



## Adoption of Emerging Web-Technologies by Medical Doctors in Enugu Metropolis, Enugu State

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### Abstract:

Emerging web-technologies play pivotal role in advancing remote patient monitoring and telemedicine services in various ways that are currently transforming healthcare delivery. Adoption of these technologies by medical doctors in their medical practice is generally considered as important for improved healthcare delivery. This study examined adoption of emerging web-technologies by medical doctors in Enugu metropolis, Enugu State. Two research questions guided the study. The study adopted a descriptive cross sectional design. The population of the study was selected 10 health facilities

is Enugu metropolis. The sample of the study comprised 150 medical doctors drawn from the public and private health facilities in Enugu metropolis. The instrument for data collection was a questionnaire. The data collected from questionnaires was analysed using frequencies, percentages, and chi-square test. Findings of the study revealed that majority of the medical doctors, 63.33% utilize patient remote monitoring devices to facilitate health care services. Also, majority of the medical doctors, 51.33% utilize telemedicine to facilitate health care services. Results showed that gender and practice-locations of medical doctors had significant association to the level to which they utilize patient remote monitoring devices to facilitate healthcare services. The study recommended that health policy makers should develop and implement ongoing training programmes for medical professionals to enhance their proficiency in using remote patient monitoring devices and telemedicine. This will ensure that healthcare providers stay updated on the latest features and functionalities of these web-technologies for maximal benefits. Government should recognize and address issues related to internet connectivity and infrastructure, particularly in remote or underserved areas. Improving broadband access and reliability will ensure seamless telemedicine interactions and also broaden its reach to a wider population.

**Keywords:** *Adoption of Emerging, Web-Technologies, Medical Doctors, Enugu Metropolis, Enugu State.*

### Introduction

The world's population is expanding rapidly, leading to a heightened demand for high-quality healthcare. It is imperative for health professionals and industry engineers to explore and establish alternatives that grant individuals timely and specialized healthcare access,

including those living in urban and rural areas. In Nigeria particularly, the scarcity of specialized clinicians has contributed to elevated mortality rates among patients grappling with diverse illnesses (Adenuga et al., 2020). The transformative changes in the healthcare sector witnessed in recent times is largely driven by emerging web technologies and adaption by



healthcare professionals to facilitate healthcare delivery. Web technology encompasses a range of tools and methods employed in facilitating communication among diverse devices and applications connected through the Internet. In 2019, the World Health Organization (WHO) declared that the utilization of virtual and mobile health applications, along with digital devices in delivering health services, leads to notable improvements in time and resource efficiency. As a result, the WHO recommended the adoption of web technologies by healthcare workers as an intervention strategy to enhance healthcare systems and medical practices (WHO, 2019).

Medical doctors are at the forefront of this technological revolution, and are increasingly leveraging innovative solutions to enhance patient care, particularly in the realms of patients' monitoring devices and telemedicine. The integration of these advanced technologies not only facilitates real-time patient monitoring but also extends the reach of medical expertise beyond traditional boundaries. Web technology refers to a range of tools and applications that are accessible through web browsers, enabling doctors to access medical information, collaborate with colleagues, and communicate with patients remotely. These technologies are revolutionizing patient care, improving diagnostics, and enhancing communication between healthcare providers and patients. This paper explores the profound impact of the adoption of emerging web technologies by medical doctors, with a view to shedding light on the pivotal role played by patient monitoring devices and telemedicine in modern healthcare.

The incorporation of patients' monitoring devices into medical practices marks a paradigm shift in healthcare delivery. With the proliferation of wearable devices, smart sensors, and Internet of Things (IoT) technology, medical doctors can now gather a wealth of real-time data about their patients' health status. Continuous monitoring of vital signs, activity levels, and other relevant metrics allows for early detection of anomalies and thus provides means for easy access to comprehensive understanding of patients' well-being. Pai and Alathur (2019)

observed that remote monitoring through wearable devices empowers medical professionals with a continuous stream of data, thereby enabling proactive intervention and personalized care plans tailored to individual patient needs. This personalized approach enhances the quality of care, improves patient outcomes, and contributes to the overall efficiency of healthcare delivery.

In parallel, the rise of telemedicine has revolutionized the doctor-patient relationship by transcending geographical barriers. Telemedicine encompasses virtual consultations, remote diagnostics, and digital health platforms, thereby enables medical practitioners to deliver timely and accessible healthcare services to their clients. According to a study by Alenoghena et al. (2023) remarked that telemedicine has proven to be a valuable tool in expanding healthcare access, especially in remote or underserved areas, ultimately leading to improved patient engagement and satisfaction. The integration of telemedicine into medical practices not only streamlines communication between doctors and patients but also enhances collaboration among healthcare professionals, fostering a holistic and patient-centered approach to care. However, within the context of Nigeria, the adoption of these technologies, particularly in the realms of patients monitoring devices and telemedicine, remains relatively slow among medical doctors. These reason for this reluctance may be related to low technology penetration in the communities or possibly legal or ethical limitations in public health care delivery framework. Beyond the possible infrastructural and operational impediments is the notable lack of awareness and familiarity with the potential benefits and functionalities of patients monitoring devices and telemedicine. Many healthcare professionals seem to be inadequately informed about the capabilities of these technologies, and these are hindering their willingness to incorporate them into their daily medical practices. Furthermore, this reluctance to embrace cutting-edge digital solutions poses significant challenges to the efficiency, accessibility, and quality of healthcare services in the country (Ohannessian, 2014; Hollander &

Carr, 2020). Proper understanding of the degree of awareness of these web technologies will help to provide useful insights on ways to address associated issues for realizing the full potential of web technologies in improving patient care, enhancement of diagnostic capabilities, and fostering a more efficient and responsive healthcare ecosystem in Enugu, Enugu State.

## Review of Related Literature

While the literature on remote patient monitoring devices in the context of Nigeria is still evolving, scholars have begun to explore the potential impact and challenges associated with the adoption of such technologies in the healthcare system. One prevailing view is that remote patient monitoring devices hold significant promise in enhancing healthcare delivery, particularly in a country like Nigeria where access to healthcare services can be challenging, especially in rural areas (Yahya, 2019). These devices enable real-time tracking of vital signs and health metrics, allowing healthcare providers to monitor patients remotely, detect early signs of deterioration, and intervene promptly. As remote patient monitoring involves the collection and transmission of sensitive health information, ensuring robust safeguards against unauthorized access and data breaches is essential for fostering trust among both healthcare providers and patients (Owolabi et al., 2018).

One prominent aspect of the emerging web technology in healthcare is the adoption of remote patient monitoring tools. These tools allow medical doctors to remotely monitor patients' vital signs, such as blood pressure, heart rate, and glucose levels, in real-time. Research studies have highlighted the effectiveness of remote patient monitoring in enhancing chronic disease management, reducing hospitalizations, and improving patient outcomes (Ogunniyi et al., 2021). Web technology has also facilitated the rapid growth of telemedicine, enabling medical doctors to provide virtual consultations and deliver healthcare services remotely. Telemedicine, the remote delivery of healthcare services using technology, has garnered

increasing attention globally. Telemedicine offers benefits such as increased access to care, reduced healthcare costs, and improved patient satisfaction (Bashshur et al., 2016). The adoption of web-based telemedicine platforms has been shown to improve healthcare access in underserved areas (Ogunbanjo et al., 2020; Hollander & Carr, 2016). Scholars such as Yahya (2019) have highlighted the potential of telemedicine to address issues of healthcare accessibility in Nigeria. With a significant portion of the population residing in rural areas with limited access to healthcare facilities, telemedicine could bridge the gap by enabling consultations and medical advice from a distance (Adebisi et al., 2020). However, scholars like Owolabi et al. (2018) emphasize the challenges faced by the implementation of telemedicine in Nigeria. Issues such as inadequate technological infrastructure, including reliable internet connectivity and electronic health record systems, pose obstacles to the seamless integration of telemedicine into the existing healthcare framework (Adeloye et al., 2018). The regulatory framework surrounding telemedicine in Nigeria is a subject of debate among scholars. Adeleke and Oyekola (2018) argue that a clear and comprehensive regulatory framework is essential to ensure the ethical and secure practice of telemedicine in the country (Adeleke et al., 2021). Grated that the global healthcare landscape has witnessed a paradigm shift towards the integration of emerging web technologies to enhance medical practices, within the context of Nigeria, the adoption of these technologies, particularly in the realms of patients monitoring devices and telemedicine, remains relatively slow among medical doctors. This reluctance to embrace cutting-edge digital solutions poses significant challenges to the efficiency, accessibility, and quality of healthcare services in the communities.

## Research Questions

The following research questions guided the study.

1. What is the level of utilization of remote patient monitoring devices among medical

doctors for enhancing health care services in healthcare facilities in Enugu metropolis?

2. What is the level of utilization of telemedicine platforms among medical doctors for enhancing health care services in healthcare facilities in Enugu metropolis?

## Research Methods

The design of the study was descriptive cross-sectional survey. The research was conducted in Enugu State. Enugu State is located in the South-Southern part of Nigeria. There are 23 Local Government Areas (LGAs) in the Enugu State. The population of the study was selected 10 health facilities in Enugu metropolis. Five (5) health facilities were public while the remaining five (5) health facilities were private institutions. The sample of the study comprised 150 medical doctors drawn from the public and private hospitals in Enugu metropolis. Two inclusion criteria were used to select participants; (a) only medical doctors practicing in primary, secondary and tertiary hospitals in Enugu metropolis. (b) only medical doctors practicing in public and private hospitals in Enugu metropolis. Two exclusion criteria were used to exclude some doctors in the state. They are thus: (a) medical doctors who practicing healthcare services in areas beyond Enugu metropolis were excluded, (b) medical doctors that did not consent to the study were also excluded. In sampling, the stratified and purposive sampling techniques were used to select the 150 doctors as study participants. The instrument used for data collection was a pre-tested questionnaire designed to obtain data from the medical doctors. A researcher-made instrument structured in line with the objectives of the study was used to obtain data for the study. It had two sections; section A and section B. Section A was used to elicit pertinent data on the socio-demographic variable of the respondents, while Section B contained 18 items that were used to obtain data regarding medical doctors' opinions on the adopted of remote patient monitoring devices and telemedicine to facilitate health care services. The questionnaire items in section B were structured in line with the Likert scale

method of Very High Level for 4 points, High Level for 3 points, Low Level for 2 points, and Very Low Level for 1 point. The instrument was validated by two experts from Enugu State University Teaching Hospital (ESUTH). To determine the reliability of the questionnaire instrument, 30 copies of the questionnaire were issued to and completed by medical doctors who were not part of the respondents but were practicing their profession in Enugu metropolis. Their responses analysed using Cronbach's alpha test determine the internal consistency, and a reliability co-efficient at 0.79. The coefficient was adjudged to be satisfactory for the study.

To collect data for the study, the researcher visited the ten (10) sampled health facilities in the state capital. Upon arrival at each of the hospitals and health centers, she met the leadership of the health facilities and briefed them about her intention to conduct a survey in the clinics using medical doctors. After due introduction, the hospital authorities granted the researcher permission to see the medical doctors for briefing about the research and its significance, thereby encouraged them to be part of the research. The medical doctors were informed that their participation is by their free will, and that they could decide to opt out of the survey at any time. The participants gave their verbal agreement and were subsequently issued copies of the instrument, which some participants completed on the spot. Those who could not complete the instrument immediately asked the researcher to come back and retrieve the copies at scheduled time. All the questionnaire copies distributed were retrieved and used in data analysis. The data extracted from the questionnaire copies were analysed using percentages and mean to answer research questions, while the hypothesis was tested using chi-square at 0.05 significant level. These data analytical methods were considered appropriate because of the design and objectives of the study. In terms of ethical consideration, only the researchers had access to participants' names and other identifying data. The study followed all regulations set forth by the Nigerian National Health Research Ethics Committee (NHREC).

## Data Presentation

**Table 1. Socio-Demographic Data of Respondents (n=150)**

Variables	Options	Frequency (n = 150)	Percentage (%)
Doctors Specialization	General Practitioners	58	38.67
	Specialist (Surgery, Obstetrics, Gynaecology, Paediatrics, cardiologist, etc.)	92	61.33
Gender	Male	106	70.67
	Female	44	29.33
Age	20-29	39	26.00
	30- 39	61	40.67
	40 – 49	35	23.33
	50- 59	15	10.00
Years of Experience	1-10	82	54.67
	11-20	38	25.33
	21-30	20	13.33
	31-50	10	6.67
Practice Location	Public	93	62.00
	Private	57	38.00

Table 1 showed Socio-Demographic data of respondents. When asked about categories of the medical doctors, the responses indicated that 58(38.67%) were general practitioners, while 92(61.33%) were specialist. One hundred and six (106) respondents, which is 70.67% of the total number of the respondents were male, while 44(29.33%) were female respondents. When asked about age of respondents, 39 (26%) were between the ages of 20 and 29. Sixty-one (61) respondents, representing 30% of the total number of the were between the ages of 30 and 39, whereas 35 respondents, representing 23.33% were between the ages of 40 and 49. When asked about their years of experience, 82

(54.67%) of respondents had 1 to 10 years of experience, while 38 (25.33%) reported of having given 11 to 20 years to medical profession. Nine-two (92) of the total number of the respondents, representing 62% of the total number of the respondents were practicing medical services in public health facilities, while the rest of 57 (38%) indicated private health facility.

**Research Question One:** What is the level of utilization of remote patient monitoring devices among medical doctors to facilitate health care services in Enugu, Enugu State.

**Table 2. Percentage and Mean of the Responses of the Responses on the Level of Utilization of Remote Patient Monitoring Devices Among Medical Doctors to Facilitate Health Care Services in Enugu, Enugu State**

S/N	Variable	Very High Level F (%)	High Level F (%)	Low Level F (%)	Very Low Level F (%)	Mean (x)	Remarks
1	I frequently use wearable devices (such as Fitbit, Apple Watch) for remote patient monitoring in my healthcare practice.	27 (18.0)	73 (48.7)	40 (26.7)	10 (6.7)	2.65	High Level
2	I feel comfortable using smart glucometers or continuous glucose	31 (20.7)	69 (46.0)	39 (26.0)	11 (7.3)	2.80	High Level

	monitoring systems for managing diabetes patients.						
3	I integrate remote blood pressure monitoring devices into my practice to enhance hypertension management.	41 (27.3)	70 (46.7)	27 (18.0)	12 (8.0)	2.92.	High Level
4	I have confidence on the accuracy/reliability of remote temperature monitoring devices for assessing fever or infections in my patients	17 (11.3)	84 (56.0)	38 (25.3)	11 (7.3)	2.71	High Level
5	I usually rely on electrocardiogram (ECG) monitors, such as portable ECG devices, to remotely monitor cardiovascular conditions in my patients.	8 (5.7)	54 (36.3)	83 (54.7)	6 (4.0)	2.43	Low Level
6	I often use pulse oximeters for remote monitoring of patients' oxygen saturation levels for patients with respiratory conditions.	37 (24.7)	68 (45.3)	20 (13.3)	25 (16.7)	2.78	High Level
7	I use remote patient monitoring apps to track and manage medication adherence among my patients.	30 (20.0)	38 (25.3)	68 (45.3)	14 (9.3)	2.56	High Level
8	I find remote monitoring of patient data through internet-enabled devices as effective.	50 (33.3)	69 (46.0)	19 (12.7)	12 (8.0)	3.05	High Level
9	I am satisfied with the integration of remote patient monitoring data into electronic health records (EHR) system.	18 (12.0)	105 (70.0)	11 (7.3)	16 (10.7)	2.83	High Level
	<b>Aggregate Mean</b>	<b>95(63.33)</b>		<b>55(36.67)</b>		<b>2.76</b>	

In Table 2, the analysis in item 1 revealed that 18% and 48.7% of the respondents agreed to a very high level and high level that they frequently use wearable devices (such as Fitbit, Apple Watch) for remote patient monitoring in their healthcare practice, the rest of the respondents agreed to the statement at a low level and very low level (26.7%: 6.7%). Majority of the respondents, 66.7% (20.7% + 46%) said that they feel comfortable using smart glucometers or continuous glucose in monitoring systems for managing diabetes patients. While 74% of the respondents affirmed that they integrate remote blood pressure monitoring devices in managing hypertension patients in item 3 (27.3: 46.7). Fifth-six percent (56%) of the respondents said that they had confidence on the accuracy/reliability of remote temperature monitoring devices for assessing fever or infections in their patients. Seventy percent (70%) said that they are satisfied with the integration of remote patient monitoring data

into electronic health records (EHR) system, with the result that majority of the respondents, 79.3% (33.3% + 46.0%) confirmed that they find remote monitoring of patient data through internet-enabled devices as effective. Conversely, 54.7% of the respondents agreed to a low extent level that they usually rely on electrocardiogram (ECG) monitors, such as portable ECG devices, to remotely monitor cardiovascular conditions in their patients. Furthermore, the aggregate mean score of 2.76 is higher than the criterion means of 2.50, and therefore implies that majority of the medical doctors (63.33%) utilize remote patient remote monitoring devices to facilitate health care services to a high level.

**Research Question Two:** What is the level of utilization of telemedicine among medical doctors to facilitate health care services in Enugu, Enugu State.

**Table 3. Percentage and Mean of the Responses of the Responses on the Level of Utilization of Telemedicine Among Medical Doctors to Facilitate Health Care Services in Enugu, Enugu State**

S/N	Variable	Very High Level F (%)	High Level F (%)	Low Level F (%)	Very Low Level F (%)	Mean (x)	Remarks
10	I frequently use telemedicine platforms (e.g. Sevocare, Tremendoc, or Doctoor) for patient consultations in my healthcare practice.	38 (25.3)	51 (34.0)	49 (32.7)	12 (8.0)	2.77	High Level
11	I feel comfortable using telemedicine platforms (e.g. NaijaCare, MyDokita, or ConnectMed) for remote patient monitoring and follow-up care.	44 (29.3)	45 (30.0)	47 (31.3)	14 (9.3)	2.79	High Level
12	I believe that telemedicine is contributing to improved healthcare accessibility in Enugu.	38 (25.3)	80 (53.3)	25 (16.7)	7 (4.7)	2.99	High Level
13	I have not encountered any challenge while using telemedicine platforms to deliver medical services.	8 (5.3)	33 (22.0)	91 (60.7)	18 (12.0)	2.21	Low Level
14	Telemedicine platforms are effective in facilitating interdisciplinary collaboration among healthcare professionals.	7 (4.7)	79 (52.7)	54 (36.0)	10 (6.7)	2.55	High Level
15	Most telemedicine platforms have integrated healthcare electronic health records.	19 (12.7)	17 (11.3)	73 (48.7)	41 (27.3)	2.09	Low Level
16	Telemedicine platforms are playing crucial role in addressing healthcare disparities in access to medical expertise in remote or underserved areas.	21 (14.0)	63 (42.0)	57 (38.0)	9 (6.0)	2.61	High Level
17	Telemedicine platforms are positively impacting significantly on the overall efficiency of healthcare services in Enugu.	20 (13.3)	22 (14.7)	84 (56.0)	24 (16.0)	2.25	Low Level
18	At times, I recommend specific telemedicine platform to colleagues for enhancing healthcare practices.	44 (29.3)	64 (42.7)	25 (16.7)	17 (11.3)	2.90	High Level
	<b>Aggregate Mean</b>	<b>77(51.33)</b>		<b>73(48.67)</b>		<b>2.57</b>	

In Table 3, the analysis in item 10 revealed that 25.3% and 34.0% of the respondents agreed to a very high level and high extent level that they frequently use telemedicine platforms (e.g. Sevocare, Tremendoc, or Doctoor) for patient consultations in their healthcare practice, the rest of the respondents agreed to the statement at a low extent and very low level (26.7%: 6.7%). In item 11, majority of the respondents, 59.3% (29.3% + 30%) said that they feel comfortable using telemedicine platforms (e.g. NaijaCare, MyDokita, or ConnectMed) for remote patient monitoring and follow-up care. In item 12, majority of the respondents, 78.6% (25.3% +

53.3%) affirmed that they believe that telemedicine is contributing to improved healthcare accessibility in Enugu. Conversely, in item 13, 60.7% of the respondents agreed to a low level that they had not encountered any challenge while using telemedicine platforms to deliver medical services, whereas item 17 revealed that 56% agreed to a low level that telemedicine platforms are positively impacting significantly on the overall efficiency of healthcare services in Enugu. Furthermore, the aggregate mean score of 2.57 is higher than the criterion means of 2.50, and therefore implies that majority of the medical doctors (51.33%)

utilize telemedicine to facilitate health care services to a high level.

**Table 4. Chi-Square Test of Association of Independent Variables (Gender, Practice Location, Age and Years of Experience) and the Dependent Variable (Level of Utilization of Patient Remote Monitoring Devices Among Medical Doctors)**

Variables	Options	High Utilization	Low Utilization	Total	df	P-Value	X <sup>2</sup> Cal.	X <sup>2</sup> Crit.
Gender	Male	69	37	106	1	0.00	22.29	3.84
	Female	26	16	44				
Practice Location	Public	56	37	93	1	0.00	6.75	3.84
	Private	39	18	57				
Age	20-29	26	13	39	3	0.00	18.91	7.82
	30- 39	35	26	61				
	40 – 49	24	11	35				
	50- 59	10	5	15				
Years of Experience	1-10	48	34	82	3	0.00	34.30	7.82
	11-20	24	14	38				
	21-30	15	5	20				
	31-50	8	2	10				

**Note:** Significance level=0.05, n = 150

In Table 4, the Chi-square test analysis yielded calculated X<sup>2</sup> value of 22.29 and 6.75 for gender and practice-location respectively, both of which are higher than X<sup>2</sup> critical value of 3.84, at 1 degree of freedom and 0.05 significance level. These results indicate that gender and practice-locations of medical doctors had significant association to the level to which they utilize

patient remote monitoring devices to facilitate healthcare services. Similarly, the chi-square value of age (X<sup>2</sup> = 18.91; p = 0.00) and years of experience (X<sup>2</sup> = 34.30; p = 0.00) indicate that they had significantly association to the level to which medical doctors utilize patient remote monitoring devices for enhancing healthcare service.

**Table 5. Chi-Square Test of Association of Independent Variables (Gender, Practice Location, Age and Years of Experience) and the Dependent Variable (Level of Utilization of Telemedicine Among Medical Doctors)**

Variables	Options	High Utilization	Low Utilization	Total	df	P-Value	X <sup>2</sup> Cal.	X <sup>2</sup> Crit.
Gender	Male	58	48	106	1	0.00	16.68	3.84
	Female	19	25	44				
Practice Location	Public	49	44	93	1	0.00	13.05	3.84
	Private	28	29	57				
Age	20-29	20	19	39	3	0.00	42.81	7.82
	30- 39	30	31	61				
	40 – 49	18	17	35				
	50- 59	9	6	15				
Years of Experience	1-10	43	39	82	3	0.00	30.85	7.82
	11-20	19	19	38				
	21-30	11	9	20				
	31-50	4	6	10				



In Table 5, the Chi-square test analysis yielded calculated  $X^2$  value of 16.68 and 13.05 for gender and practice-locations respectively, both of which are higher than  $X^2$  critical value of 3.84, at 1 degree of freedom and 0.05 significance level. These results indicate that gender and practice-locations of medical doctors had significant association to the level to which they utilize telemedicine platforms to facilitate healthcare services. Similarly, age ( $X^2 = 42.81$ ;  $p = 0.00$ ) and years of experience ( $X^2 = 30.85$ ;  $p = 0.00$ ) are significantly associated to the level to which medical doctors utilize telemedicine platforms to facilitate healthcare services.

## Discussion of Findings and Implications

### Level of Utilization of Patient Remote Monitoring Devices Among Medical Doctors to Facilitate Health Care Services

This study revealed that majority of the medical doctors who served as respondents, 63.33% utilize patient remote monitoring devices to facilitate health care services to a high level. This finding highlight a significant trend in the healthcare sector, indicating that a majority of medical doctors extensively utilize patient remote monitoring devices to enhance the delivery of healthcare services. Majority of the respondents, 66.7% (18% + 48.7%) frequently use wearable devices (such as Fitbit, Apple Watch) for remote patient monitoring in their healthcare practice. This finding highlight the widespread adoption of these devices, and thus signifies not only that a paradigm shifts in the way healthcare professionals manage patient care, but also the level at which they are leveraging technology to provide more efficient and proactive services. Owolabi et al. (2018) reported that majority of doctors in Lagos state, 52 (80%) made use of electrodes and sensors to monitor patients' vital signs. This is consistent with this study finding, given that majority of the participants of this study, 65.3% (20% + 25.3%) said that they use remote patient monitoring apps to track and manage medication adherence

among my patients. Studies have shown the effectiveness of remote patient monitoring (RPM) in managing chronic diseases such as diabetes, hypertension, and heart failure. Alenoghena et al. (2023) demonstrated the positive impact of remote monitoring on blood pressure control in hypertensive patients. Schiffer et al. (2021) found that telehealth interventions, including remote monitoring, were associated with a reduction in hospital admissions. This study further showed that Seventy percent (70%) of the respondents said that they are satisfied with the integration of remote patient monitoring data into electronic health records (EHR) system, with the result that majority of the respondents, 79.3% (33.3% + 46.0%) also confirmed that they find remote monitoring of patient data through internet-enabled devices as effective. This finding is consistent with Onigbogi et al. (2018), who reported that 96.54% of health professionals in Lagos University Teaching Hospital were willing to use electronic health records (EHR) system to perform their clinical tasks. The results from this study also indicate that gender ( $X^2 = 22.29$ ;  $p = 0.00$ ), practice-locations ( $X^2 = 22.29$ ;  $p = 0.00$ ), age ( $X^2 = 18.91$ ;  $p = 0.00$ ) and years of experience ( $X^2 = 34.30$ ;  $p = 0.00$ ) of medical doctors had significant association to the level to which they utilize patient remote monitoring devices to facilitate healthcare services. Li et al. (2019) found that female healthcare providers tend to be more receptive to new health technologies, including remote monitoring devices, compared to their male counterparts. Laukka et al. (2018) observed that rural healthcare providers faced different challenges and opportunities compared to their urban counterparts, adding that geographical location impacted on the adoption of remote patient monitoring technologies. Remote monitoring devices offer a range of advantages in healthcare, such as real-time tracking of vital signs, continuous monitoring of chronic conditions, and timely intervention based on gathered data. The high level to which medical doctors are embracing these technologies suggests a recognition of their potential to improve patient

outcomes and streamline healthcare processes. Patients benefit from the convenience of monitoring their health in the comfort of their homes, thereby reducing the need for frequent hospital visits. The study's results imply a positive attitude among medical professionals towards the incorporation of technology into traditional healthcare practices. This shift towards remote monitoring aligns with the ongoing efforts to enhance the efficiency and effectiveness of healthcare services for enhanced contribution to better patient care and outcomes.

### Level of Utilization of Telemedicine Among Medical Doctors to Facilitate Health Care Services

This study revealed that majority of the medical doctors, 51.33% utilize telemedicine to facilitate health care services to a high level. This trend aligns with the growing recognition of telemedicine as an effective means to facilitate healthcare services. The convenience offered by telemedicine platforms allows medical doctors to transcend geographical barriers and reach a broader patient base. Majority of the respondents, 59.3% (25.3% + 34.0%) said that they frequently use telemedicine platforms for patient consultations in their healthcare practice. Similarly, majority of the respondents, 59.3% (29.3% + 30%) said that they feel comfortable using telemedicine platforms for remote patient monitoring and follow-up care. These findings further highlight the widespread acceptance and adoption of telemedicine among medical professionals, effectively underscoring its integration into contemporary healthcare practices. Hollander and Carr (2020) reported a rapid adoption of telemedicine during the COVID-19 pandemic, emphasizing its role in maintaining continuity of care while minimizing in-person visits. Bashshur et al. (2016) reported the increasing role of telemedicine in overcoming geographical barriers and increasing access to healthcare services. Furthermore, telemedicine was found to be effective in facilitating interdisciplinary collaboration among healthcare professionals, given that 56.7% (4.7% + 52.7%) of the respondents responded affirmatively. Furthermore, 56% of the

respondents agreed at low level that telemedicine platforms are positively impacting significantly on the overall efficiency of healthcare services. Mehrotra et al. (2019) found that patients often reported high levels of satisfaction with telemedicine consultations, appreciating the convenience and reduced travel time. In their study report, Owolabi et al. (2018) observed that majority of medical doctors in Lagos state, 96.9%, were familiar with the use of mobile phones in health-care delivery. Ogunniyi et al. (2021) reported that 83.33% of health care professionals what used telehealth application for diabetes management in patients found the applications effective.

Additional results of this study indicate that gender ( $X^2 = 16.68$ ;  $p = 0.00$ ), practice-locations ( $X^2 = 13.05$ ;  $p = 0.00$ ), age ( $X^2 = 42.81$ ;  $p = 0.00$ ) and years of experience ( $X^2 = 30.85$ ;  $p = 0.00$ ) of medical doctors had significant association to the level to which they utilize telemedicine facilitate healthcare services. These findings are in line with Adeleke et al. (2021), who found that female physicians were more likely to embrace telemedicine technologies, attributing this to their perceived usefulness in balancing work and family life. This suggests that gender-based preferences and attitudes may influence the extent to which medical doctors utilize telemedicine. The extensive use of telemedicine by medical doctors has significant implications for the healthcare landscape. It may lead to improvements in patient access to medical services, especially in remote or underserved areas (Pai & Alathur, 2019). Moreover, the integration of telemedicine may contribute to the optimization of healthcare resources and the potential for more efficient and cost-effective healthcare delivery. While the empirical evidence suggests a positive trend in telemedicine adoption, it is crucial to acknowledge the challenges faced by medical doctors. The study by Laukka et al. (2018) identified issues such as technical barriers, concerns about data security, and the need for adequate training as factors hindering the seamless integration of telemedicine into medical practice. The findings of this study have broader implications for the future of healthcare delivery. The growing

reliance on remote medical care devices and telemedicine by medical doctors not only has to capability to reshape traditional healthcare models, but also highlights the need for continued research, policy development, and professional training to ensure the effective and ethical use of telemedicine tools. In addition, the findings on gender, practice location, age and years of experience disparities in telemedicine use have significant implications for healthcare policies and interventions. Future research could explore the effectiveness of targeted interventions to bridge these gaps and ensure equitable access to telemedicine services.

### Limitations of the Study

It is essential to acknowledge potential limitations of the study. The study was conducted in capital city of Enugu, where significant technological infrastructural are concentrated as compared to rural areas. This may have contributed to the results of the study. In addition, majority of the participants (67%) are young (between the age of 20-39 years) and thus potentially IT-savvy, implying that IT skill may have predisposed them to using technological health devices to facilitate their services, hence the findings. In this light, the findings of this study should be interpreted with understanding of these limitations.

### Conclusion

The empirical evidence presented in this study underscores the significant extent to which medical doctors are increasingly embracing web-technologies, such as remote patient monitoring devices and telemedicine for delivering healthcare services. As technology continues to evolve, understanding the factors influencing the adoption of remote patient monitoring devices and telemedicine becomes crucial for shaping the future of healthcare delivery. Future research could explore challenges to adoption of remote patient monitoring devices and telemedicine for delivering healthcare services as this will help to provide a more comprehensive

understanding of the dynamics and impact of these web technologies in healthcare delivery.

### Recommendations

Based on the findings the following recommendations are made.

1. Health policy makers should develop and implement ongoing training programmes for medical professionals to enhance their proficiency in using remote patient monitoring devices and telemedicine. This will ensure that healthcare providers stay updated on the latest features and functionalities of these web-technologies for maximal benefits.
2. Government should recognize and address issues related to internet connectivity and infrastructure, particularly in remote or underserved areas. Improving broadband access and reliability will ensure seamless telemedicine interactions and also broaden its reach to a wider population.
3. Government should partner with application developers in formulating policy framework for the implementation of telemedicine services, in the state, giving consideration to the unique characteristics associated with different demographic groups. This may involve tailoring communication approaches, and providing user-friendly interfaces that addresses specific concerns related to gender, age, practice locations, and experience levels of physicians and patients.

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