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RESEARCH PAPER

Reviewing Effect of GAI (Generative Artificial Intelligence) on Patient-Centered Medicine

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***Abstract*—The growing presence of Generative Artificial Intelligence (GenAI) in contemporary healthcare is changing the paradigm of patient-centered medicine by facilitating hyper-personalized, accessible, and high-efficiency care. GenAI has the potential to create human-like content and create synthetic data, and clinicians and patients' equal recipients of the power of intelligent virtual assistants, automated documentation, and personalized communication. This review is the discussion of the technological development of GenAI tools, their uses in the delivery of personalized care, and how they transform clinical workflows. The three of the most significant areas of influence are improved patient-provider interaction, more efficient medical note-taking with the help of AI scribes, and constant patient contact with virtual health assistants. Although the possible advantages are high, issues of data privacy, chart bias, and medical responsibility are severe issues of concern. The paper also elaborates on ethical, legal, and social considerations of GenAI in the field of healthcare noting the requirements of trust, transparency, and fairness. An extensive literature review introduces an active research movement and defines the spheres of its betterment. The results underline the facts that responsible GenAI and its application can largely promote patients-centered medicine in case it is properly regulated by sound ethics and empirical confirmations. The future studies should concentrate on risk reduction and on the increased value of clinicality.**

Keywords*—Generative Artificial Intelligence (GenAI), Patient-Centered Care, Healthcare Personalization, AI-Driven Decision-Making, Clinical Documentation Automation, Digital Health Ethics, Intelligent Virtual Assistants.

I. INTRODUCTION

Over the past few years, the healthcare sector experienced a paradigm shift into a personal patient care service. Patient-Cantered Medicine (PCM) has patients in the core of healthcare as it considers patients inclinations, values, and personal needs [1]. It focuses on open communication, shared decision making and treatment plans based on patient lifestyle and circumstances. The technique acknowledges that patients are not recipients of care but they are active stakeholders in their health treatment. In the modern world, PCM has assumed greater significance with health systems experiencing the impacts of increasingly aging populations, competing chronic appendages, and demands of higher rates of personalized and effective healthcare [2]. Practicing PCM is important because it maximizes treatment outcomes, patient satisfaction and assisting in promoting the quality of life [3].

Artificial intelligence (AI) increasingly became a new reality of the contemporary healthcare [4] changing the way of analysis of medical data and the way clinical work is conducted. The conventional AI instruments have aided in diagnostics, forecasting, and automatic zing redundant administrative processes with a tendency to see patterns in large databases. A significant advancement in this field is Generative AI (GenAI) [5]. Unlike conventional AI, which analyses existing data, GenAI models, such as large language models, create entirely new content, including text, images, or synthetic data. Well-known examples include ChatGPT, Bing Chat, Bard, LLaMA [6], Stable Diffusion, Midjourney, and DALL·E. In healthcare, GenAI can assist patients by providing real-time answers, explaining medical information in simple terms, and guiding them through care options.

GenAI's capabilities hold great promise for advancing patient-centred care [7]. It enables patient-friendly communication through chatbots and virtual assistants, generates personalized health information, and creates synthetic data to support research without risking patient privacy [8]. Early uses include AI tools for mental health therapy. AI-assisted treatment planning, and smart diagnostic support for complex conditions. However, despite its potential to improve patient engagement and ease administrative burdens, GenAI also brings concerns about misinformation, biases in generated content, data security, and trust in AI-driven decisions. To fully benefit from GenAI in healthcare, continuous monitoring, responsible development, and strong ethical frameworks are essential for safe, effective, and trustworthy integration.

A. Structure of the Paper

This paper is structured in the following way: Section II gives an overview of Generative AI in healthcare. Section III explores its applications in personalized care. Section IV examines the ethical, legal, and social implications. Section V reviews relevant literature on the topic. Section VI The paper concludes with a summary of findings and suggestions for future research directions.

II. OVERVIEW OF GENERATIVE AI IN HEALTHCARE

Generative AI is revolutionizing the healthcare business by producing new medical data, aiding in drug discovery, personalized treatments, medical imaging, and clinical decision-making. It has the potential to enhance efficiency, innovation, and patient care overall.

A. Evolution of Generative AI Technologies

An advanced subfield of AI, generative AI has lately attracted a lot of interest and funding from corporations. Although generative AI has only recently come to the public's attention, the ideas behind it have been around for a long time.

The first language model, ELIZA, was developed in 1966 at MIT. It was an early NLP program that could simulate human speech [9]. Large language models (LLMs) and other forms of modern generative AI can create convincing representations of many different kinds of data, including sophisticated biomedical data, pictures, and text. Big language models, so called because they feature billions of parameters that may be changed, have been under constant development and improvement since at least 2018. Synthetic physiologic data, including medical pictures and biological sequences, is being generated by scaling up the models, which hold great promise for use in both research and clinical practice. Public and academic interest in OpenAI ChatGPT skyrocketed after its introduction at the tail end of 2022 [10] can be considered a major milestone in the development of generative AI. This occasion emphasized the potential, as well as issues, related to the domain of LLMs across various spheres, such as healthcare, since it displayed the capacity of LLMs to produce human-like text and support complicated processes.

B. *Key GenAI Tools Relevant to Medicine*

OpenAI has been the leader in effectiveness and has seen the advent of the large language models (LLMs), such as their GPT series. Such models have greatly augmented the power of natural language processing (NLP) systems, allowing more and more complex language comprehension and generation. Figure 1 shows some of the current examples of generative AI (GAI) models and emphasizes that these technologies can generate text, audio, video, images, 3D, and computer code. The ability of GAI models to create complex, human-like output means that they are equally useful in all sorts of applications including games and entertainment, designing products and finally the field of healthcare that is increasingly adopting GAI models. The most significant multinational corporations, such as Google and Microsoft, as well as a variety of start-ups spent the last decade on the elaboration and improvement of these technologies. A remarkable success is DALL·E, which is another generative AI model developed by OpenAI and accepted images with text. At the medical-related sector, the implication is hopeful. As an example, training medical imaging datasets with textual descriptions in DALL·E and other image generators would allow the creation of a realistic synthetic medical image. Radiologists, clinicians and researchers can use such synthetic data to supplement limited data to aid training and algorithm development and increase privacy of data. It is necessary to mention that generative AI is a fast-developing sector, and the experiments and research in this field are constantly underway to increase its background and investigate its possibilities in the sphere of medicine and healthcare.

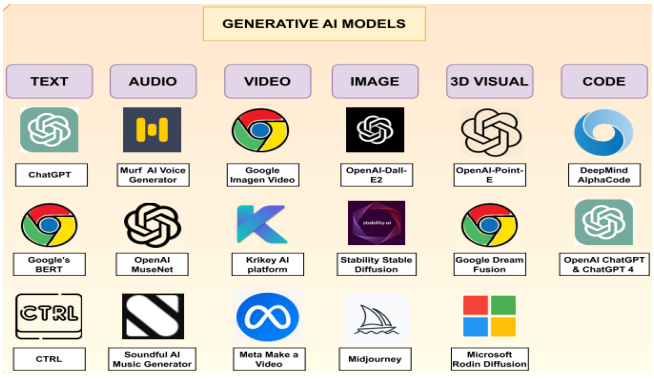

Fig. 1. Generative AI models [11]

C. *Distinction Between Generative AI and Traditional AI in Clinical Contexts*

In healthcare, conventional AI is mostly attributed to analyzing available data in order to assist in the decision-making process, e.g. diagnosis of illness, prognoses of patients, and facilitating repetitive administrative procedures. Such systems are built on structured data and predefined rules which are used to make a prediction or classification. By contrast, generative AI once makes predictions and classifications, creating contents that never existed earlier. Application to clinical use cases may involve creating synthetic medical images to supplement training sets, automating the writing of clinical notes, novel drug design, or individualized treatment regimen design through simulation of a range of scenarios. Although conventional AI is adept in detection and pattern recognition, generative AI contributes by enhancing human creative and subject-matter knowledge, through new solutions to a problem and strengthening medical research and practice. Consequently, the major difference between them is their purpose: traditional AI analyses and predicts, and generative AI generates and innovates, broadening the horizons of precision medicine, medical training, and workflows in the clinics.

III. Applications of Generative AI in Personalized Care

The generative Artificial intelligence (GenAI) is disrupting patient-centered medicine by empowering hyper-personalized care with sophisticated artificial intelligence personality and data processing. Its implementation in the medical system helps to provide individual patient dialogue, simplify clinical records, and drive smart virtual care companions. The apps enable not only better patient interaction and comprehension but also take a load off clinicians, decreasing administrative work, and access to care. By leveraging technologies such as NLP, LLMs, and AI-driven analytics, GenAI fosters continuous, proactive, and context-aware support for patients. This section explores the transformative applications of GenAI that are reshaping personalized care delivery and redefining the provider-patient relationship in modern healthcare systems.

A. *Advancing Tailored Patient Communication*

Health outcomes can be positively affected by healthcare provider-patient (henceforth "provider-patient") contact. Improved health outcomes may result from physicians' communication techniques including active listening, providing patients with clear explanations, and including patients in decision-making about their care [12]. Tailoring is a method for making personalized messages in this sense. Promoting health behaviour change through tailored health communication has been shown to be an effective and cost-efficient technique. It is a method based on assessments that finds the best information or methods to address the unique needs of each individual by using data from or about that person and linked to a specific health outcome [13].

The healthcare industry is only one of many that has benefited greatly from AI. Many health-related apps have made use of the technology, which aims to intelligently understand, learn, and behave. All aspects of patient communication are covered by AI. The most common uses of artificial intelligence (AI) in patient communication involve chatbots, speech recognition, and virtual assistants. The technology's intended uses include aiding with appointment

scheduling, drug administration, treatment plan management, reminders, patient education, and the transmission of health-related advice [14]. Since the technology would allow for fluid speech communication, it has the ability to enhance communication processes.

B. Streamlining Clinical Documentation and Workflow

Artificial intelligence scribes are a subset of AI that automates the documenting of clinical encounters by using sophisticated technologies such as speech recognition, natural language processing (NLP), and machine learning. There is less need for human intervention in the form of transcription and summary of communication thanks to these solutions, which allow for direct data entry into EHRs. Artificial intelligence (AI) scribes offer a sustainable, scalable, and likely cost-effective alternative to digital and human scribes; they are also capable of being more accurate, faster, and integrated into healthcare workflows. With their familiarity with medical terminology and context, AI scribes have the potential to improve patient health, reduce practitioner exhaustion, and allow for more thorough recordkeeping [15]. Accurate documentation is now possible because to AI scribes, which have emerged in tandem with rapidly developing natural language processing and machine learning technologies.

The health professionals are also burdened with a lot of paper work on top of having to attend to more patients within a shorter time. The result of this trend has been burnout as well as a compromise on the quality of patient care provided. The recent breakthroughs in natural language processing and artificial intelligence (AI) and the creation of such technologies as large language models (LLM) may help to delegate some of this administrative task and release a clinician to perform patient care. Coupled with the fact that documentation is becoming a bigger part of clinician lives, there is a risk of burnout compromising care through the decrease in face time. In modems medicine, there are challenges on striking the balancing paperwork and interaction as administration is expanding at the expense of clinical face time. Although complete documentation makes coordination more convenient, a form/folks priority puts provider satisfaction and quality metrics in danger [16].

C. Deploying Intelligent Virtual Health Assistants

The communication via the voice with devices is nowadays the usual task of many individuals. Intelligent Personal Assistants (IPA), including Amazon Alexa, Microsoft Cortana, Google Assistant, or Apple Siri. These chatbots employ AI capabilities, including natural language processing, machine learning, data analytics, to offer targeted health information to the patients, to predict/detect changes in the health of the patient, and to assist the communication between the patients and the healthcare organizations. These assistants can close the gap between patients and healthcare services by imitating the human-like interactions resulting in continuous and proactive healthcare management [17]. The main benefits of Virtual Health Assistance (VHAs) are:

- Their potential to improve the access to healthcare, in particular those who live in remote or underserved areas and struggle to reach medical institutions, is referred to as VHAs.
- Health monitoring and support by the AI-driven assistants are uninterrupted and do not require physical visits, decreasing the reliance on the presence of a healthcare provider and relieving them of the increased workload.
- VHAs are essential in preventive care since they examine the patient data to detect the presence of diseases early enough together with the relevant medical interventions.
- The availability to offer 24-hour support means that patients get any response as soon as they wanted it and this is specifically useful when dealing with chronic diseases including diabetes, hypertension, and mental health problems [18].

D. Empowering Patients Through GenAI-Driven Engagement

Patient-centered medicine is the key to achieving genuine patient empowerment in the contemporary healthcare environment by way of GenAI-driven patient engagement. Generative AI enables shared decision-making because it offers much more personalized and data-driven recommendations that enable more meaningful and informed exchange between the clinicians, patients, and the caregivers. GenAI systems can devise personalized prescriptions, decode medical services accessible terms, and identify possible outcomes through analyzing large volume of individual health data and associated medical literature thereby allowing patients to make decisions that meet their preferences and values. Besides, GenAI helps to improve health literacy in another significant way, providing custom educational messages that are clear, applicable, and flexible according to the specific situation of a patient. Customized virtual assistants and chatbots can provide simple language explanation of diagnoses, procedures, medication and provide real-time follow ups and reshape the way they explain according to the literacy level or language requirements of the patient. This ever-present ability to comprehend learned information allows the patient to have more control over their health, less anxiety, and confidence if they have to learn to manage complicated conditions.

IV. Navigating Ethical, Legal, and Social Implications

Generative AI plays an important role in its compliance with patient-centered medicine. With an increase in the use of GenAI systems in the health care field, issues concerning the confidentiality of data [21] and bias of algorithms as well as that of clinical responsibility arise. Protection of sensitive patient information, the precept of justice towards varied groups of people, and professional duty are key elements to ensure the provision of trust and ethics in care rendition. These concerns not only safeguard the rights of the patients, but they also make sure that GenAI improves the equitable and human-cantered approach to medicine and does not damage it. This section looks at these critical dimensions that are used to determine the responsible use of GenAI within the healthcare sector.

A. Safeguarding Patient Data and Digital Privacy

Digitization of healthcare has essentially altered the manner in which patient data was managed. There is more to this AI healthcare integration than technological progress; it is an entirely new way of approaching the treatment of patients because the data and AI algorithms of machine learning can now discover meaningful patterns amidst and solutions not previously visible in health data volumes.

However, the integration of AI into healthcare has its challenges. Foremost among these is the need to safeguard patient privacy in an environment where data are both a valuable resource and a potential vulnerability [20]. Digital privacy resembles ensuring the confidentiality and privacy of individuals' while using digital devices, technologies, and online services. Figure. 2 highlights three types of digital privacy. The digital privacy types and issues are interrelated terms that eventually influence confidentiality, integrity, and access control, i.e., CIA, which are the main pillars of digital privacy and are addressed more below [21]:

- Information privacy refers to a person's ability to manage how their digital information, specifically PII, is accessed and utilized.
- Communication privacy refers to the right to secure digital communication, which includes texts, emails, and video calls, and ensures that communications are only exposed to the sender's intended recipient
- Individual privacy in the context of digital privacy refers to the freedom to exist freely on the internet, to choose information exposure, and to avoid unwelcome disruptions.

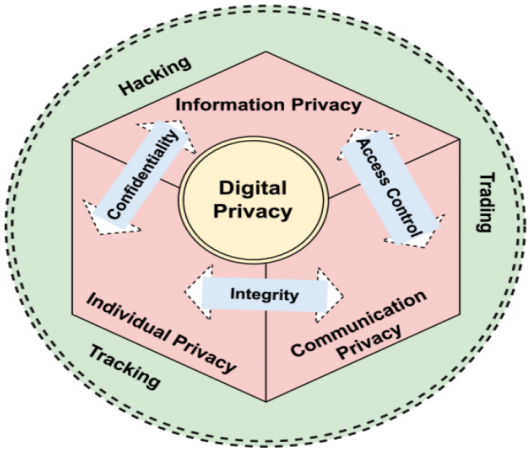

Fig. 2. Digital privacy types and issues [21].

B. *Addressing Bias and Ensuring Fairness in Care Delivery*

Medical bias can be broken down into three groups: data-driven, mechanical, and human. AI programs used in health care that are biassed can have terrible effects by spreading deeply rooted biases in society. For example, this can lead to wrong diagnoses for racial and gender minorities, which are historically under-represented in current datasets, which makes inequality even worse [22]. The flaws in the training data could lead to biassed AI models that lower the quality of healthcare for different groups of people.

Harmonizing diversity and representativeness of training and development datasets used in the development and training of an AI is one of the great ways of reducing biases in AI. Healthcare fairness is a complex term characterizing fair allocation of resources, opportunities, and outcomes of different patient groups. Fairness is founded on the principles of justice, beneficence, and non-maleficence which are the main principles of ethics [23]. All medical arrangements should allow and avail quality care to every person regardless of any discriminatory practices. In such radiology applications, fairness in AI implies coming up with and implementing unbiased AI models that make accurate diagnoses and offer the right treatment to all patients without any regard to their social positions or ethnicity [24]. This fairness can be achieved by having an in-depth knowledge of the possibilities of bias in AI and coming up with a strategy to correct the biases. To address the following points, need to be considered:

- Data privacy and security [25]
- Liability and accountability
- Transparency and explain ability

C. *Defining Responsibility and Clinical Accountability*

A significant, albeit implied, value in medicine is accountability. But it's not often that consider the difference between being held accountable and the virtue that accompanies it. Although accountability in medical relationships is important, contend that the virtue of accountability—a particular character disposition—must be present before accountable relationships can emerge and thrive in the healthcare industry [26].

The HCPC, NMC, and GMC all have standards of conduct that demand accountability from practitioners. The ability to adequately explain all elements of a patient's care is a requirement of the NMC, and the GMC and HCPC standards of conduct state that clinicians must be able to defend their own decisions. The onus for assessing the usefulness of AIS results is on the user. Whitby's maintains that physicians should take full responsibility for the results of their AIS use and should not be able to avoid accountability by blaming the AIS when problems occur [27]. The onus is on the human clinician involved in the decision-making process to guarantee that the patient is safe and suitable for the advice given by the AI system, and the onus is also on them to bear the consequences of the patient's use of the AI system's recommendations.

V. Literature of Review

This section reviews recent studies on generative AI in patient-centered medicine, focusing on its use in clinical decision-making, nursing, ethics, and healthcare delivery. The reviewed works are given:

Ozdemir, Ayvaci and Zentner (2025) explores non-experts' perception of LLM responses versus physician responses in patient-physician communication. The study compares responses from physicians and ChatGPT, a Chat Generative Pretrained Transformer, to patient queries. Results show that non-experts prefer ChatGPT responses over physicians, even when machine responses are low quality. The study indicates on the necessity to better design LLMs in order to provide the health-related information to laypeople [28]

Tischendorf et al. (2025) GenAI in nursing and clinical practice emphasizes its ability to improve the processes of care provision, aid decision-making, and alleviate the burden. The systematic literature analysis of 13 studies, conducted 2019-2024, has shown that GenAI has the potential to improve efficiency in such activities as the schedule and care planning, but gaps in decision accuracy and reliability are observed. Although the application of GenAI can help to decrease the workload, additional studies and technical enhancements are required to fill those gaps and enhance the accuracy of decision-making in the field of nursing [29].

Chen and Esmaeilzadeh (2024) presents the discussion of generative AI in health care, along with the threats and

opportunities. Efforts to avoid security and privacy threats are also outlined through which these systems may continue to work publicly with safety and efficiency. The results can be used to build future AI systems and these systems should be used to envisage debate on AI ethics, AI security vulnerabilities as well as AI data privacy regulations. The paper explores the applications and advantages of generative AI on different fields of health care [30].

Xu and Wang (2024) discusses the use of GenAI LLMs in healthcare, or ChatGPT, in digital media terms. It is all about changing the healthcare access and streamlining the medical service processes. The application is likely to transform how conventional services are offered hence disrupting the current traditional services paradigm, however, poses ethical and security issues as it expands. The paper demonstrates possible opportunities and issues in the field of medical technology [31].

Gunawan and Wiputra (2024) systematic review emphasizes some of the ethical issues with regard to the use of generative AI in medicine, including bias, transparency, accountability, and patient autonomy. The analysis underlines that to develop and introduce AI technology, strong ethical guidelines are needed that do not conceal, are not unfair and respect the patient rights. The results indicate that these concerns matter greatly when integrating responsible AI in healthcare, and future studies should be oriented towards mitigating the bias, transparency, responsible decision-making, and the impact of AI on health professionals [32].

Rezgui (2024) research demonstrates how Large Language Models (LLMs) may become revolutionary in healthcare, improving patient care, decision-making, and medical research. It furthermore deals with other issues like accuracy, reliability, and ethical implications. It also underscores the importance of constant monitoring and evaluation to guarantee data secrecy and the wellbeing of the patients. The research helps to learn more about the consequences and future trends of LLMs in healthcare industry [33].

Table I presents the summary of the major studies on role of generative AI in patient centred medicine with an emphasis on areas of focus, methodology, major findings, potential issues and recommendations on making care more personal and ethical.

TABLE I. COMPARATIVE ANALYSIS OF RECENT STUDIES ON THE ROLE AND IMPACT OF GENERATIVE AI IN ADVANCING PATIENT-CENTERED MEDICINE

Reference	Study On	Approach	Key Findings	Challenges	Future Direction
Ozdemir, Ayvaci and Zentner (2025)	Non-experts' perception of LLM (ChatGPT) vs. physician responses in patient-physician	Comparative study of responses from physicians and ChatGPT to patient queries; tested factors like response length and source disclosure	Non-experts preferred ChatGPT responses over physicians', even when LLM quality was low; preference influenced by longer prose, response source disclosure, and length/source variations	Risk of non-experts favoring potentially low-quality or inaccurate LLM responses over expert advice; potential for misinformation	Need to design LLMs that provide accurate, high-quality, and trustworthy health information tailored for laypeople; explore ways to balance response style and factual correctness
Tischendorf et al. (2025)	Use of GenAI in nursing and clinical practice	Systematic review of 13 studies from 2019–2024	GenAI supports task efficiency, decision-making, and reduces workload in nursing	Low accuracy of current systems; concerns on reliability	Improve algorithmic accuracy and reliability; expand use in diverse nursing contexts
Chen & Esmaeilzadeh (2024)	Privacy and security of GenAI in healthcare	Conceptual and empirical analysis of GenAI infrastructure risks	Identified privacy and data security risks; GenAI can enhance care if risks are mitigated	Data leaks, system vulnerabilities, lack of robust governance	Propose security and ethics-by-design for GenAI in clinical environments
Xu & Wang (2024)	Application of GenAI (LLMs) via digital media lens	Exploratory study based on digital news and real-world use cases	GenAI transforms access and delivery of care; improves timeliness and reduces errors	Ethical risks, misinformation, public trust issues	Expand regulatory oversight and public education for safe GenAI deployment
Gunawan & Wiputra (2024)	Ethical concerns in medical GenAI	Systematic review of literature on GenAI ethics	Identifies issues in bias, consent, autonomy, and transparency	Lack of ethical frameworks, AI bias, patient mistrust	Advocate for robust ethical models and training for clinicians using GenAI
Rezgui (2024)	Impact of LLMs on healthcare innovation	Applied research evaluating LLMs' role in clinical use and research	LLMs improve clinical decision-making, care delivery, and medical research	Reliability and ethical limitations in clinical deployment	Ongoing monitoring and regulation needed for LLM safety and reliability

VI. CONCLUSION AND FUTURE WORK

Finally, Generative Artificial Intelligence in patient-centred medicine is a paradigm shift in healthcare for the benefit of patients. GenAI technology is optimizing provider-patient communication, improving clinical workflows, and providing personalized health education to patients by engaging AI. Smart virtual assistants, automated documentation, and synthetically created data are linking to a decrease in the workload of clinicians, enhanced patient experience, and better access to healthcare. These innovations drive the principles of patient-centred care: the concepts of respect, autonomy, and informed choice, and at the same time, contribute to the objectives of the digital health transformation in general. Nonetheless, there are major challenges. Issues like privacy of data, bias of algorithms, and liability of a clinician should be pre-emptively resolved to promote ethical, equitable, and open systems of AI. Poor standardization and ethical regulations are a threat to trust wherein the use of technologies is concerned.

In future endeavours, to achieve GenAI in medical practice, transdisciplinary efforts need to be made in order to establish an ethical framework, create clinical validation procedures, and adopt mitigation methods to eliminate biases. Additional empirical studies are needed to determine whether there are long-term results, trust, and effectiveness in the real world. A possible breakthrough in secure and personalized care delivery is also associated with the exploration of the GenAI intersection with such emerging technologies as federated learning, blockchain, and edge computing. The next epoch of smart healthcare will be characterized by sustained innovation, which will be powered by ethics and evidence.

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