Healthcare technologies such as mobile health and robots for home care have been seen as inferior to human caring and contact (Sparrow and Sparrow, 2006). Mobile healthcare being consciously integrated into the life of the aged willingly is termed "acceptance". For acceptance of mobile health services to occur in any environment, three basic requirements: motivation for the usage of mobile health services, adequate ease of use and comfort of the mobile health services, and cognitive and emotional state of the users considered and met. Associated models for technology acceptance have found that perceived usefulness, ease of use, titillation and amusement directly correlate with people's adoption intentions (Kulviwat et al., 2007). The demographics of the target population in the urban and rural areas should be considered when deciding how mobile health services should be developed for a specific usage. Mainly, variables such as age, needs, and experience with technology, role, and culture are essential to accepting healthcare services.

Effect of Age on Usage

In the usage of technology by older people, earlier research has found that when faced with problems, the older old (75 years and above) have a high probability of giving up and welcoming drawbacks and inconveniences in the comfort of their home rather than obtaining assistive solutions, in comparison with the young-old (65–74 years) (Giulini et al., 2005). Research suggests older people are less comfortable with computers and new technology than younger people (Czaja and Sharit, 1998). Additionally, older people are usually sceptical and frightened of contemporary technology than the young and less trusting in the abilities of specific ones (Scopelliti, Giuliani, and Fornara, 2005). To reduce this anxiety, older people prefer robots to be unthreatening, with a female voice, small size, slow-moving and less autonomous, and with a severe aspect and single colour. Older people have been found to interact more with a small, non-threatening cat robot than young people (Libin and Libin, 2004).

The Needs Factor of the Users

There are several needs of the old and the older old, but the home care needs of the older person significantly influence their feelings toward mobile healthcare. As indicated in the previous sections, some older people require mobility, hearing or vision assistance. Some older people need reminders to take their medication continually and do other routine health activities without fail, whereas some also need much more social support. It has been found that older people tend to embrace assistive devices in healthcare and housing to enable them to obtain and/or maintain their autonomy (Pain et al., 2007), particularly with the presence of a perceived need for the assistive device or technology (Tinker and Lansley, 2005). Making due diligence in discovering and assessing the needs of older people and matching these to the provided technology can result in higher acceptance rates (Kobb et al., 2003) because failure in some telemedicine projects has been partly attributed to poor assessment of the needs of the users of the technology (Brebner et al., 2005). Expectations of the future needs of older people can also play a critical role in acceptance. For example, one significant need of older people is higher anxiety regarding the loss of cognitive abilities as people advance in age, which was correlated with higher evaluations of a home care robot that could assist in providing reminders and finding things around the home of older (Cesta et al., 2007).

Experience with Technology/Mobile Health Care

Most people in low- and middle-income countries often need to become more familiar with evolving technology (Dijkers et al., 1991). The lack of familiarity of older people from low/middle-income countries, particularly those living in rural communities with technology, is a major rationalism for people feeling precarious about specific technologies (Dijkers et al. 1991). Conversely, some older people living in Western cultures have first-hand experience with the usability of aiding devices, which can alter older people's attitudes from considering supporting devices inessential, considering them very beneficial (Forlizzi, 2005). Indeed, the acceptance of devices must be measured over time as people become familiar with robots. A classic example (Koay et al., 2007) found that peoples' preferences regarding technology changed over time during a five-week

trial as respondents became accustomed to the technology. Their findings reveal that, with time, the participants preferred the technology better than earlier (Wada and Shibata, 2007).

Cognitive Ability and Education of Users

There is only a small amount of research on the effects of the level of education on attitudes towards robots—one of the scarce studies on cognitive ability and educational level sampled 123 older people in Italy. The result of the study indicated that a higher educational level has a direct correlation with greater acceptance of technological solutions for everyday botheration (Giulini et al., 2005). In most advanced countries, the cognitive ability and educational level of older people are more encouraging than those in low/middle-income countries, with the situation being worse for those living in rural areas. Poverty and lack of sound and adequate government policies is the major drawback to these regions' low education level.

Culture of Users

The cultural differences of different people bring about different attitudes towards the acceptance of technology. Besides, the disparity in how societies conventionally care for older people will probably result in cultural differences in technology acceptance. This scenario culminates as cultural differences in people's relationship with the aged and their attitudes towards ageing and independent living. An example is people's attitudes towards their responsibilities, as revealed in some nurses' distrust of some technology, and therefore had unrealistic expectations and felt that their job security was imperilled (Novek et al., 2000).

Future of Home Care and Mobile Health Services

The past and present situations in the medical field should be able to define its future direction. How can the past and the current challenges be controlled, with the associated risk and health inequality mitigated? Undoubtedly, technology has played a more significant role in the medical field in the past and even now. Robot-human interaction impacts medical surgery and a mobile device such as a tablet. Olaleye, Salo, and Ukpabi (2018) positioned tablets as a multi-tasking helpful device across different sectors. Tourangeau et al. (2017) emphasised health services without borders as health care that is functional as an auxiliary of conventional hospitals and clinics. Also, Olaleye, Sanusi, Agjei and Adusei-Mensah (2021) introduced an intervention of a mobile contact called "My Contact Person" (MCP) as an inevitable tool for paramedic health workers in emergencies. The ageing population of Western countries is a challenge to human resource management. This development calls for home-care nurses (Krings and Weinberger, 2018). Situations are tense in the developing countries of Africa, especially in Nigeria, where there is an uncontrollable population. To solve the problem of inequality and long queue in hospitals, (De Groot, Maurits and Francke 2018; Joseph et al., 2018) recommends assistive robotics in health care and a humanoid robot. This study envisages that there will be a renowned diffusion of personal health care services, robot health care services, chatbot health care services, predictive health care services, smart Nurses, Doctors, and smart Patients. The future health care services are moving towards self-service, aided service with artificial intelligence intervention for smart patients, a community of learning and sharing health service experiences. The government policy must support these projections to make it a reality.

IMPLICATION AND CONCLUSION

This study is one of the pioneer studies in Sub-Saharan Africa and the integration of Critical Social Theory and Innovation Diffusion Dimension to extend the theory of rural nursing and contribute to medical literature as it offers a new meaning to home care and mobile health services as an antecedent of poverty alleviation and rural development. It is expected that introducing home care and mobile health services will lead to easiness and convenience for rural dwellers and give assurance as they have access to treatment in the confines of their homes and the language they understand with the aid of smart nurses and smart technologies. Home care and mobile health services will help decongest the seemingly crowded centres. It will alleviate poverty in rural communities by reducing the sickness burden hampering work productivity. On the other hand, it will create employment opportunities so that the government will recruit staff for the public health enlightenment program. Independent nurses or health care practitioners can also collaborate with Non-Governmental Organizations to champion the course. Medically excluded people due to their habitation remoteness will be reached and pave the way for mobile medical service accessibility, and this development will drastically reduce the mortality rate. This study concludes by calling for private and public funders to collaborate on advancing models of care for innovative solutions that will enable nurses to improve health and health care. The study recommends that healthcare organisations should support nurses in taking the lead in developing and adopting innovative patient-centred care models. Nurses and other healthcare providers must champion the mHealth program with their colleagues and patients. The government is challenged to identify, develop, implement, and evaluate innovative solutions to manage chronic disease and other illnesses. The study has practical relevance to medical practitioners, African governments, non-governmental agencies, and society.

In many rural African countries, mobile phones have been the first extant contemporary technology infrastructure that has dramatically reduced communication costs and prevented delays in response to emergencies and other disasters. Policies geared towards home care and mobile healthcare can significantly reduce the cost of communicating health-related issues, particularly between health professionals and rural dwellers. Several studies argued that mobile Phones have tangible economic benefits and other consumer welfare in specifically low and middle-income countries (Jensen, 2007; Aker, 2008; Klonner and Nolen, 2008; Aker, 2010; Oyelere et al., 2017). Policymakers and other agencies have always promoted the poverty-alleviation potential of mobile phones (Corbett, 2008), which will yield a similar result when integrated into home care

and mobile healthcare. An article in *The Economist* (2008) similarly reported: "A device that was a yuppie toy not so long ago has now become a potent force for economic development in the world's poorest countries".

Additionally, this conceptual insight reveals the inequities in the use of health services. It estimates the magnitude of the relationships between poverty alleviation and rural development. The utilisation of home care and mobile health services are linked explicitly to achieving MDG 1 (eliminating extreme poverty).

Study Limitations and Further Research

The medical field is a vast research domain, and this study has successfully focused on home care and mobile health services in Nigeria. Future research endeavours should extend beyond a single-country study and adopt a multi-group analysis of home care and mobile health services across African countries. An empirical study with a mixed methodology would significantly enhance the conceptual paper, providing valuable insights.

Future researchers should explore the following research questions to contribute to the literature on home care and mobile health services:

1. Why is artificial intelligence, including robotics, chatbots, machine learning, and deep learning, necessary for the future of home care and mobile health services?
2. How can the government initiate and influence the diffusion of smart healthcare, smart medical practitioners, and smart patient engagement?
3. What strategies can governments and medical stakeholders employ to establish an ecosystem of smart healthcare in rural areas, facilitating consultation and collaboration?
4. How can governments effectively address the barrier of medical inequality in rural areas by integrating emerging technologies?
5. What impact can blockchain technology have on the payment system for healthcare services?

These questions, among others, present exciting avenues for exploration by future researchers. Examining the relevance of well-being and electronic healthcare in smart healthcare (Olawumi et al., 2022; Olaleye et al., 2023) is crucial.

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