

Knowledge and Adoption of Artificial Intelligence for Effective Communication by Healthcare Providers in Nigerian Teaching Hospitals**Doris Ngozi Morah,¹ and George Nathan Brown²**¹PhD Madonna University Nigeria, Okija, Anambra State² Heritage Polytechnic, Eket, Akwa Ibom State²Corresponding author, Email: morahng@yahoo.com¹**Received: 13-5-2024 Accepted: 15-5-2024 Available online: Published: 30-6-2024**

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Artificial intelligence (AI), heralded by the dawn of new media technology, has redefined communication in every sphere of society, and the health sector is no exception. The primary objective of this study is to meticulously investigate the levels of knowledge possessed by healthcare providers, the rates at which these professionals have adopted AI technologies, and the various factors that influence their usage of AI in select teaching hospitals in South-South, Nigeria. Five objectives were raised for this study. A descriptive survey research design was adopted. Four hundred registered healthcare providers comprising doctors, nurses, pharmacists, and laboratory scientists working in some selected teaching hospitals in Akwa Ibom, Bayelsa, Rivers and Delta State in South-South, Nigeria were selected from four teaching hospitals in the region using the purposive sampling technique. The select hospitals comprise the University of Uyo Teaching Hospital, University of Port Harcourt Teaching Hospital, Federal Medical Centre, Yenagoa, and Delta State University Teaching Hospital, Oghara, Delta State. The result indicates that the level of AI knowledge among healthcare providers in select teaching hospitals in South-South Nigeria is not uniformly distributed. However, the adoption is still in its infancy, with most respondents reporting that they have just begun adopting AI technology in healthcare communication. The most typical uses of AI in healthcare are patient data analysis, virtual health assistants, clinical decision support systems, and machine learning for diagnostics. The study recommends that healthcare organisations and government agencies organise education and training for healthcare professionals to improve awareness and attention to AI technologies in healthcare services in selected teaching hospitals within South-South Nigeria.

Keywords: Artificial Intelligence, Healthcare, Health Communication, Internet, Nigeria,

Introduction

Artificial Intelligence (AI) has gained much attention over the last few years and continues to upgrade industries and change how things are done. Curiously, the beginnings of AI meander back to ancient civilisations, where machines of human-like intelligence were employed to perform calculations (Maxwell, 2024). In the digital era, however, AI took the shape it is today. In terms of development, AI has been moulded by increased computing power, algorithms, big data, natural language processing, and machine learning techniques (Morah & Udeze, 2024). Artificial intelligence is a new technology dealing with designing intelligent machines capable of

executing activities that require humans to exercise their intelligence, such as perception, recognising speech, making decisions, processing natural language, and problem-solving (Morah & Udeze, 2024). Fish (2023) notes that AI is the name given to science that encompasses several subfields, such as machine learning, deep learning, natural language processing, robotics, and computer vision.

Machine learning is an AI field that trains machines to learn autonomously without explicit programming, identifying patterns and making predictions. Daniel (2023) believes Deep learning uses artificial neural networks to process

unstructured data. Natural language processing (NLP) teaches machines to interpret human language, analyse text data and extract relevant information. Robotics develops machines capable of performing physical tasks resembling human actions, while computer vision trains machines to interpret visual data from images and videos. AI applications in healthcare can improve patient

diagnosis (Uso, 2024). AI becomes effective in handling patients' data as healthcare providers struggle to face this challenge. AI applications in health care range from image recognition, drug discovery, predictive analytics, and clinical decision-making to patient monitoring. To this end, Myles and Krite (2024, p. 361) observe that "AI technology has great potential for improvement in patient outcomes, cost of treatment, and operational efficiency". One of the significant challenges that most health providers face is the data of the patients. More health data has to be collected, analysed, and interpreted to provide a correct diagnosis and administer the proper line of treatment. Uso (2024, p. 18) agrees that, "AI algorithms can analyse patient data to identify patterns and predict potential health risks". This would become the basis for a treatment plan tailored to each one's needs.

Other areas where AI can be helpful in healthcare include clinical decision-making. AI algorithms symptoms, anxiety reduction, and improvements in physiological measures such as blood pressure and blood glucose levels. Morah and Udeze (2024, p.26) affirm that "effective communication is a cardinal principle of public relations, which must be guided by feedback that should commensurate immediately with the channel of communication, an invaluable potential of the new media technology." Specifically, effective communication significantly affects patient adherence to management plans recommended by healthcare providers, which is essential for achieving these health outcomes (Ah th, 2002). Moreover, patient-centred communication skills are associated with improved health outcomes and increased patient and clinician satisfaction. These skills not only enhance patient engagement and satisfaction but also contribute to the overall well-being of healthcare providers, reducing the risk of malpractice suits. As patients increasingly expect better communication and involvement in their

outcomes, reduce costs, and improve operational efficiency.

AI technology has also been a practical solution to various challenges in modern medicine, such as increasing treatment costs and more precise

can observe and analyse patient data to recommend state-of-the-art treatment options based on current medical research and best practices. AI can also be used in patient monitoring to provide real-time monitoring and early detection of health issues. It mainly aids patients with diseases requiring monitoring to maintain their health status. According to Simeon (2023), such technologies will be vital in managing chronic conditions amongst patients through timely diagnosis and treatment. AI is highly considered, meaning health outcomes are highly improved, cost reduction is enhanced, and quality health services are provided.

Effective communication is crucial in enhancing patient outcomes and healthcare provider satisfaction. Research (Stewart et al., 1999) indicates that critical dimensions of communication positively influence various patient health outcomes, including pain management, recovery from

treatment decisions, integrating effective communication strategies becomes vital in fostering a collaborative healthcare environment (Stewart et al., 1999). Thus, prioritising effective communication, especially AI, will benefit patient health and enhance healthcare providers' satisfaction and effectiveness.

AI in healthcare can improve patient outcomes, increase efficiency, and save costs. However, ethical concerns have been raised about the potential for AI to perpetuate mistakes in diagnosis and treatment, leading to job losses among healthcare providers. As AI evolves, it is crucial to consider its ethical implications and develop responsible AI practices. Addressing these challenges is essential for realising the full potential of AI and ensuring its beneficial impact on society. As AI adoption in healthcare is still in its early stages, it is essential to investigate factors influencing knowledge and adoption by healthcare

providers, particularly in developing countries like Nigeria. This will subsequently assist the provider in implementing and

integrating AI into practice and lower additional risks related to AI use. Therefore, it is crucial to research how healthcare professionals in a few chosen teaching hospitals in South-South Nigeria use AI and their level of understanding. The study will investigate the degree of knowledge these hospitals' healthcare professionals possess regarding artificial intelligence (AI) use for effective healthcare communication, its applications in the medical field, and the elements that help or impede AI adoption.

Statement of the Problem

Artificial intelligence (AI), a rapidly advancing technology, can profoundly improve communication nuances within healthcare environments. This development could lead to enhanced patient engagement, greater accuracy in diagnostic processes, and an overall elevation in the quality of service delivery provided to individuals seeking medical assistance. Nevertheless, it remains to be seen to what degree healthcare practitioners operating within Nigerian teaching hospitals are aware of and have actively embraced AI technologies to foster effective communication among patients and healthcare providers alike. There is a growing concern that a combination of limited awareness regarding AI, inadequate training opportunities for healthcare professionals, and various barriers to adopting cutting-edge technology may significantly impede the effective utilisation of AI tools in these critical healthcare settings. The primary objective of this study is to investigate the levels of knowledge possessed by healthcare providers meticulously, the rates at which these professionals have adopted AI technologies and the various factors that influence their usage of AI, all with the intent of identifying existing gaps and potential opportunities to enhance communication practices and improve healthcare outcomes within the framework of Nigerian teaching hospitals.

Objectives of the Study

The objectives of the study are to:

1. Assess healthcare providers' knowledge of AI in select teaching hospitals.
2. Examine the adoption of AI for communication in select teaching hospitals.

3. Identify barriers to AI adoption by healthcare providers.
4. Evaluate the impact of AI on communication effectiveness in select teaching hospitals.
5. Explore the training needs of healthcare providers for AI adoption in communication.

Research Questions

The research objectives were addressed through the following research questions:

- RQ1: What is the level of AI knowledge among healthcare providers in select hospitals in Nigeria?
- RQ2: How widely is AI adopted for communication by healthcare providers?
- RQ3: How do healthcare providers effectively adopt AI for communication in select teaching hospitals in South-South Nigeria?
- RQ4: How does AI affect communication effectiveness between providers and patients?
- RQ5: What are the training needs of healthcare providers to effectively adopt AI for communication in teaching hospitals?

Significance of the Study

The significance of this study is pivotal for the enhancement of Nigeria's healthcare system. Healthcare providers will acquire insights into the integration of AI technology. The study will pinpoint challenges such as knowledge deficits and ethical considerations, aiding providers in understanding AI's potential advantages to support the adoption of AI technology for effective and economical healthcare delivery.

Policymakers will also gain from the research findings. The outcomes will guide the establishment of policies and regulations for AI integration within Nigeria's healthcare framework. Thus, policymakers will be empowered to enact practical reforms, improving the health system's efficacy.

Patients are anticipated to benefit significantly from the study's insights. The integration of AI in healthcare technology could elevate patient outcomes by lowering treatment costs and improving operational effectiveness.

The study suggests that the advantages of AI integration are likely to enhance health outcomes for Nigerian patients over time.

Researchers will also reap benefits from this study's findings. The research enriches the knowledge regarding AI technology adoption in Nigeria's health service delivery. It paves the way for further investigation into AI technology in healthcare. The study's outcomes are also advantageous for technology companies. The findings may direct the creation of new AI solutions tailored to the requirements of Nigerian healthcare professionals. Additionally, it may assist businesses in probing the Nigerian healthcare market for viable AI technology applications.

Understanding Artificial Intelligence

Artificial Intelligence (AI) has emerged as a transformative technology with far-reaching implications across various domains. AI refers to developing intelligent agents capable of reasoning, learning, and problem-solving. This literature review explores AI's key concepts, applications, and challenges. One of the core concepts in AI is machine learning, which involves training algorithms on large datasets to identify patterns and make predictions. This has led to significant advancements in natural language processing (NLP) and computer vision. NLP enables computers to understand and generate human language, while computer vision allows machines to interpret and analyse visual information.

Artificial Intelligence is a superior form of computer science that develops intelligent machines that work and react like humans. It involves developing models and algorithms to conduct data analysis for decision-making processes. AI has found applications in numerous fields, including communication, healthcare, finance, manufacturing, and transportation. In healthcare, AI is used for

medical image analysis, drug discovery, and personalised treatment plans (Esteva et al., 2017). In finance, AI is employed for fraud detection, algorithmic trading, and risk assessment (Kharlamova & Ryabov, 2020). In manufacturing, AI optimises production processes, predicts equipment failures, and improves quality control (Lee et al., 2019).

AI technology has started altering many industries, including healthcare, very fast since it has tremendous potential to revolutionise healthcare delivery. Artificial Intelligence is the development of computer-based systems with human-like intelligence and cognitive abilities. They analyse data, make decisions, and learn from experience like humans. AI's ability to process human language enables companies to understand individual behaviours, preferences, beliefs, and interests for effective communication (Morah & Udeze, 2024). Hassan, Islam, Munir, and Cherukuri (2020, p. 285) have explained that "AI involves using machine learning, natural language processing, and other advanced technologies in creating intelligent machines which can easily perform tasks that would ordinarily require human intelligence". First, to understand AI, one needs to know its subfields, which include machine learning, natural language processing, and robotics. Morah (2024) insists that society must first accept a technology to benefit from its impacts. Therefore, the effectiveness of AI for health communication will yield much fruit if the users have a positive disposition to use the technology.

Artificial Intelligence consists of numerous subfields defined by distinct characteristics and objectives. Machine learning, a significant component of AI, focuses on creating algorithms that learn from data to generate predictions. It enables machines to enhance their performance through experiential learning. The proficiency of machine learning algorithms in processing large datasets allows for accurate pattern recognition

and predictions. Natural language processing is another vital subfield of AI, focusing on human language analysis and comprehension. Jurafsky and Martin (2020) assert that NLP develops algorithms that facilitate machine understanding of human language and responses. NLP technologies find applications in chatbots, intelligent assistants, and translation systems. The rapid evolution of NLP signifies a transformative shift in communication, enabling more natural interactions between humans and machines. Robotics, a crucial aspect of AI research, involves creating systems that can perceive and respond to their environment. Thus, robotics encompasses the development of intelligent machines capable of movement, perception, and interaction with their surroundings. Asada and Dario (2015) indicate that robotics applications span diverse fields, including healthcare, manufacturing, and transportation. Intelligent robots in these sectors can automate repetitive tasks, improve efficiency, and enhance safety. AI's role in healthcare encompasses the development of AI-powered tools, such as diagnostic devices, chatbots, and electronic health records.

Despite its promising applications, AI presents significant challenges. One primary concern is the potential for bias in AI algorithms, which can lead to discriminatory outcomes if not addressed (Obermeyer et al., 2019). Additionally, ensuring data privacy and security is crucial to protecting sensitive information and maintaining public trust in AI technologies. According to Brinati et al. (2018), this technology has several challenges when integrated into healthcare delivery. Among them are misunderstandings and a need for more awareness about AI technology among healthcare providers. However, healthcare providers often need more knowledge and understanding about AI technology, leading to resistance and reluctance to integrate it into healthcare delivery. Kalu (2024) argues that fear of AI replacing them and difficulty interpreting AI-powered tools can also hinder the

development of accurate diagnostic tools. Encouraging education and training on AI technology can improve treatment outcomes and address ethical issues within healthcare delivery.

Ethical considerations are crucial for commissioning AI technology in health delivery, as it relies on large volumes of data that can be biased. This can lead to less-than-optimal diagnosis or treatment, impacting outcomes. Privacy and security concerns also arise from the use of patient data. Ethical considerations also require the development of well-defined regulations and guidelines for AI-powered tools in healthcare delivery to prevent unintended outcomes and harm to patients. AI applications in health care include disease diagnosis, drug discovery, and personalised treatment plans. For example, AI-powered image analysis tools help diagnose abnormalities by analysing medical images more accurately (Yip et al., 2020). Moreover, predictive analytics models are being developed further to identify people with a high chance of getting a particular disease so that preventive measures can be taken (Deo, 2015). Treatment plans can also be optimised using AI to enable massive volumes of data to develop personalised treatment plans that suit the needs of individual patients.

The Role of AI in Enhancing Healthcare Communication

Artificial intelligence (AI) has arisen as a formidable instrument within the healthcare sector, possessing considerable capacity to transform communication among healthcare providers. Consequently, this discourse examines the contemporary research landscape about AI within this sphere, elucidating its advantages, obstacles, and prospective developments.

AI-driven instruments can markedly augment healthcare communication by meticulously analysing medical data, discerning patterns, and facilitating the exchange of information. For

example, AI algorithms can process extensive patient data, identifying trends that may elude human perception. Such advancements can culminate in more precise diagnoses, individualised treatment protocols, and enhanced patient outcomes (Wang et al., 2021).

Furthermore, AI can potentially ameliorate communication deficits among healthcare professionals in diverse environments and specialisations. Applying natural language processing (NLP) methodologies enables AI systems to comprehend and react to human language, promoting efficient information dissemination and minimising miscommunications (Li et al., 2020). This functionality is especially beneficial in orchestrating care for intricate patients or consulting with specialists from varying domains.

Even with its prospective advantages, the incorporation of AI into healthcare communication is fraught with challenges. A primary apprehension pertains to the potential biases inherent in AI algorithms. Should these systems be trained on skewed datasets, they may inadvertently perpetuate existing inequalities and disparities within the healthcare framework (Rajkomar et al., 2019). Moreover, safeguarding data privacy and security is imperative to uphold patient confidentiality and foster trust in AI-enhanced healthcare solutions.

Prospectively, the trajectory of AI within healthcare communication appears auspicious. As AI technologies evolve, one can anticipate the emergence of increasingly sophisticated applications capable of further enhancing the quality and efficiency of healthcare delivery. However, it is crucial to confront the challenges associated with AI implementation and ensure its advantages are equitably disseminated among all demographic groups.

Knowledge and Adoption of AI by Health Care Providers in Nigeria

AI has to be affected in adoption and knowledge for healthcare providers to realise its full potential in health delivery. While the providers recognise its potential benefit, only 12% of them have been able to implement AI-powered tools (NEJM Catalyst, 2023). The reason for the slow adoption could thus also be related to an inadequate understanding of the AI technology among healthcare providers themselves. Better AI awareness among healthcare providers is also needed for improved AI use in healthcare delivery. On the contrary, AI technology is being incorporated into the medical curriculum so that in a couple of years, health professionals will be knowledgeable about using AI-powered tools (Jha et al., 2024). Secondly, substantial investments are needed to develop easy-to-use AI tools and adequate training toward enabling the adoption and application of AI technology in the delivery of patient care.

The slow implementation of AI by health providers in the United States is also a unique case globally. That can be done by limiting factors of AI integration into health care. One perceived negative attribute is that the AI algorithms in AI-powered tools are not transparent; hence, it complicates the assessment of their validity (Kusiak et al., 2024). Issues of the patient's privacy and data security will also be significant concerns that hamper providers from adopting AI technology. Any open methods of evaluating AI-powered tools should, therefore, comply with regulations concerning the privacy and security of information.

It would be very challenging to overcome such challenges to the adoption of AI by healthcare providers without close cooperation among this industry's players. It is the effort of researchers, clinicians, and policymakers, together with industry leaders, to ensure that reliability, safety, and efficacy in the AI-powered tools being developed and deployed within health are at par

(Ho & Wang, 2020). Healthcare providers must be involved in all stages of designing and evaluating the AI-powered tools to build confidence and support for its adoption. Moreover, healthcare professionals must know the competencies to apply AI technologies to effective practice (Kuo et al., 2019). Including education in AI in the medical curriculum and continuous education programs for active healthcare professionals will bridge the knowledge gap regarding AI technology (Fiore et al., 2023). That will improve with training and interventions that support healthcare providers in integrating AI technology into practice; thus, it will be comforting for them to work with or use AI-powered tools in patient care delivery (Delgado-Segura et al., 2020).

Empirical Reviews

Despite its newness, AI use in health communication has garnered research interest. Chen et al. (2017) examined the evolution and current use of Artificial Intelligence in healthcare, highlighting its advantages, challenges, and the necessity for educating health providers to facilitate its comprehensive integration. Gao et al. (2020) explored the factors influencing Artificial Intelligence adoption among physicians and healthcare providers, revealing a general lack of knowledge and adoption despite awareness of AI technologies, with perceived usefulness, usability, and costs as critical determinants.

Similarly, Kannampallil et al. (2020) reviewed the extent of AI adoption in healthcare, identifying slow adoption rates due to standardisation, privacy, and regulatory challenges while advocating for collaborative development with healthcare providers for effective implementation. Alaraki and Hamouri (2021) conducted a systematic literature review on AI adoption factors and barriers, emphasising user acceptance, technology readiness, organisational culture, and financial incentives as critical determinants, asserting that healthcare

professionals' involvement in planning is crucial for successful acceptance. Likewise, Khan and Dijkmans (2021) provided an overview of AI applications in healthcare, noting its potential to enhance efficiency and personalisation while recommending the education of health professionals on AI's benefits and limitations to ensure successful adoption and integration.

Meanwhile, these studies revealed some factors that influence AI adoption in healthcare and also pointed out the need to involve education and healthcare providers in developing and implementing AI technologies. The studies reviewed here show that health professionals have scant knowledge of AI technologies within healthcare. Again, the facilitators of AI adoption in healthcare include perceived usefulness, ease of use, cost, user acceptance, technology readiness, organisational culture, privacy concerns, and regulatory barriers. More importantly, education on the benefits and limitations of using AI technologies, engagement in their development and implementation, and standardisation of the technology will go a long way in improving the adoption and integration of AI technologies in healthcare delivery.

Theoretical Framework

The Technology Acceptance Model (TAM) and the Diffusion of Innovations Theory (DOI) provide valuable frameworks for understanding the adoption of artificial intelligence (AI) by healthcare providers in Nigerian teaching hospitals.

Technology Acceptance Model (TAM)

The Technology Acceptance Model was initially proposed in 1989 by Fred Davis (Morah & Okunna, 2020) as a modification of the Theory of Reasoned Action to understand user acceptance and adoption of technology. TAM suggests that two primary factors — perceived usefulness and ease of use — influence an individual's decision to adopt new technology. In the context of AI, healthcare providers are more

likely to adopt AI tools for communication if they believe these technologies will improve their efficiency and patient interactions. However, adoption rates may be low if AI tools are perceived as challenging or too complex. This study will examine how these factors impact the willingness of healthcare providers to use AI for effective communication, considering the potential need for training to enhance perceived ease of use. It will be essential, as it helps identify the factors that affect a healthcare provider's intention to use AI technologies in South-South teaching hospitals.

Diffusion of Innovation Theory

Diffusion of Innovation Theory, developed by Everett Rogers in 1962 (Morah & Okunna, 2020), is the process by which an idea, product, or technology is transmitted through a social system and the rate at which the items are adopted. It suggests that the relative advantage, compatibility, complexity, observability, and 'trialability' determine whether an innovation will be adopted. It assumes that people's adoption decisions are based on their perceptions of innovation and social networks' characteristics. The Diffusion of Innovations Theory explains how new ideas, practices, or technologies spread within a social system over time, emphasizing five key factors: relative advantage, compatibility, complexity, trialability, and observability. Applying DOI to this study, the adoption of AI in Nigerian teaching hospitals will depend on how healthcare providers perceive the relative advantages of AI over traditional communication methods, the compatibility of AI tools with their existing workflows, and the perceived complexity of these technologies. Furthermore, the ability to experiment with AI tools (trialability) and observe their benefits firsthand (observability) can significantly influence adoption rates. Understanding these factors can help identify barriers and facilitators to AI adoption among healthcare providers, providing insights into

strategies for more effective diffusion of AI technologies in the healthcare sector in Nigeria.

Methodology

The study adopted a descriptive survey research design to describe and analyse the knowledge and adoption of AI by healthcare providers in some selected teaching hospitals in South-South Nigeria. The population consisted of 2,277 registered doctors, nurses, pharmacists, and laboratory scientists working in some selected teaching hospitals in Akwa Ibom, Bayelsa, and Delta states in South-South, Nigeria. The researchers selected four teaching hospitals in the region using the purposive sampling technique to ensure that only healthcare providers with at least AI and new media literacy are studied. The teaching hospitals include:

- University of Uyo Teaching Hospital, Uyo, Akwa Ibom State
- University of Port Harcourt Teaching Hospital, Port Harcourt, Rivers State
- Federal Medical Centre, Yenagoa, Bayelsa State
- Delta State University Teaching Hospital, Oghara, Delta State.

The sample size involved 400 healthcare providers; 100 health providers were selected from each state's four hospitals. The data collection was done using a structured questionnaire. Descriptive statistics of frequencies and percentages were used to analyse the responses obtained. To test the hypothesis, the **Chi-Square Goodness-of-Fit Test** was deployed.

Findings and Data Analysis

This study sought to investigate healthcare providers' knowledge and adoption of AI in select teaching hospitals in South-South Nigeria. The study aimed to gather insights into the factors that influence AI adoption among healthcare providers in Nigerian healthcare facilities and identify areas where education and training can be improved to facilitate the

integration of these technologies into healthcare delivery via effective communication. Below are the findings:

RQ1: What is the level of AI knowledge among healthcare providers in select hospitals in Nigeria?

Options	Frequency	Percentages (%)
Very low	63	16
Low	78	20
Moderate	57	14
High	44	11
Very high	158	39
Total	400	100

Table 1 distribution suggests that while many healthcare providers possess a high level of AI knowledge, there is still a notable proportion with limited understanding. This finding aligns with previous research indicating variability in AI knowledge and adoption rates among healthcare professionals globally. For instance, a study by Shen et al. (2021) found that healthcare providers' familiarity with AI technologies varied significantly, often depending on their training and education on AI. Similarly, Li et al. (2022) highlighted that while some healthcare professionals are increasingly aware of AI's potential benefits, others still perceive it as complex and need more knowledge for practical use.

Chi-Square Test 1

H₀: The level of AI knowledge among healthcare providers in select teaching hospitals in South-South Nigeria is uniformly distributed.

H₁: The level of AI knowledge among healthcare providers in select teaching hospitals in South-South Nigeria is not uniformly distributed.

The calculated Chi-Square statistic is 102.52, and the critical value for 4 degrees of freedom at a significance level of 0.05 is 9.49. Since the calculated Chi-Square statistic (102.52) is much greater than the critical value (9.49), we reject the null hypothesis (H₀). The result indicates that the level of AI knowledge among healthcare providers in select teaching hospitals in South-South Nigeria is not uniformly distributed. There is a significant variation in the levels of AI knowledge among healthcare providers.

RQ2: How widely is AI adopted for communication by select healthcare providers?

Options	Frequency	%
AI technology is widely adopted and used in our hospital	51	13
We have started exploring the use of AI technology in our hospital	276	69
We are aware of AI technology, but we have not yet adopted it in our hospital	35	9
We have not heard about AI technology in our hospital	38	9
Total	400	100

Table 2 distribution shows how widely healthcare providers have adopted artificial intelligence (AI) technology in select teaching hospitals in the South-South region of Nigeria for communication. Most respondents (69%) reported that they have started exploring using AI technology in their hospital. In comparison, only 13% reported that AI technology is widely adopted and used in their hospital. A smaller proportion of respondents (9%) reported that they are aware of AI technology but have yet to adopt it, and a similar proportion of respondents

reported that they have yet to hear about AI technology in their hospital. These findings suggest that there is still room for increased adoption and implementation of AI technology in healthcare delivery in the region.

Chi-Square Test 2

H₀: The level of AI adoption for communication among healthcare providers in select hospitals is uniformly distributed.

H₂: The level of AI adoption for communication among healthcare providers in select hospitals is not uniformly distributed.

The calculated Chi-Square statistic for AI adoption levels is 414.46, and the critical value for 3 degrees of freedom at a significance level of 0.05 is 7.81. Since the calculated Chi-Square statistic (414.46) is much greater than the critical value (7.81), we reject the null hypothesis (H₀). The result indicates that the level of AI adoption for communication among healthcare providers in select hospitals is not uniformly distributed.

RQ3: How do healthcare providers effectively adopt AI for communication in teaching hospitals in South-South Nigeria?

Options	Frequency	%
Clinical decision support systems	81	20
Machine learning in diagnostics	79	20
Virtual health assistants	88	22
Patient data analysis	137	34
None of the above	15	4
Total	400	100

The data in Table 3 above shows how healthcare providers have effectively adopted artificial intelligence (AI) for communication in select teaching hospitals in the South-South region of

Nigeria. The most common application of AI adopted by respondents is patient data analysis, with 34% of respondents indicating its use. Virtual health assistants are also being used, with 22% of respondents indicating its application. The use of clinical decision support systems and machine learning in diagnostics is reported by 20% of the respondents. A small proportion of respondents (4%) reported that none of the listed applications of AI is currently being used in their hospitals. These findings suggest that there has been some penetration of AI technology in healthcare delivery in the region. It is being applied in various areas that can improve patient outcomes.

Chi-Square Test 3

H₀: The methods of AI adoption for communication among healthcare providers in select teaching hospitals are uniformly distributed.

H₃: The methods of AI adoption for communication among healthcare providers in select teaching hospitals are not uniformly distributed.

The calculated Chi-Square statistic for AI adoption methods was found to be 94.25, and the critical value for 4 degrees of freedom at a significance level of 0.05 is 9.49. The calculated Chi-Square statistic (94.25) is much greater than the critical value (9.49), we therefore reject the null hypothesis (H₀). The result indicates that the methods of AI adoption for communication among healthcare providers in teaching hospitals are not uniformly distributed.

RQ4: How does AI affect communication effectiveness between providers and patients?

Options	Frequency	%
Improving diagnosis accuracy	161	40
Reducing medical errors	198	49

Predictive analysis	risk	34	9
Others		7	2
Total		400	100

The data in Table 4 above shows how AI affects communication effectiveness between healthcare providers in select teaching hospitals in the South-South region of Nigeria and patients. Most respondents (49%) reported that AI technology aims to reduce medical errors, and 40% indicated that it is geared towards improving diagnosis accuracy. A smaller proportion of respondents (9%) reported using AI for predictive risk analysis. Only a tiny proportion of respondents (2%) reported using AI for other purposes not listed in the survey options.

Chi-Square Test 4

H₀: The effects of AI on communication effectiveness between providers and patients are uniformly distributed.

H₄: The effects of AI on communication effectiveness between providers and patients are not uniformly distributed.

The critical value at a significance level of 0.05 is 7.81, and the calculated value is 263.3. Since the calculated Chi-Square statistic (263.3) is much greater than the critical value (7.81), we reject the null hypothesis (H₀). The result indicates that the effects of AI on communication effectiveness between providers and patients are not uniformly distributed. The results suggest that specific effects, such as "Reducing medical errors" and "Improving diagnosis accuracy," are perceived to be significantly more impactful than others.

RQ5: What are the training needs of healthcare providers to effectively adopt AI for communication in teaching hospitals?

Options	Frequency	%
Comprehensive training on AI and its application in healthcare communication	33	8
Training on how to integrate AI with existing communication methods	12	3
Training on how to handle patient data confidentiality and privacy in AI-assisted communication	51	13
Training on troubleshooting and problem-solving in AI-assisted communication	73	18
Training on how to evaluate the effectiveness and accuracy of AI-assisted communication in healthcare.	199	50
No specific training is needed for AI-assisted communication in healthcare	32	8
Total	400	100

The data presented in Table 5 above shows the training needs of healthcare providers to effectively adopt AI for communication in select teaching hospitals in the South-South region of Nigeria. The most commonly cited training need is training on evaluating the effectiveness and accuracy of AI-assisted communication in healthcare, with 50% of respondents indicating that adopting it is challenging. Training on troubleshooting and problem-solving in AI-assisted communication was also reported by 18% of respondents as a training need, while training on handling patient data confidentiality

and privacy in AI-assisted communication was cited by 13% of respondents. Comprehensive training on AI and its application in healthcare communication and training on integrating AI with existing communication methods were cited as challenges by only a small proportion of respondents (8% and 3%, respectively). A small proportion of respondents (8%) also reported that no specific training is needed for AI-assisted communication in healthcare.

Chi-Square Test 5

H₀: The training needs of healthcare providers to effectively adopt AI for communication in teaching hospitals in teaching hospitals are uniformly distributed.

H₅: The training needs of healthcare providers to effectively adopt AI for communication in teaching hospitals are not uniformly distributed.

The critical value for degree of freedom = five at a significance level of 0.05 is 11.07. Since the calculated Chi-Square statistic (346.78) is much greater than the critical value (11.07), we reject the null hypothesis (H₀). This indicates that the training needs of healthcare providers to adopt AI for effective communication in teaching hospitals are not uniformly distributed. The results suggest that specific training needs, particularly "training on how to evaluate the effectiveness and accuracy of AI-assisted communication in healthcare," are perceived to be significantly more prominent than others.

Discussion of Findings

The study examined the knowledge, adoption, effectiveness, and barriers associated with AI technology among healthcare providers in select teaching hospitals in South-South Nigeria. This study aligns with the literature that underscores the transformative potential of AI in healthcare but also highlights the need for strategic, context-specific solutions to overcome the challenges healthcare providers face in adopting these

technologies. The findings are derived from five key research questions, each analysed through a Chi-Square Goodness-of-Fit Test to determine the distribution and significance of the responses.

Findings in Table 1 show that most health workers from selected teaching hospitals in South-South, Nigeria have good knowledge of artificial intelligence. A quite appreciable proportion of the respondents identified a very low to fair level of knowledge in AI. The Chi-Square test revealed a non-uniform distribution of AI knowledge levels ($p < 0.05$). The result suggests that while a substantial number of healthcare providers possess a high level of knowledge about AI, there is still a notable segment with low or very low knowledge. The concentration of high knowledge levels could be attributed to ongoing education and exposure to AI in medical contexts.

In contrast, the lower levels reflect gaps in training or limited access to AI-related information. The result suggests a great need for more education and training in AI to equip health providers with informed decisions on applying AI technology when discharging health services. However, the variability in knowledge levels underscores the importance of targeted training and continuous professional development to bridge the knowledge gap and facilitate the effective adoption of AI in healthcare settings (Topol, 2019). According to Liaw (2020), knowledge and training on AI technology among healthcare providers play an essential role in the practical application of AI technology in healthcare delivery.

AI technology is in its early days of adoption by healthcare providers in some selected teaching hospitals in South-South, Nigeria, as it was reported by most of the surveyed responses who just started using AI technology in their hospital, and few have indicated that AI technology is already in wide use in their hospital. Most (69%) healthcare providers reported that they have

started exploring AI technology, while 13% indicated that AI is widely adopted and used. A small proportion (9%) was aware of AI but had yet to adopt it, and another 9% had yet to hear about AI. The Chi-Square test indicated a significant difference in the levels of AI adoption ($p < 0.05$). The result reflects a diverse landscape in terms of AI integration, with most institutions in the exploratory phase and only a few fully adopting AI tools. The limited full adoption might be due to infrastructural challenges, financial constraints, or a need for more strategic policy implementation. The finding calls for the need to motivate healthcare providers to embrace AI technology, given the potential benefits accompanying the adoption of the technology in healthcare delivery. According to Asuit (2019), inadequate adoption of AI technologies in healthcare is founded on health providers' reservations about the efficacy and reliability of the technology as well as cultural and organisational barriers.

Findings in Table 3 show that patient data analysis is the most prevalent current application of AI in healthcare among selected teaching hospitals in South-South Nigeria. This was followed by virtual health assistants, clinical decision support systems, and machine learning in diagnostics. Among the methods of AI adoption, "Patient data analysis" (34%) was the most common, followed by "Virtual health assistants" (22%), "Clinical decision support systems" (20%), and "Machine learning in diagnostics" (20%). A small portion (4%) reported using none of these methods. The Chi-Square test, however, confirmed a non-uniform distribution ($p < 0.05$), indicating significant preferences for specific methods over others. The preference for "Patient data analysis" aligns with the literature suggesting that data-driven insights are pivotal for enhancing communication efficiency and decision-making in healthcare settings.

On the other hand, the relatively lower adoption of "Machine learning in diagnostics" might suggest either a lack of confidence or understanding in using these advanced tools. These results imply that the application of AI technology is already diffusing into the various spheres of healthcare delivery. AI technology can help improve healthcare outcomes with adequate and accurate diagnosis, reduce medical errors, and improve patient management (Gholamzadeh & Vatankhah, 2018).

In Table 4, the primary purposes for healthcare providers using AI technology in some teaching hospitals in South-South, Nigeria, include curbing medical errors and accurately diagnosing ailments. "Reducing medical errors" (49%) and "Improving diagnosis accuracy" (40%) were the most frequently cited effects of AI on communication, while "Predictive risk analysis" (9%) and "Others" (2%) were much less common. The Chi-Square analysis showed a significant deviation from a uniform distribution ($p < 0.05$), indicating that specific effects of AI are perceived to be more critical than others. The emphasis on reducing errors and improving diagnosis highlights AI's role in enhancing accuracy and safety in healthcare communication, consistent with existing studies that underscore AI's potential to minimise human error and support clinical decisions. The result agrees with Cohen and Berkowitz (2019), who stated that integrating AI technology into human decision-making could reduce errors in diagnosing and treating diseases by up to 63%. The implication is that healthcare providers appreciate the potential of AI technology to enhance healthcare delivery and, hence, find its application in patient care.

Table 5 indicates that the most prevalent training needs of healthcare providers to adopt AI for communication in teaching hospitals effectively involves training on how to evaluate the effectiveness and accuracy of AI-assisted

communication in healthcare, training on troubleshooting and problem-solving in AI-assisted communication and training on how to handle patient data confidentiality and privacy in AI-assisted communication. The most significant training needed to effectively adopt AI was "Training on how to evaluate the effectiveness and accuracy of AI-assisted communication in healthcare" (50%), followed by "Training on troubleshooting and problem-solving in AI-assisted communication" (18%), "Training on how to handle patient data confidentiality and privacy in AI-assisted communication" (13%), "Comprehensive training on AI and its application in healthcare communication" (8%), "No specific training is needed for AI-assisted communication in healthcare" (8%), and "Training on how to integrate AI with existing communication methods" (3%).

However, the Chi-Square test 5 indicated that the training needs of healthcare providers to adopt AI for communication in teaching hospitals effectively are not uniformly distributed ($p < 0.05$). "Training on how to evaluate the effectiveness and accuracy of AI-assisted communication in healthcare." is the most significant training needs and aligns with existing literature on the ethical and security challenges associated with AI in healthcare. The result highlights the need for robust training to foster trust among healthcare providers and patients. The poor training level and facilities further underline the complexity of implementing AI in healthcare environments, particularly in resource-limited settings. Healthcare providers must ensure that their efforts to adopt AI technology within healthcare are taken seriously regarding data privacy and security to ensure all patient information remains confidential. It has organisational and financial challenges, such as resistance to change and lack of equipment and infrastructural setup, which may be improved with more funding and

education on the benefits of AI technology in the delivery of healthcare (Duru, 2023).

The findings from the five research questions collectively suggest a complex landscape for AI knowledge, adoption, and impact in teaching hospitals in South-South Nigeria. While there is considerable knowledge and exploration of AI, significant training needs remain, particularly concerning training on evaluating the effectiveness and accuracy of AI-assisted communication in healthcare and training on troubleshooting and problem-solving in AI-assisted communication. The non-uniform distribution across different aspects of AI usage and perception indicates that targeted interventions are required to address specific gaps, such as training for low-knowledge providers and addressing privacy concerns to facilitate broader adoption.

Implications

The findings of this study help strategise ways of improving the adoption and integration of AI in healthcare delivery in Nigeria, thereby offering better patient outcomes, efficiency, and reduced health expenditure. Education for health providers is instrumental in promoting AI adoption since education will enhance the acceptance of AI technologies and participate actively in the development and implementation process. Policymakers and regulatory bodies may also standardise AI technologies and make some financial incentives available to ensure their adoption and integration into the Nigerian healthcare system. The bottom line remains that the successful adoption and integration of AI technologies in healthcare will significantly improve healthcare outcomes, consequently improving the lives of patients receiving care from Nigerian healthcare facilities.

Conclusion

This study explored the knowledge, adoption, effectiveness, and barriers associated with AI technology among healthcare providers in select

teaching hospitals in South-South Nigeria. The findings reveal a significant variation in the levels of AI knowledge among healthcare providers, with a notable number demonstrating high levels of understanding while others remain less informed. Despite considerable exploration and partial adoption of AI technology for communication, full integration is limited. That suggests that most institutions still need to be in the early stages of AI adoption.

The study also identified specific methods of AI adoption, such as patient data analysis and virtual health assistants, as more prevalent, indicating a preference for applications that directly support clinical decision-making and patient engagement. The positive impacts of AI on communication effectiveness—primarily in reducing medical errors and improving diagnosis accuracy—are well recognised by healthcare providers. However, significant barriers, particularly concerns about data privacy, resistance to change, and infrastructural challenges, impede widespread AI adoption.

The above results underscore the need for targeted strategies to enhance AI literacy, improve infrastructural capabilities, and address ethical concerns to facilitate the effective and equitable adoption of AI in healthcare settings in Nigeria. That will require coordinated efforts by stakeholders, including healthcare administrators, policymakers, and technology providers, to overcome existing barriers and fully leverage the potential of AI for improved communication and patient outcomes in Nigeria's healthcare system.

Recommendations

The study explores healthcare providers' knowledge, adoption, and application of AI technology in selected teaching hospitals in South-South Nigeria. While many healthcare providers know highly about AI, the adoption stage is still early. The uses of AI in healthcare include patient data analysis, virtual health

assistants, clinical decision support systems, and machine learning-based diagnostics. South-South Nigeria's teaching hospitals are primary healthcare providers, and they must deploy effective communication strategies in delivering quality healthcare services to patients. AI presents an opportunity for better patient care, service quality, and health outcomes. The findings could inform strategies to enhance AI adoption in healthcare and ensure quality services. However, data privacy remains a significant barrier to adoption, and there is resistance to change and a need for more equipment and infrastructure. Since the study aims to inform strategies to enhance AI adoption and ensure quality healthcare services in Nigeria, it is recommended that:

- a. Healthcare organisations and government agencies should organise education and training for healthcare professionals to improve awareness and attention to AI technologies in healthcare.
- b. Hospital administration should support integrating AI technology into health services by investing in infrastructure and equipment.
- c. Developing more AI applications in South-South Nigeria's teaching hospitals will motivate more use among health carers.
- d. Hospital leaders should develop policies and guidelines to control and regulate AI integration, ensuring quality care.
- e. Hospital and government policies should ensure comprehensive training on the effectiveness and accuracy of AI-assisted communication in order to adopt effective communication in hospitals.
- f. Healthcare providers should ensure patients' confidential information remains undisclosed to unauthorised access, building trust between patients and healthcare providers.

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