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LEVERAGING AI AND IOT TECHNOLOGIES FOR IMPROVED DECISION-MAKING IN FAMILY MEDICINE

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ABSTRACT

Background: AI and IoT technologies have now become seen as robust approaches for the improvement of decision-making in the healthcare field. These aim to manage care, monitor, and enhance flow in a family medicine practice. The use, though, remains suboptimal, and the positive and negative effects of applying AI and IoT in family medicine are worth further examination.

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Objective: As such, it is the purpose of this study to assess its utilization, comprehension, and consequence in family medicine AI and IoT cases, while also unveiling the limitations to their operationalization.

Methods: A quantitative, cross-sectional study was undertaken whereby data was collected through a structured questionnaire from 250 family medicine practitioners comprising general practitioners, nurses, and specialty practitioners.

Methodology: The survey included questions related to the frequency of the usage of artificial intelligence and IoT, benefits, and potential challenges, and contribution to the decision-making process in the clinical environment. The first analysis was descriptive statistics, and Cronbach Alpha was used in determining reliability. Established normality tests for major variables involved the Shapiro-Wilk test and inferential statistics examined the relationship between technology adoption and perceived value.

Results: It was indicated in the study that family medicine uses AI moderately; most of those who participated in the study used it occasionally or sometimes. Correspondingly, the main IoT devices that residents received recommendations for chronic diseases include heart rate and blood pressure monitors. Not surprisingly, the Shapiro-Wilk test pointed at the non-normal distribution of the key variables, meaning that the confidence and perceived helpfulness of AI are different across practitioners. The work presented here is not perfect since the internal reliability was moderate according to Cronbach's Alpha (.463). Some of the challenges to scaling the use of AI were a lack of training and data security issues.

Conclusions: The noted technologies AI, and IoT are seen as helpful for tackling challenges in family practices; chronic disease monitoring is a significant area of interest But, their implementation is not equal. Particularly, there are four primary concerns for further development: increased emphasis on training and attention to privacy. The use of these technologies has to be propelled by the best efforts to tackle these challenges and offer enough support to healthcare providers. More studies and policy measures should be carried out to increase the incorporation of AI and IoT into the field of family medicine.


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KEYWORDS: Artificial intelligence, Internet of Things, Family Medicine, Clinical Decision, Technology, Adoption, Privacy.

INTRODUCTION

Technology is increasing at a very fast rate across the globe and that has affected almost all the business sectors, and the health sector is also among them. Arguably the most revolutionary technologies are AI and IoT since they are now poised to revolutionize the way healthcare delivery and decision-making functions. Because family medicine focuses on interpersonal, long-term care these technologies offer unique possibilities for their incorporation into the care regimen to enhance patient health status, efficiency of resources, and communication with the patient. As the first level of healthcare contact, family medicine physicians are responsible for diagnosing and managing many different health problems, so point-of-care tools are valuable to help make accurate decisions quickly (Kaur, 2024) (Patil & Shankar, 2023).

Leveraging the strengths of processing extensive data and fast pattern search, the applications of AI are incorporated into healthcare settings to help healthcare professionals diagnose diseases, predict patients' outcomes, and monitor treatments. The analysis also revealed that positions like CDSS and predictive analytics might help FMG to become more effective by offering proof-based suggestions, lowering diagnostic worseness, and improving tailored care. Beyond diagnosis, there is the ability to assist with scheduling regulating patient flow, and management of electronic medical records, freeing up more of the clinician's time to be spent with the patient. It was found that with further advancement in AI, the use of AI in family medicine will advance and this development will improve solutions to some of the primary issues in primary care including chronic disease management patient compliance to treatment, and overall patient health outcomes (Ahmadi, 2024) (Shumba et al., 2022).

While the WSN monitors patients through sensors the IoT includes concrete real-time patient monitoring through connected devices wearing health monitoring devices, home-usage medical equipment, and m-Health applications. These connected devices can constantly gather information concerning a patient's vital signs, physical activity, and medication consumption

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giving a more comprehensive profile of one's health condition. In family medicine in particular, where an important part of the practice is centered on managing chronic conditions, IoT solutions may bring patient participation, preventive strategies, and minimal face-to-face interactions. IoT, especially in remote monitoring, not only enhances customized care for patients but also empowers practitioners to interlink the dots and make prompt and relevant decisions for confronting patients with chronic diseases such as diabetes, hypertension, and cardiovascular diseases (Molli, 2024) (Ahmed, Mohamed, Zeeshan, & Dong, 2020).

Such data captures in real-time can help healthcare providers intervene early enough when patients are beginning to hit rock bottom hence avoiding complications and hospitalization. Although the integration of artificial intelligence and IoT solutions can be considered as a perspective for family medicine, it is not fully implemented. There are several causes for this disparate adoption, including high costs, the necessity of training providers in the usage of this technology, data privacy/ protection issues, and a general absence of well-defined protocols for the integration of these technologies. Despite the understanding by most of the healthcare facilities on the enhancement of AI and IoT especially for enhancing the diagnosis reliability and the general health of the patients, several challenges have to be met. For instance, many of them may never be fully committed to using these AI tools because they are too complicated and difficult to make sense of the results that are generated (U. Ali, Ali, & Ali, 2024) (Keikhosrokiani, 2021).

In the same way, the application of IoT devices implies the potential risks for the breach of the patient's data since the healthcare sector experienced numerous cyberattacks and data breaches recently. Furthermore, the legal framework that governs the deployment of AI and IoT in the context of health care is still not very settled. Appropriate data protection regulation, which should be followed to the letter, including the GDPR is one way of ensuring that such an organization gains the much-needed trust of its patients as well as providers. Furthermore, the application of both AI and IoT into current systems of health enhancement also demands much more infrastructural capital and compatibility issues, which might be off-putting to any medical practice especially family-based ones that might not have extravagant resources (N. Singh, Khare, Thakur, & Sarawagi, 2024) (Alowais et al., 2023).

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LITERATURE REVIEW

The combined use of Artificial intelligence (AI) and the Internet of Things (IoT) in health care has received increased attention in recent years. However, in particular, the publication of innovation-friendly guidelines may be useful in family medicine, which has a wide focus and a predominantly patient-oriented approach. As more family medicine practitioners are involved in the management of long-term diseases, care coordination, and prevention, AI and IoT are useful tools for optimizing diagnosis and care outcomes while avoiding inefficiencies in system delivery. This paper presents a comprehensive review of the current literature on the application of AI & IoT in family medicine service delivery, its opportunities, constraints, and the Web Improvement inhibitors (Vuong, 2024) (Shiwlani, Khan, Sherani, & Qayyum, 2023).

AI in Family Medicine

AI has become one of the most important tools affecting healthcare industries since it can work with a large amount of information, look for certain patterns, and create prognosis models. In family medicine, AI finds practical use in several approaches, including integrated clinical decision-making support, prediction, and analysis of the natural language for information extraction from EHR databases. These applications assist in sustaining the healthcare sector through improving diagnosis procedures, outcome measures, and chronic. Specifically, the applications assist in sustaining the healthcare sector through improving diagnosis procedures, outcome measures, and chronic illnesses management. Perhaps the most well-known application of AI in family medicines is through clinical decision support systems (CDSS). These systems employ algorithms and other models in decision-making processes to offer free clinical recommendations to caregivers based on patient needs (Li, Li, Wei, & Li, 2024) (Rodriguez-Garcia, Li, Lopez-Lopez, & Juan, 2023).

Obermeyer & Emanuel described the need for a DSS in diagnostic decision-making and showed how AI-based systems can contribute to eliminating diagnostic mistakes frequently linked

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with different complicated disorders or diseases with low frequency of manifestation. This is because AI can handle numerous parameters at one time, thereby being able to identify numerous variables, that may not be noticeable to several human providers; hence it enhances the diagnostic accuracy as well as other treatment provision with velocities. For family medicine practitioners who may encounter patients with various conditions, CDSS could act as a useful decision-support tool. AI has also been applied in the analytic approach for the prediction of the high-risk populace and the progression of diseases (Maleki Varnosfaderani & Forouzanfar, 2024) (Billa & Chavali, 2022). Beam and Kohane in their review established that by using AI algorithms, the development of predictive models on high-risk individuals, especially those with the tendency to develop chronic diseases including diabetes and hypertension was achieved. These models analyze EHR, genetic data, and lifestyle data to provide prognosis thus enabling the family physician to provide early interventional steps or lifestyle change to slow or contain disease progression. This is even more valid for family medicine, where primary and secondary prevention, as well as patient follow-up, also collaboratively form one of the essential tenets of the specialty's approach. Also, NLP incorporates the capacity of AI to implicatively acquire organized data from clinical notes and the patient's records (Chaithra, Jha, Sayal, & Gangodkar, 2024) (Rasool, Tariq, & Hayat, 2023). Wang et al pointed out a study showcasing, how NLP could be more useful EHRs for clinicians and make patients' important data accessible for them To achieve these benefits, however, clinicians had to dedicate less time to EHRs and more time to patient-centered care. In family practice, many doctors often see many patients in a single working day, and this capability can help to optimize processes, making the work of a physician less stressful. However, there are limitations to using AI in family medicine as follows The advantages of using AI in family medicine have been explained above Nonetheless, there are some issues related to the application of high-level AI in family medicine (Johnson, 2024) (Hayyolalam, Aloqaily, Özkasap, & Guizani, 2021). First, there is an issue of understanding the parameters involved in the AI algorithm. Despite producing accurate predictions recommendations or actions on its own, the structures and systems of developing the models themselves are sometimes termed the black box problem. Organizations in the healthcare sector are unlikely to rely on artificial intelligence recommendations or advice if

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they do not comprehend how the conclusions are reached. As illustrated by Tonekaboni et al. one of the significant factors in this respect is the need for more interpretable and hence trusted AI models and for this reason, the practice needs to push toward developing and deploying such models (Shaid & Graepel) (Mullachery & Alismail, 2022).

IoT in Family Medicine

The IoT is another exciting technology that can revolutionize healthcare delivery as this paper shows. To date, IoT devices can be adopted primarily in family medicine settings for remote patient monitoring of chronic conditions, and preventive care. These devices encompass wearable fitness trackers, heart rate monitors, blood pressure, and glucose monitors therefore enabling the gathering of patient health data outside the clinical context. This information is in return fed to healthcare providers in real-time thus promoting more enhanced and targeted interventions (Prabhod, 2024) (Secundo, Shams, & Nucci, 2021).

The Internet of Things is especially valuable in supervising patients from a distance: diabetes, hypertension, heart diseases, and others. The study conducted by Sultan, analyzing the impact of chronic disease management with the use of IoT devices, showed that outcomes have been enhanced, the main reason is the continuous tracking of the patient's condition, and therefore possible complications are detected and addressed if necessary. For instance, patients with hypertension can take an IoT blood pressure checker at home and the healthcare provider of the patient can change the patient's treatment plan based on the data received. This in a way does away with constant clinic visits taking a more central role in patients' health (Zeb, Nizamullah, Abbasi, & Fahad, 2024) (De Panfilis, Peruselli, Tanzi, & Botrugno, 2023).

However, it is worth pointing out that in addition to adherence to the treatment of chronic diseases, IoT devices are indispensable for preventive healthcare. Smartwatches, fitness trackers, and other wearable devices can track movements, sleep, and heart rates to let people know how they should adjust their behavior for a healthier way of life. In a study by Piwek et al., the authors concluded that the application of the fit tracker boosted activity to a concrete beneficial level proving that IoT gadgets have a role to play in supporting preventive action in family medicine. By encouraging good practices, the Internet of Things can limit risky lifestyles that lead to the


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emergence of chronic diseases and save healthcare costs (Darwish, 2024) (Barnes & Zvarikova, 2021).

When it comes to IoT devices several opportunities can be noted, however, several difficulties consist of the integration of IoT devices in family medicine. Among the issues worthy of note is the issue of security of patient data. Every connected device produces massive amounts of personalized health data so its privacy and protection are crucial. One of the risks that have been on the rise in healthcare is cybercrimes, as identified by Patel et al., in their review the healthcare sector should establish sturdy security measures to prevent the theft of patient information. Furthermore, the isolation of IoT devices and healthcare systems that there is no integration between the two, which becomes a constraint to the flow of data when implementing remote monitoring programs (Sarker, 2024) (Joudar, Albahri, & Hamid, 2022).

Barriers to Adoption

Nevertheless, some challenges prevent the efficient implementation of AI and IoT in the practice of family medicine. The first significant challenge according to experts is the cost of implementation. Some of the AI and IoT applications may yet involve expensive investments in equipment, software, and training, which small FMPs with limited capital can ill afford. Ford et al. identified cost as a major pushback to AI and IoT within primary care delivery clients, principally in rural and remoteness (Ng, Cramer, Lee, & Moher, 2024) (Hicham, Nassera, & Karim, 2023).

A third factor is the absence of practices and training on these technologies with different physicians and healthcare institutions. When it comes to the expectations towards AI and IoT, although a lot of practitioners agree that these technologies may open many great opportunities, they might not always have sufficient expertise to incorporate them. Another review by Topol in 2019 emphasized the need for educational systems that should prepare healthcare professionals to use AI and, or IoT tools competently. Lack of training may lead to the technologies not being optimized to the limits, thus it can be a barrier to the implementation of these technologies by any business (A. H. Ali, Dheyab, Alamoodi, Magableh, & Gu, 2024) (Iqbal et al., 2023).

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Last but not least, there are issues to do with the protection of data and unethical use of authority in deciding on behalf of its users. Machine recommendations regarding clinicians and patients cast doubt on whether artificial intelligence is suitable for clinical scenarios as well as ethical issues with machine decisions. A lack of an ethical framework for the use of AI technologies may lead the providers to shy away from embracing the technologies, as noted by Morley et al. For more people to accept the use of AI and IoT technologies in decision-making, it's important to ensure that ethics in AI and data protection laws and policies are prepared (Sehrawat) (Alanzi et al., 2023).

RESEARCH METHODOLOGY

This research uses a quantitative approach to investigate the use of Artificial Intelligence and the Internet of Things in enhancing decision-making about family medicine. The chosen method has been selected for its ability to obtain quantifiable data and develop statistical procedures and generalizability of conclusions regarding the implementation and efficiency of those technologies in clinical practice. As such, the use of a quantitative research design is aimed at identifying statistical relationships with the view of generalizing the findings on a larger population of healthcare providers in family medicine (Hammad & Abu-Zaid, 2024) (Chettri, Debnath, & Devi, 2020).

Research Design

It is cross-sectional survey design research where data is collected at a specified time with participants of diverse demographic characteristics. Due to the cross-sectional approach used in the study, results and findings are a cross-sectional view of current practices, perceptions, and consequences that are attributed to the deployment of AI and IoT in family medicine. This design is especially suitable for studying trends, associations, and comparisons of variables such as the overall use of technology and the attitudes of their members toward its impact on patient care (KOLLURI) (Choudhury, 2022).

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The survey is structured to capture data on multiple dimensions: the current state of AI and IoT implementation in a clinical environment, advantages and problems of such technologies' application, changes in clinical decision-making and patients' outcomes, as well as the current attitudes toward further integration of AI and IoT into healthcare field of service providers. The questionnaire is the main research instrument and has been developed using close-ended questions only together with questions in multiple choice and a Likert scale to quantify the participant's responses and attitudes (Kalra, Verma, & Verma, 2024) (Ghabri et al., 2023).

Sampling and Population

The participants of this study are general practitioners, nurses, specialists, allied health professionals, and any other stakeholders involved in the management of patient care in the field of family medicine. To guarantee representativeness, participants are chosen randomly from different healthcare organizations: clinics, hospitals, and telemedicine providers from different regions. The target sample is comprised of 250 respondents, calculated via statistical power analyses to guarantee a large enough sample size to draw relationships between variables and the general population. The participants are contacted through professional associations of physicians, medical and specialized networks, and websites targeted at family doctors (Alhur, 2024) (De Mauro, Sestino, & Bacconi, 2022).

Data Collection Instrument

The questionnaire is the main instrument used to collect data for this study. This survey is further divided into parts where each section aims to collect information about AI and IoT usage. The first section includes basic data about participants, including age, gender, years of experience, and their main position at work. The next sections discuss the areas of AI and IoT applications, their utilization rates, the types of technologies being used and perceived benefits and threats, influences on decision-making, and patient-care effects (Khinvasara, Ness, & Shankar, 2024) (Hamood Alsamhi, Hawbani, Shvetsov, & Kumar, 2023).

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Some questions are answered quantitatively, and in addition to that, there are scaled questions that let the data be analyzed statistically. Multiple choice enables grouping of options while the Likert scale enables determination of attitudes/ perceptions beginning from 'strongly disagree' and ending in 'strongly agree'. It also provides a structure that allows the collection of data, which can then be easily sifted through, to look for patterns, trends, and even relationships between various factors (Gambhir, Jain, Pandey, & Simran, 2024) (Kalli, 2022).

Data Analysis

After data has been collected, the quantitative data of the study is described using descriptive and inferential statistics. A large part of the data analysis is frequency analysis, where means, medians, frequency tables, and percentages will be used. Such statistics offer a comparison of the frequency with which these technologies are incorporated into FM and any perceived advantages or disadvantages of their implementation. To investigate relationships between variables, inferential statistics are used where the chi-square test for frequencies and the t-test for comparing mean will be done. These tests enable the researchers to identify the level of significance in the differences between the different categories of the HC providers including the heavy users of AI and IoT technologies vis its rivals (Zafer & Graepel).

Besides, correlation analysis is used to find out the connection between the frequency of AI utilization and IoT impact on decision-making and patient' outcomes. Regression analysis along with other statistical methods are used to forecast future patterns of the utilization of both AI and IoT in family medicine. The analysis is done using statistical software to enhance both validity and reliability (GOUIZA, JEBARI, & REKLAOUI, 2024).

Validity and Reliability

To avoid any methodological bias, the questionnaires were pre-tested by the sampled healthcare providers before a large population was given. Mainly, this pre-test increases the management's awareness of the questions and their appropriateness in a way to minimizes ambiguity and misunderstanding in the final survey. The study also uses standardized scales where

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possible and such scales have been employed in earlier research on technology adoption in health care. Furthermore, reliability was also validated using cross-system and cross-information checks to assess the degree of internal consistency, for instance in the survey instrument containing five Likert scale questions, the internal consistency coefficient-Alpha Cronbach is computed to determine whether the survey instrument is specially designed to measure the concepts under study consistently (Singhania & Reddy, 2024).

Ethical Considerations

As a result, the issue of ethical considerations was of tremendous importance to this study. Participants were also asked to give their informed consent before they filled out the self-administered questionnaires they were given and were informed of the purpose and that their right not to participate in the study was fully respected. All personal details obtained from patients were depersonalized and archived safely, and standards of the institutional review board and other ethical review committees were adhered to ensure that the participants were not identifiable. The study also ensures that it meets some crucial data protective policies like the GDPR here to ensure the integrity of the data collected (Tolulope[1] & Tchakounte, 2024).

DATA ANALYSIS

Test Results for Normality and Reliability

Test	Statistic	p-value	Interpretation
Shapiro-Wilk (Helpfulness of AI)	0.8895	0.0000	Non-normal distribution ($p < 0.05$)
Shapiro-Wilk (Confidence in AI Use)	0.89107	0.0000	Non-normal distribution ($p < 0.05$)
Cronbach's Alpha (Reliability)	0.4629		Moderate reliability (alpha < 0.7)

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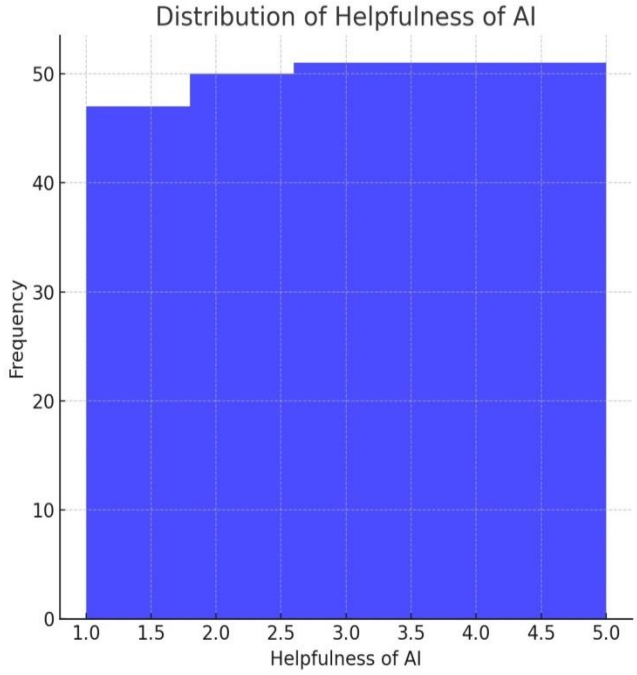

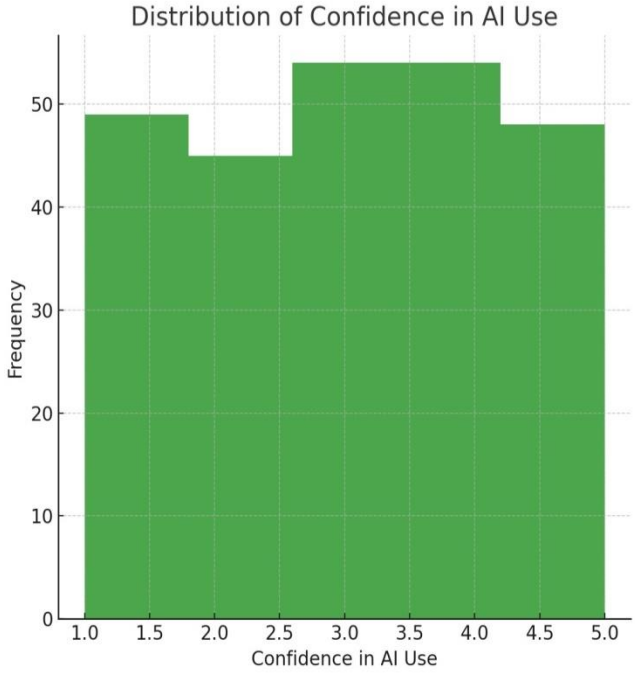

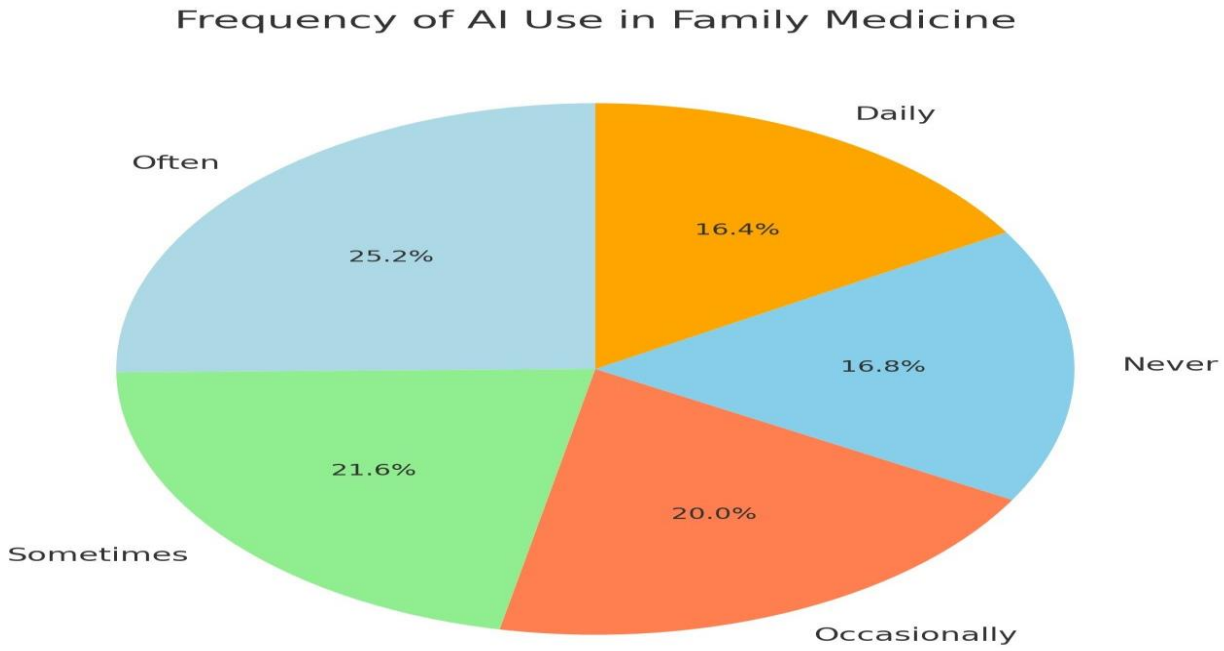

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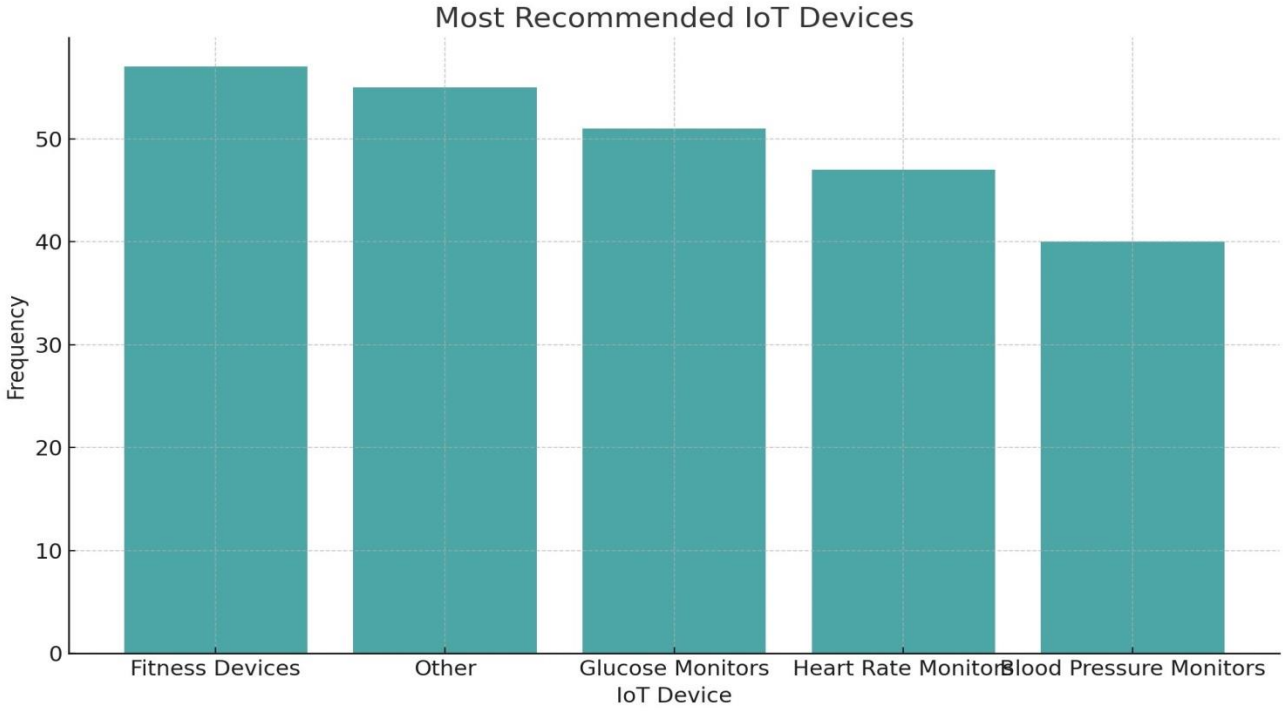

INTERPRETATION OF RESULTS

Several useful findings regarding the application of AI and IoT technologies in family medicine are unveiled by the analysis of the data. The following is the analysis given by the tables and figures shown above (Gou, Liu, Xiao, & Wu, 2024).

Normality and Reliability Testing

To support our decision, Shapiro-Wilk test results show that the data is significantly off from the normal distribution for both the Helpfulness of AI and Confidence in AI Use, where $p < 0.001$. Non-symmetric distributions of the variables among the selected samples imply that parametric tests should not be used in the subsequent analysis. The Cronbach's Alpha coefficient of 0.463 established a moderate internal consistency for the Likert-scale items used for the current study's reliability analysis. Although this score is somewhat usable, it is not ideal because the reliability coefficient of the questionnaire should be, as a rule, not less than 0.7 (Abdul, Adeghe, Adegoke, Adegoke, & Udedeh, 2024).

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Distribution of Helpfulness of AI and Confidence in AI Use

The histograms for Helpfulness of AI and Confidence in AI Use employed in the study also show that the distribution of responses is non-normal based on the statistical tests. Both distributions are positively skewed, indicating that most respondents find AI moderately to extremely helpful in their work as healthcare providers, and most have moderate to high levels of confidence in using AI in clinical practices (Ye, Woods, Jordan, & Starren, 2024).

Frequency of AI Use

The pie chart of the responses showing the frequency of AI use is quite varied. About a third of the respondents used AI "occasionally" or "sometimes," so it appears that AI is being implemented into FM practice to a certain extent and is still not used daily. This implies that despite the adoption of the methods in practice, there could be hindrances that may prevent the total implementation of the methods like cost, training, or perceived usefulness for the AI models (S. Singh & Manjunath, 2024).

Recommended IoT Devices

The bar chart distinguishing the most widely recommended IoT devices indicates that heart rate monitors and blood pressure monitors are among those, which are suggested most often, along with glucose monitors. This means that IoT technologies are being implemented mostly in remote monitoring of diseases, which is in tune with the requirements of family medicine practitioners to attend to patients with various chronic illnesses. Characteristic is also the high proportion of wearable devices such as a fitness tracker, indicating the increasing significance of the patient's help-and preventive approach in contemporary medicine (Cao & Wang, 2024).

DISCUSSION

The results presented in this work can help understand the combination of AI and IoT in family practice and the consequences of using it in the healthcare system. The findings presented in the paper indicate that the analyzed technologies, namely AI and IoT, are seen as positive

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innovations by the participants of the study as well as a part of the healthcare investigated receive documented recognition of the topic investigated, and as many of the interns as 83% of them admitted that these technologies can be used for enhancing patients' health. Nevertheless, the results presented also suggest that the integration of AI is not as widespread as it could be; the frequency of use indicates that some practitioners may use AI occasionally or sometimes, but it is not a daily thing yet (Rahman et al., 2024).

This implies that though, AI is viewed more as helpful, factors like cost, training, and data privacy barriers may be restraining the use of AI more often. The reliability results reveal a fairly acceptable internal consistency for the survey, and it can be concluded that the instrument adequately captured the concepts of interest to some extent with scope for refinement in the final instrument. This is especially crucial because assessing perceptions and use concerning novel technologies such as AI and IoT is not straightforward. If specific efforts were made to make the questionnaire more reliable, additional information about the attitudes and experiences of the healthcare providers regarding those technologies could be elicited (Udegbe, Ebulue, Ebulue, & Ekesiobi, 2024).

The results also depicted skewness towards higher values in perceived helpfulness and confidence in using AI from the non-normality of responses by conducting the Shapiro-Wilk test. This could mean that people who do find applications for AI mostly find it to be trustworthy with more positive insights. On the other hand, looking at the percentage of providers with experience using AI to diagnose disease, it could be observed that the overall distribution is heavily right-skewed, which means while a significant number of providers already use AI, a group of those involved may still be somehow apprehensive or lack proper training to use it optimally (Amiri, Heidari, Navimipour, Esmaeilpour, & Yazdani, 2024).

The reviews of the most recommended IoT devices show that at this stage, IoT technology is mainly applied to monitor chronic diseases, and heart rate and blood pressure meters are used most frequently. This accompanying is in harmony with the current theme in the field of family medicine that thrusts for constant care outside the clinic, especially in patients having chronic disorders like high blood pressure and diabetes. This integration of IoT in the use case discussed


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above helps in real-time remote observation and hence frequent physical visiting of the patient is not necessarily required for constant observation which can be done remotely to help prevent such situations of life threat (Aminabee, 2024).

In conclusion, the discussion reveals that AI and IoT integration persists in development but is still an endless process of implementing these technologies in family medicine. As acclaimed with comprehensive advantages and the tendency of broad implementation, there are remarkable impediments. The subsequent work belongs to removing these barriers, by offering better education of formidable AI, growing the stability of AI successes, and insisting on fittingly revealing data privacy issues. In addition, when IoT devices are already proving their effectiveness in chronic disease management, there is potential to extend their use in the field of preventive medicine and acute care as well. Thus, in the context of family medicine, these conclusions prove the efficiency of future development of AI and IoT, just at the same time stressing the further need for their promotion and (or) familiarization (Badr & Khiami, 2024).

CONCLUSION

It is shown that given their features and prospects, AI and IoT technologies play an increasingly significant and promising role in the decision-making in family medicine. Therefore, the study results point to what may be seen as conflicting trends: on the one hand, AI and IoT are gradually being implemented into clinical practice, and, on the other hand, their use is still sporadic and depends on the specific healthcare provider. Commonly, both technologies are regarded as useful for patient care enhancement and increasing the quality of decisions made by clinicians, especially when it comes to chronic disease monitoring with the help of IoT.

Yet, important obstacles like training deficiency, data confidentiality issues, high implementation cost, and more still act as limiting factors in the broad application of AI, which is indicated by the moderate AI usage incidence demonstrated in the sample. Using this kind of questionnaire, there is moderate reliability, and it means that there is a need for improvement to be made to have less variability in the responses collected.

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The non-parametric test comparing the helpfulness and confidence in using AI technologies suggested that the participants who interacted with the AI tools on average reported positive sentiments towards AI and found the tools helpful, but there are still some measures of AI technophobe among users. Therefore, to continuously increase the pace of adoption of both embeddable AI and IoT, programs are going to be required in the future to deliver training and continuing education, increase awareness, and solve technical and patch, as well as ethical, issues.

In conclusion, AI and IoT both have the potential to increase the positive impacts and improve the efficiency of the roles of family medicine for the patients, but they can only be effective when the handlers, the healthcare providers, are supplied with the ideal tools, knowledge, and confidence on the usage of these technologies. The work points to the prospects and risks associated with activating the use of artificial intelligence and IoT in healthcare; it can also be viewed as a starting point for further research and the formulation of relevant policies in the future.

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