

Awareness and Usage of Tele-medical Devices among Healthcare Practitioners for Service Delivery in Teaching Hospitals in Anambra State: A Comparative Study of University Teaching Hospitals, Anambra State.

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Abstract

This study investigated the awareness, competencies, and usage of telehealth devices among medical practitioners in teaching hospitals: Nnamdi Azikiwe University Teaching Hospital Nnewi. And Chief Odumegwu Ojukwu University Teaching Hospital Awka, in Anambra State, Nigeria. A descriptive survey design was employed, with data collected from 207 doctors, nurses, and laboratory technologists (74% response rate) using a structured questionnaire. Findings revealed that while practitioners demonstrated a high aggregate awareness of telehealth devices ($M=2.91$, $SD=0.78$), their self-reported competencies were relatively low ($M=2.48$, $SD=0.98$), falling below the criterion mean of 2.50. Actual usage of telehealth for service delivery was significantly low ($M=1.86$, $SD=0.93$), primarily limited to basic supportive functions like patient education, rather than advanced clinical applications. Traditional healthcare service components were well-established, but telemedicine was not strongly recognized as a functional component ($M=2.16$). The most critical barriers to adoption were inadequate technological infrastructure (91.8%), insufficient training (87.0%), and connectivity problems (86.0%). Statistical analysis showed strong positive correlations between awareness and usage ($r = .949$), and between competencies and usage ($r = .946$), with both factors jointly accounting for 91.1% of the variance in usage. The study concludes that a significant gap exists between awareness and the practical application of telehealth. Successful integration requires a holistic strategy that concurrently addresses systemic infrastructural barriers, implements comprehensive competency-based training programs, and develops supportive institutional policies to translate awareness into effective clinical usage.

Keywords: Telehealth, Medical Practitioners, Awareness-Competency Gap, Service Delivery, Teaching Hospitals (Nigeria)

Introduction

The advent of information communication and technologies (ICTs) has precipitated transformative shifts across various service delivery sectors, including healthcare. The proliferation of ICTs has engendered increased ease, speed, effectiveness, and efficiency in human endeavors, fostering heightened satisfaction among both service providers and users (Haleem, 2021). Telehealth represents a pivotal development within the healthcare domain, facilitating remote provision of medical services through digital means. Telehealth encompasses the utilization of web-based resources and advanced digital network technologies to transmit health-related information electronically, thereby enabling long-distance professional healthcare delivery, health monitoring, dissemination of medical safety reports, and educational outreach (Sumninder & Bawa, 2015). Telehealth is the practice of using communications technologies to provide healthcare services remotely, utilizing web-based resources and advanced digital network technologies to transmit information electronically. This enables long-distance professional healthcare services, health monitoring, dissemination of medical safety reports, and delivery of health-related education to the public (Sumninder & Bawa, 2015).

According to Kodre et al. (2024), awareness of telehealth technologies refers to the general understanding and knowledge about using technology to deliver healthcare services at a distance, often through devices like computers, phones, or tablets. The usability and functionality of these devices depend largely on the type of telehealth service care that a patient seeks.

The COVID-19 pandemic has significantly heightened awareness of telehealth among healthcare professionals and the broader public, underscoring its importance as a vital component of modern healthcare delivery. This increased awareness has compelled doctors, nurses, and other medical practitioners worldwide to adopt digital technologies and develop requisite skills to operate effectively within the rapidly expanding telehealth sector (Fouad et al., 2023). Before the outbreak of COVID-19, many Nigerians preferred traditional in-person consultations; however, the pandemic's onset rendered remote healthcare delivery not only a necessity but also a more attractive alternative (Haleem, 2021).

The success of integrating telehealth into clinical practices largely depends on the continuous evaluation of healthcare professionals' adoption levels and their use of telehealth technologies. With the increasing number of smartphone users and internet subscribers in Nigeria, the healthcare sector is ripe for holistic development and implementation of teleconsultation infrastructure and services (Ezeonwumelu et al., 2022). However, the effective adoption and utilization of telehealth remain impeded by interconnected challenges. Foremost among these are substantial deficits in awareness and understanding of telehealth's applications and the benefits among medical practitioners, variable professional competencies, and systemic infrastructural barriers.

Statement of the Problem

The integration of telehealth devices into healthcare systems holds significant promise for revolutionizing service delivery, especially in regions with geographic and infrastructural challenges and limited physical access to care. However, the effective adoption and utilization of telehealth in this context are likely impeded by an interconnected set of critical challenges. Foremost is a substantial deficit in awareness and understanding of telehealth's applications and benefits among medical practitioners. Within teaching hospitals, many medical practitioners may lack fundamental knowledge of available telehealth technologies, their operational protocols, and their potential to enhance clinical outcomes.

Compounding this awareness gap is the issue of variable professional competencies. Even where awareness exists, the technical and clinical skills required to effectively operate telehealth platforms, conduct remote diagnoses, manage digital patient data, and maintain patient engagement through virtual mediums are not uniformly possessed by healthcare providers. This skills gap directly threatens the quality and efficacy of telehealth services, potentially leading to underutilization or ineffective implementation (Assaye et al., 2022).

Furthermore, the utilization of telehealth is constrained by systemic and infrastructural barriers. These include unreliable internet connectivity, inconsistent electrical power supply, inadequate institutional funding for digital tools, and a lack of supportive policy frameworks. Such resource constraints create a challenging environment where even aware and competent practitioners find sustained application difficult (Okereke et al., 2021). Despite the recognized importance of awareness, competency, and usage as pillars for successful recognised integration, a critical gap persists in the empirical literature. There is a lack of holistic, localized data that diagnoses the precise points of failure in the adoption pathway, from knowledge and skills to actual application in teaching hospitals in Anambra State.

Objectives of the Study

The study aims to investigate medical practitioners' awareness, competencies, and usage of telehealth devices for healthcare service delivery in teaching hospitals in Anambra State. The specific objectives are to:

1. Determine the components of healthcare service delivery in teaching hospitals in Anambra State.
2. Ascertain the level of medical practitioners' awareness of telehealth devices for healthcare service delivery in teaching hospitals in Anambra State.

3. Examine the extent of medical practitioners' usage of telehealth devices for healthcare service delivery in teaching hospitals in Anambra State; and
4. Determine the extent of challenges faced by medical practitioners in the usage of telehealth devices for healthcare service delivery in teaching hospitals in Anambra State.

Research Questions

The following research questions guided this investigation:

1. What are the key components of healthcare service delivery provided in teaching hospitals within Anambra State?
2. What is the level of awareness among medical practitioners regarding telehealth devices for healthcare service delivery in teaching hospitals in Anambra State?
3. To what extent do medical practitioners in Anambra State's teaching hospitals utilize telehealth devices for healthcare service delivery?
4. What are the key challenges faced by medical practitioners in using telehealth devices for healthcare service delivery in teaching hospitals in Anambra State, and to what extent do these challenges occur?

Literature Review

Medical Practitioners' Awareness of Telehealth Devices

Telehealth awareness among medical practitioners remains a critical factor in adoption. Chellaiyan et al. (2019) found that technology anxiety is a major reason for doctors' reluctance to adopt telehealth, with awareness levels varying significantly across healthcare worker categories. Shouman et al. (2021) observed that telehealth awareness levels were higher among physicians (72%) than among other healthcare workers (48%), with education, professional development opportunities, and workplace technology exposure influencing awareness.

In Saudi Arabia, Al-Rayes et al. (2020) reported that public awareness of telehealth services remained low (34%) seven years after its introduction, with significant variation across age groups, geographical locations, and educational levels. Assaye et al. (2022) found that 56% of health professionals in Ethiopia had good knowledge of telehealth services, with awareness significantly associated with prior training, computer access, and positive attitudes. However, 88.4% had never received formal telehealth training, indicating a critical gap between awareness and formal competency development.

In Nigeria specifically, Oluwafumilayo et al. (2023) found that only 35% of health professionals had good knowledge of telehealth at a teaching hospital. Fouad et al. (2023) reported that psychiatrists possessed the highest level of awareness of telehealth in the medical profession, attributed to greater participation in workshops and conferences. These findings suggest that awareness is unevenly distributed, influenced by professional category, exposure to professional development, and access to technology.

Medical Practitioners' Competencies in Telehealth

Nesmith (2020) identified four essential competencies for successful telehealth usage: technology skills, communication skills, empathy, and coaching skills. Technology skills enable practitioners to adapt to different platforms and electronic health records systems. Communication skills include active listening, clear instruction delivery, and maintaining patient-centred conversations without physical presence. Empathy involves the capacity to have a good rapport and deliver services with appropriate emotions in virtual settings. Coaching skills enable proper instruction of patients without direct supervision. Mazandarani et al. (2023) identified two critical competency categories: technical competencies allows echnology use and clinical competencies enabling technology integration into clinical processes. Only 42% of Iranian physicians felt adequately competent in technical skills, while 65% felt competent in clinical application. The Association of American Medical Colleges (AAMC, 2020) identified five key competency domains: patient-centred virtual care, healthcare delivery technology, data stewardship, communication in digital environments, and systems-based practice.

Wosik et al. (2020) found that practitioners with formal training demonstrated significantly higher competency levels and sustained usage rates (78%) compared to those without training (34%). Gajarawala & Pelkowski (2021) conducted a meta-analysis of 47 studies and found that competent practitioners were significantly more likely to provide high-quality telehealth services, experience fewer technical difficulties,

and report higher job satisfaction. The gap between awareness and competency remains substantial, particularly in developing healthcare contexts.

Medical Practitioners' Usage of Telehealth Devices

While awareness of telehealth has increased globally, actual usage remains limited in many contexts. Adesina et al. (2022) found that while 78% of nurses had positive attitudes toward ICT, actual utilization remained limited to basic applications such as communication (62%) and record-keeping (45%), with minimal use of advanced telehealth functions (18%). Hassan et al. (2020) noted that telehealth utilization increased during the COVID-19 pandemic in Sub-Saharan Africa, though baseline had been extremely low (less than 5%). Ross et al. (2021) investigated outpatient tele-neurology and found that virtual visits significantly reduced travel distances, with 87% patient satisfaction. However, practitioner usage increased from 12% pre-pandemic to 68% during the pandemic but declined to 34% post-pandemic despite positive outcomes. Carrillo et al. (2022) conducted a meta-analysis of 34 studies and found that teleconsultations were equally effective as face-to-face consultations for primary care and mental health services, yet actual usage rates remained lower than face-to-face consultations even when effectiveness was demonstrated.

Challenges to Telehealth Adoption

Multiple barriers impede telehealth adoption in developing contexts. Assaye et al. (2022) identified primary challenges, poor ICT infrastructure (82%), inadequate resources for telehealth practice in rural areas (76%), insufficient training (88.4%), and lack of institutional support (69%). Adenuga et al. (2020) highlighted barriers specific to Nigeria, inadequate telecommunication infrastructure (86%), socio-cultural resistance (64%), insufficient awareness (58%), privacy concerns (72%), medico-legal uncertainties (67%), and unwillingness to pay (54%). Okereke et al. (2021) categorized barriers in sub-Saharan Africa into five domains: technological barriers including high data costs (89%), poor internet connectivity (84%), and inadequate electricity (76%); competency barriers including insufficient training (78%) and low digital literacy (65%); economic barriers; policy barriers; and cultural barriers. Oluwafumilayo et al. (2023) found that major challenges in Nigeria included poor awareness (65%), inadequate infrastructure (88%), high internet costs (79%), poor power supply (85%), and low literacy levels (68%). Daglish et al. (2022) highlighted financial barriers, lack of healthcare insurance coverage (72%), out-of-pocket payment requirements (68%), and insufficient reimbursement for telehealth services (85%).

Methodology

This study adopted a descriptive survey research design of the correlational type. This design was employed because it enables the researcher to describe data collected in relation to medical practitioners' awareness, competencies, and usage of telehealth devices for healthcare service delivery in Anambra State teaching hospitals and to examine relationships among the study variables. The study population comprised 281 medical practitioners (doctors, nurses, and laboratory technologists) from government-owned teaching hospitals in Anambra State, Nigeria. The study utilized total enumeration sampling technique as the target population was considered manageable. This approach ensured that the data collected depicted a true picture of the issues under study.

Data were collected using a self-structured questionnaire titled; Medical Practitioners' Awareness, Competencies and Usage of Telehealth Devices for Healthcare Service Delivery Questionnaire (MPACUTDHSDQ). The instrument consisted of two sections. Section A gathered respondents' bio-data. Section B gathered information on healthcare service components, awareness of telehealth devices, competencies, usage, and challenges. Items were measured on a four-point Likert scale: Strongly Agree/Very Highly Aware (4), Agree/Highly Aware (3), Strongly Disagree/Moderately Aware (2), and Disagree/Not Aware (1). The instrument was validated by the research supervisor and two lecturers in the Department of Library and Information Science, who vetted items for compatibility with variables and ability to meet study objectives. The split-half method was used to determine reliability, with a pilot test administered to 30 healthcare practitioners outside the study scope. Cronbach alpha was used to establish internal consistency. The reliability coefficient for the whole instrument was 0.79, indicating acceptable internal consistency. Questionnaires were administered by the researcher with three research assistants over three weeks to ensure comprehensive coverage

Data were analyzed using descriptive and inferential statistics. Simple percentages presented in tables analyzed demographic data. Research questions were answered using mean and standard deviation. The criterion mean was set at 2.50; scores below 2.50 were considered insignificant while 2.50 and above were considered significant. Research hypotheses were tested using Pearson Product Moment Correlation Coefficient and regression analysis to determine relationships between variables at the 0.05 significance level.

Response Rate and Demographics

Table 1: *Respondent Demographic and Professional Characteristics (N = 207)*

Characteristic	Category	n	%
Sex	Female	125	60.4
	Male	82	39.6
Age Group	31-40 years	87	42.0
	Other	120	58.0
Profession	Nurse	102	49.3
	Doctor	54	26.1
	Lab Technologist	51	24.6
Years of Experience	1-5 years	104	50.2
	6-10 years	68	32.9
	11-15 years	35	16.9

Note. Response rate was 74% (207 of 281 questionnaires).

Response Rate and Demographics of 281 questionnaires distributed, 207 were returned, yielding a 74% response rate. This rate exceeds the 70% threshold recommended for generalizable findings (Ericson et al., 2023). Respondents were predominantly female (60.4%) and in the 31-40 age group (42%). The majority were nurses (49.3%), followed by doctors (26.1%) and laboratory technologists (24.6%). Most respondents (50.2%) had 1-5 years of experience, with 32.9% having 6-10 years and 16.9% having 11-15 years of experience.

Healthcare Service Components

Table 2: *Descriptive Statistics for Healthcare Service Components (N = 207)*

Component	<i>M</i>	<i>SD</i>
Laboratory Services	3.73	-
Consulting Services	3.71	-
Patient-Centered Care	3.63	-
Pharmaceutical Services	3.62	-
Aggregate Score	3.40	0.65
Telemedicine Services	2.16	-

Note. Criterion mean = 2.50. Scores above 2.50 indicate recognition as a functional component.

The aggregate mean score for healthcare service components was $\bar{x} = 3.4$ ($SD = 0.65$), well above the criterion mean of 2.50. Consulting services ($\bar{x} = 3.71$) laboratory services ($\bar{x} = 3.73$) patient-centered care ($\bar{x} = 3.63$), and pharmaceutical services ($\bar{x} = 3.62$) recorded the highest mean scores. However, telemedicine services ($\bar{x} = 2.16$) had the lowest mean score, falling below

the criterion mean, indicating that respondents did not strongly recognize telemedicine as a functional component of healthcare delivery in Anambra State teaching hospitals.

Medical Practitioners' Awareness of Telehealth Devices

Table 3
Descriptive Statistics for Awareness of Telehealth Devices (N = 207)

Device / Technology	M	
Blood Pressure Monitors	3.42	
Video Conferencing Platforms	3.24	
Computers / Laptops	3.20	
Aggregate Awareness Score	2.91	0.78
Smart Thermometers	2.62	
Telemedicine Carts	2.48	
Telehealth Robotics	2.33	

Note. Aggregate Mean (M) = 2.91, SD = 0.78. Higher scores indicate greater awareness.

The aggregate mean score for awareness was $x = 2.91$ ($SD = 0.78$), indicating high awareness of telehealth devices. Highest awareness was observed for blood pressure monitors ($x = 3.42$) video conferencing platforms ($x = 3.24$), and computers/laptops ($x = 3.2$). Lower awareness was noted for specialized technologies: telemedicine carts ($x = 2.48$), telehealth robotics ($x = 2.33$), and smart thermometers ($x = 2.62$). This pattern suggests practitioners are familiar with common digital tools but have limited exposure to advanced or emerging technologies.

Medical Practitioners' Competencies for Telehealth

Table 4: *Descriptive Statistics for Telehealth Competencies (N = 207)*

Competency Area	M	
Patient Education & Resources	2.77	
Using User-Friendly Interfaces	2.71	
Treatment Plan Development	2.66	
Aggregate Competency Score	2.48	0.98
Ensuring Secure Data Transmission	2.33	
Integrating Wearable Devices	2.15	
Integrating with Electronic Health Records	1.91	

Note. Criterion mean = 2.50. Scores below 2.50 indicate a competency deficit.

The aggregate mean score for competencies was 2.48 ($SD = 0.98$) slightly below the criterion mean of 2.50, indicating relatively low overall competency levels. Highest competency ratings were for patient education and resources (over line $x = 2.77$) user friendly -interfaces ($x = 2.71$), and treatment plan development ($x = 2.66$). However, practitioners rated themselves lowest in integrating with electronic health records ($x = 1.91$) integrating wearable devices ($x = 2.15$), and ensuring secure data transmission ($x = 2.33$). These gaps in technical integration and data security represent critical competency deficits.

Medical Practitioners' Usage of Telehealth Devices

Table 5: *Descriptive Statistics for Usage of Telehealth Devices (N = 207)*

Usage Context	M
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Patient Education	2.24	
Treatment Planning	2.12	
Test Results Delivery	2.10	
Aggregate Usage Score	1.86	0.93
Virtual Prenatal Care	1.67	
Remote Dermatology Consultations	1.64	
Remote Surgical Guidance	1.48	

Note. Criterion mean = 2.50. Scores below 2.50 indicate low usage.

The aggregate mean score for usage was 1.86 (SD = 0.93) significantly below the criterion mean of 2.50, indicating low overall usage. Relatively higher usage was observed in patient education (over line $x = 2.24$), treatment planning (over line $x = 2.12$) and test results delivery ($x = 2.1$). Lowest usage was in remote surgical guidance ($x = 1.48$), remote dermatology consultations ($x = 1.64$) and virtual prenatal care ($x = 1.67$). These findings suggest telehealth is primarily used for basic supportive functions rather than advanced clinical interventions.

Challenges to Telehealth Implementation

Table 6: *Frequency of Reported Challenges to Telehealth Implementation (N = 207)*

Challenge	n	%
Inadequate Technological Infrastructure	190	91.8
Insufficient Training	180	87.0
Connectivity Problems	178	86.0
High Acquisition/Maintenance Costs	172	83.1
Difficulty Integrating with EHR Systems	154	74.4
Inadequate Technical Skills	144	69.6
Inconsistent Insurance Coverage	138	66.7
Inability to Handle Emergencies	130	62.8
Patient Reluctance	67	32.4
Resistance to Technology	62	30.0
Language / Cultural Barriers	59	28.5

Note. EHR = Electronic Health Records.

The most widely acknowledged challenges were inadequate technological infrastructure (91.8%), insufficient training (87.0%), and connectivity problems (86.0%). High acquisition and maintenance costs (83.1%) and difficulty integrating with electronic health records (74.4%) were reported by the majority. Other significant challenges included inadequate technical skills (69.6%), inconsistent insurance coverage (66.7%), and inability to handle emergencies via telehealth (62.8%). Less frequently reported barriers included resistance to technology (30.0%), patient reluctance (32.4%), and language/cultural barriers (28.5%).

Discussion of Findings

The findings reveal a critical gap in telehealth integration in Anambra State teaching hospitals. While traditional healthcare service components are recognized as adequate, telemedicine remains underdeveloped with a mean score of 2.16, significantly below the criterion threshold. This aligns with findings by Haleem (2021) and Fouad et al. (2023) that telehealth remains a new concept in many developing countries despite

its recognized potential. The high awareness levels ($x = 2.91$) observed among practitioners are consistent with post-pandemic trends documented by Oluwafumilayo et al. (2023) and Fouad et al. (2023). However, awareness of advanced technologies remains limited, echoing concerns raised by Chellaiyan et al. (2019) about the need for structured training programs. The moderate awareness without corresponding competency and usage demonstrates the phenomenon identified by Almathami et al. (2020) where awareness does not automatically translate into adoption.

The relatively low competency level (2.48) despite moderate awareness suggests that knowledge alone is insufficient for effective telehealth implementation. This supports Wosik et al. (2020) findings that formal training and competency development are critical for sustained usage. The identified gaps in technical integration (EHR integration: $x = 1.91$) and data security align with barriers documented by Adenuga et al. (2020) and Okereke et al. (2021) in sub-Saharan African contexts.

The very low usage levels (1.86) despite moderate awareness and low-to-moderate competencies support the Technology Acceptance Model's contention that perceived usefulness, ease of use, and enabling conditions determine actual adoption. The primary barriers identified-inadequate infrastructure (91.8%), insufficient training (87.0%), and connectivity problems (86.0%)-directly correlate with the findings of Assaye et al. (2022) and Okereke et al. (2021).

The relationship between awareness and usage ($r = 0.949$ $p = 0$) and between competencies and usage ($r = 0.946$, $p = 0$) confirms the direct pathways outlined in Rogers' Diffusion of Innovations Theory. The jointly significant relationship of awareness and competencies on usage ($R^2 = 0.911$) demonstrates that these factors together account for 91.1% of variance in telehealth usage, supporting the multidimensional nature of technology adoption emphasized by Kruse et al. (2020).

Conclusion

This study demonstrates that medical practitioners in Anambra State teaching hospitals possess moderate to high awareness of telehealth devices but exhibit relatively low competencies and minimal usage in clinical practice. While traditional healthcare service components are well-established, telemedicine remains underdeveloped. The strong positive relationships between awareness and usage, competencies and usage, and the joint effects of both factors on usage, confirm that improving healthcare service delivery through telehealth requires simultaneous attention to practitioner knowledge, skill development, and systemic enablers. Critical barriers including inadequate infrastructure, insufficient training, poor connectivity, and integration challenges must be addressed concurrently with awareness and competency-building initiatives. The findings align with sub-Saharan African patterns identified by Okereke et al. (2021) and Daglish et al. (2022), suggesting that regional-level coordination and investment in digital health infrastructure are essential. Without addressing these systemic barriers, even highly aware and competent practitioners cannot effectively implement telehealth services. Successful integration requires holistic approaches encompassing infrastructure development, competency-based training, supportive policies, and institutional commitment.

Recommendations

Based on the findings, the following recommendations are hereby made:

1. Government and institutional leadership should invest in modern ICT infrastructure, including stable internet services and reliable electricity supply, to enable effective telehealth service delivery.
2. Continuous professional development programs should be organized to improve practitioners' competencies in telehealth technologies through workshops, seminars, and certification programs.
3. Clear policies and guidelines should be developed to standardize telehealth practices, clarify medico-legal issues, ensure data privacy and security, and enhance practitioner confidence. Teaching hospitals should formally integrate telehealth into routine service delivery, including adoption of electronic health records, teleconsultations, and remote patient monitoring as standard practices.
4. Public awareness campaigns should be conducted to educate patients on telehealth benefits and reduce resistance to digital healthcare services.

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