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REVIEW ARTICLE

Ethical Concerns Surrounding AI Use in E-Medicine

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ABSTRACT

The integration of artificial intelligence (AI) into healthcare systems has significantly advanced the field of e-medicine, but it has also raised critical ethical concerns. These concerns primarily focus on the quality of digital health data and the impact of unregulated AI applications, attracting global attention. The early stages of this digital evolution highlight the importance of addressing ethical challenges and implementing recommendations for the responsible use of AI in e-medicine. Unregulated AI poses risks related to security, data privacy, and cross-border compliance. Mitigating these issues through strategic interventions can improve both the local and global healthcare systems. Ethically regulated AI in e-medicine offers the potential to overcome existing limitations in healthcare and establish a robust, inclusive model for the future. Ethics and regulations often go hand in hand because they both aim to guide behavior and decision-making in ways that promote fairness, accountability, and the wellbeing of individuals and society. With appropriate validation processes and transparent data-sharing practices, AI use in e-medicine can deliver substantial benefits to healthcare organizations, providers, and patients worldwide. The manuscript is a narrative review of ethical concerns surrounding e-medicine as of late 2025 in the published literature.

Keywords: Artificial intelligence, Ethics and regulations, Global healthcare systems, E-medicine.

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INTRODUCTION

Understanding E-Medicine

E-medicine can be defined as the use of electronic or digital means to generate, process, utilize, and transfer any medically relevant data for diagnosis, treatment, and prevention of diseases and accidents; research and evaluation; palliative care; and for the continuous training of healthcare professionals, all in the interest of promoting the health and wellness of individuals and their communities [1]. E-medicine is one of the most effective processes for enhancing access to health care, especially in hard-to-reach areas.

"At a basic level, e-medicine may include teleconsultation, whereby health workers can offer consultancy services to peers and/or patients, or even a digital healthcare device. Simple applications of e-medicine may manifest in electronic medical record keeping, point-of-care medical devices, and real-time medical information sharing. At advanced levels, e-medicine may involve conducting clinical practices, including robotic telesurgeries using electronic or digital platforms; predictive analysis (for a diagnostic and therapeutic approach) using big data and machine learning." [2] These ever-evolving platforms of telemedicine, digital interfaces, data processing, predictive diagnostics, electronic medical systems, tele-surgical advancements, robotics, and other digital medical image systems, along with adjuvant Artificial Intelligence (AI), comprise the dynamic domain of e-medicine. "E-Medicine Device" is the term we can use to label any standardized healthcare device generating digital data to distinguish from analog medical devices like mercury thermometers, sphygmomanometers, analogue prosthetics, etc. The diagnostic and therapeutic advancements have led to the conversion of analog data to electronic and digital data, and consequently, the sharing of information has significantly boosted the domain of e-medicine.

Role of AI in E-Medicine

The data generated from E-Medicine Devices is generally termed E-Health Data or Digital Health Data (EHD/DHD). The researchers and regulators are aware of the quality concerns of the DHD. [3] The well-timed evolution of Artificial Intelligence (AI) and AI being implemented on the DHD has been of definite concern for many clinicians. The end goal and purpose of e-medicine is to improve the quality of health for everyone; hence, AI and its intervention on DHD are of

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definite interest. Appropriate utilization of AI can definitely support improving the quality of DHD.

The application of artificial intelligence (AI) in the medical field represents an emerging reality for professional operators increasingly frequent in hospitals. [4]

Artificial Intelligence (AI) in e-medicine has brought transformative advancements, such as easing clinicians' workload and improving diagnostic accuracy. There are multiple stakeholders who utilize the services of AI in healthcare. The manufacturers of AI-embedded medical devices, sellers of these devices, hospitals, physicians, biomedical engineers, maintenance support, different levels of patient caretakers, patients, health insurance companies, and wellness enthusiasts are some stakeholders who need to provide feedback on the performance data of the AI. The role of AI and the extent to which AI can support healthcare efficiently depend on the quality and feedback data provided by all the stakeholders.

Role of AI in Healthcare with Digital Health Data

In the vast domain of healthcare, the application of AI can happen on any digital data. In the field of surgery, AI applications hold promise as tools to predict surgical outcomes and perioperative surgical management. [5] AI systems assist the physicians in the comprehensive detection and localization of abnormalities. Anderson et al. (2024) [6] AI, with its deep learning (DL) algorithms, processes many different tasks that directly apply to image reconstruction, synthetic image creation, tissue segmentation, and detection and characterization of musculoskeletal diseases and conditions on radiographs, ultrasonography, CT, and MR images. [7]

Use of AI in the wellness industry and for general mental health and social wellness is gaining popularity and will be considered during this discussion. The practical utility of AI applications in workplaces can enhance employee mental health and overall wellbeing. The findings suggest that AI has the potential to revolutionize the management of workplace wellbeing, providing actionable insights for both researchers and practitioners.[8]

With these observations, we would have to review the application of artificial intelligence (AI) in the medical, wellness, and healthcare fields, representing an emerging "Era of E-Medicine and E-Health." The use of AI assists the healthcare profiles in the executive, diagnostic, therapeutic, preventive, and palliative phases of care, which is encountered in hospitals, homes, and amongst individuals, and it must be acknowledged that this trend shall continue to grow. The evolved digital health data (DHD) leverages the emergence of newer e-medicine devices with AI applications. Artificial Intelligence (AI) is a branch of computer science that focuses on creating systems capable of performing tasks that typically require human intelligence. The tasks AI performs include learning, reasoning, problem-solving, perception, language understanding, and decision-making.

The lack of appropriate regulatory processes for the quality of DHD from general wellness devices is of concern, especially for home healthcare gadgets that are often not licensed as medical devices by the appropriate regulatory authority. Currently, the regulatory frameworks are inadequate towards medical devices in many countries; healthcare in some parts of the world is still developing, and regulations towards healthcare practices are not compatible across geopolitical boundaries.

The introduction of e-medicine with AI in the interconnected world paves the way towards both ethical and legal dilemmas. AI-related errors and patient health damage have received growing attention due to increased utilization and unfinished product design. AI utilization in diagnostic modalities has raised questions about the risks of using unrepresentative populations during development. The utilization of therapeutic AI has raised concerns about the incompleteness of information given to the patient. The suggestive AI algorithms have initiated a revolution in the doctor-patient relationship and have resulted not only in ethical but also multiple medico-legal consequences. As we dive into ethical concerns, it is important we establish them within the framework of medical ethics.

BACKGROUND

On Ethics and Healthcare

At the heart of ethics is a concern about something or someone other than ourselves and our own desires and self-interest. [9] The fundamental framework of social ethics is vast. Yet, across the history of Medical practice, the following two broad frameworks of ethical discussions are often encountered

- Consequentialism
- Non-Consequentialism or Deontology

Consequentialism is a philosophy that judges the rightness or wrongness of an action based on its consequences. The medical therapy is designed to promote the best interests of the patient throughout the period of the delivery of care. [10] To address the demands of an evolving market, the healthcare industry has evolved from individual caregivers to businesses of healthcare organizations.

Deontology, or non-consequentialism, also known as duty-based ethics, is an ethical theory that judges actions based on rules and intentions rather than the consequences of those actions. People are not to be treated as a means to achieve personal or organizational goals. If healthcare providers use people only to move their agendas (personal, financial, or professional) forward, they are said to have violated ethical principles. Deontology emphasizes the value of every unique human executing a duty-bound role. [11, 12]

The current local and global healthcare trends have sparked numerous arguments between organizations providing healthcare, along with those who also set the regulatory systems and the receivers of care who are financially incapacitated or have received improper procedures during expected care. The responsibility of patient care is spread across all the sectors of healthcare organizations (HCOs). The HCOs are required to implement best-practice management, technological developments/innovations, and applications of cutting-edge research into integrated E-Medicine devices

and systems to gain the desired outcomes, with well-defined evidence-based practices and solutions that may be replicated by other organizations. [13, 14]

Thus, evolving standards of health care and safety have gradually led and mandated both the local and global regulatory authorities to propagate towards the establishment of robust evidence-based protocols. (Sackett and Rosenberg 1995) [15] Physicians are now expected to adhere to these guidelines to minimize the risk of medico-legal issues. This approach emphasizes gathering comprehensive diagnostic evidence before starting any treatment in any HCOs. Consequently, there is a noticeable shift in global healthcare ethical discussions, moving from one of consequentialist ethics to deontological ethics in the standard medical practice, which seeks consistent, replicable and reliable outcomes.

The timely integration of regulated AI might evolve towards this interface becoming a stabilizing force and a catalyst for enhancing ethical standards in healthcare. (Korkmaz 2024) [16]. E-medicine devices and health technologies enhanced with AI can act as a safeguard and guiding system for reducing human errors in safe medical practices, especially where there is a constraint of human resources for the provision of health and wellness services.

Ethical Assessment of AI Used in Healthcare

Artificial intelligence (AI), along with e-medicine, is rapidly transforming the healthcare landscape. While AI offers numerous potential benefits, such as increased efficiency, improved accuracy, and expanded access to care, it also raises significant ethical concerns that must be addressed. The recognised need for 'ethical AI checklists' co-designed with health practitioners and social stakeholders, which could further operationalise the technical solutions, is being collated. Since the risks to health and wellbeing are large, a proactive approach is necessary for ensuring human values and ethics are appropriately respected by AI and e-medicine devices.[17]

Ethics and intelligence are historically closely intertwined. Artificial intelligence extends these discussions and with the advancements in AI capabilities and applications, it gives rise to new ethical challenges. Thereby, it is essential to conduct thorough validations to steer AI development responsibly. AI systems could be designed to maximize general welfare, but defining and quantifying "welfare" while balancing the interests of inherently biased groups presents a major challenge. Advances in AI and big data processing may enable bias reduction, yet this raises profound ethical and philosophical dilemmas. The integration of vast datasets could lead Gen AI to exhibit forms of advanced autonomy, potentially resembling consciousness. This, in turn, might enable deep-learning-driven interventions that minimize or eliminate human involvement in critical sectors like healthcare. Such developments compel a deeper examination of consciousness, identity, what it means to be human, and the ethical status of non-human entities. AI is not merely a technological tool—it is a transformative force reshaping ethical and moral frameworks, challenging our understanding of human nature and the principles that guide our moral decisions.[18]

Methodology

The manuscript is a narrative review collected across published literature, scoping for ethical concerns surrounding AI across healthcare with the utilization of e-medicine, covering privacy, bias, transparency, accountability, equity, and more. It synthesizes existing literature, regulations, and case studies without presenting original empirical data. Grey literature published on the ethical impact on healthcare has also been incorporated. The results and subsequent discussions are elaborated below. The synthesis of the frame is based on the decreasing order of scoped publications, which are cited. The references are selected from high-impact journals with contextual relevance.

RESULTS AND DISCUSSION ON THEME

Ethical concerns surrounding AI use in E-medicine

Privacy, Confidentiality and Security

E-medicine relies heavily on the collection, processing, and transmission of sensitive patient data. Protecting patient confidentiality while using this data for AI training is a significant challenge. The risks of data breaches, unauthorized access, or mishandling of personal health information (PHI) raise privacy concerns. The use of smartphones and other smart devices without healthcare-grade security compliance has also become a key source of privacy breaches.

The price of a complete record file of a single patient can be hundreds of dollars on the dark web. In comparison to other data industries, the healthcare industry is among the worst affected.[19]. More importantly, such data leaks and AI breaches can pose a threat to human life, dignity, and social interactions.

Researchers are expected to adhere to defined ethical guidelines regarding the participant data being handled during any clinical studies. However, the AI introduced into sales, marketing, and business models has the sole purpose of enhancing projections and profits. This diversity between research and commercial interests in AI utilization raises concerns for participant data privacy and security. The Office for Civil Rights, USA, has consistently recorded an increase in data breaches and hacking activities. 2023 alone had new reports of 133 million health care records exposed, stolen, or impermissibly disclosed.[20] The consolidated data for most countries are not often disclosed.

"This means a person's health information is now increasingly available to various third parties outside the doctor-patient relationship, with the possibility of privacy harm, including loss of reputation or humiliation, discriminatory treatment, blackmail or extortion, mental injury, denial or withdrawal of services, and restrictions on speech for fear of being observed or surveilled." [21] The breach of confidentiality and breach of trust by the healthcare organization cannot always be compensated; even if at all such deviations are penalized by the court, the financial returns to every patient might never happen. There might be numerous unreported

breaches of patient data, and numerous organizations might not be aware of leaks.[22, 23] Many countries are yet to catch up with legalities to protect digital data, whether stored on local or cloud servers.

A careful examination and contrast of the information technology (IT) laws for countries would enable an assessment of the gaps in the current judiciary and structure proposals to improve the situation. [24]. Both consequentialist and deontological ethical justifications exist for providing patient privacy. This is essential, given the fiduciary nature of the doctor-patient relationship and the mutual expectations of trust. Privacy in healthcare has many facets, including informational privacy, physical privacy, associational privacy, proprietary privacy, and decisional privacy. [25] In order to provide a high-quality standard of care, HCOs need to explore layers of privacy to protect themselves during the utilization of AI in e-medicine devices, further increasing the cost involved in the business of healthcare. [26]

The digital data regulations of the country have a direct impact on AI and DHD. As per the Digital Personal Data Protection Bill, GoI, 2023, the regulations in India do not grant the right to data portability and the right to be forgotten to the data principal. The regulation might allow the transfer of personal data outside the country, except to countries notified by the central government. This process may not ensure adequate evaluation of data protection standards in the countries where the transfer of personal data is allowed.[27] This would necessitate HCOs to monitor healthcare, clinical research activities, and data generated thereon to protect sensitive healthcare data entirely within the boundaries.

The Health Insurance Portability and Accountability Act (HIPAA), USA, has two key sections: the Security Rule and Privacy Rule. These rules give health information providers and processors flexibility in how they protect user data. Compliance with the law and its many provisions is essential to avoid penalties and possible fines [28] with relation to any DHD.

The Personal Information Protection Law (PIPL) of the People's Republic of China is not only applicable to organizations and individuals who process personally identifiable information (PII) in China but also to those who process data of Chinese citizens outside of China. [29]

The General Data Protection Regulation (GDPR) established stringent data protection and privacy requirements within the European Union (EU), with global implications effective from 2018. Non-compliance can result in penalties. Organizations outside the EU must comply if they process data of EU citizens, making GDPR adherence essential for maintaining partnerships with EU entities. GDPR enforces digital privacy as a fundamental right, monitored by independent data protection authorities in each EU and EEA member state. [30, 31]

Numerous African countries are yet to implement or embrace the shift towards digitalization legislatures, which improve trade relationships, healthcare, globalization, and the perceived quality of life index (QLI). As of early 2025, 137 of 194 African countries have digital data and privacy legislatures initiated. [32]

With the above legal disparities, there is an increased risk for privacy, confidentiality, and security for the DHD. AI and its utilization shall exponentially increase, and the risks too if not appropriately regulated. Impact analysis of AI along with the DHD generation, storage, protection, and sharing must be further explored by HCOs and government organizations to reduce ethical issues.

Bias, Discrimination, and Fairness

Data Bias

AI algorithms can inherit biases present in their training data, leading to potentially unfair or inaccurate outcomes. For example, AI models trained primarily on data from one demographic might underperform for others, leading to misdiagnosis or inappropriate treatments. Biased AI tools may perpetuate or exacerbate existing health disparities.

AI systems can also suffer from bias, compounding existing inequities in geographic regions. The nationality, race, socioeconomic status, ethnicity, gender, religion, disability, vocation, sexual orientation, and pronoun wars can also create bias. Thus, strategies for detecting and mitigating bias are pivotal for creating AI technology that is generalizable and fair. [33] The low sensitivity in AI can label disease as healthy, potentially delaying access to care. [34]

The Office of Minority Health (OMH), USA, has modeled systems to reduce health disparities among minority populations, American Indian, and Alaska Native communities by promoting equity in AI and healthcare algorithms. [35] Models similar to OMH can be debated, improvised, and implemented at every level of governance. The sharing of healthcare data amongst governance systems becomes easier, and this permits improvisations of e-medicine and AI-supported technologies. The urgent need for standards has resulted in numerous governing bodies arriving at standards that may need to be eventually improved.

A pattern of "problem-solution-problem" emerges, with regulatory bodies often altering the standards that disrupt the continuous delivery of healthcare, which is a serious ethical concern.

AI Misinformation capability

AI technologies can generate 'deepfakes' used in the production of both misinformation and disinformation. However, AI can also help combat false information through analyzing patterns, language, and context to aid content moderation. This is of particular importance since the DHD generated from AI-embedded e-medicine devices needs to be verified by regulatory authorities for the validity of AI outcomes before implementation on patients, since end users might not have the tools for assessment of the same.

Fairness and developer limitations

According to Tubella *et al.* (2022, "many model debiasing techniques have been developed in order to *equalise* predictive outcomes in accordance with various statistical fairness definitions, with each technique offering advantages and trade-offs in terms of accuracy, use of sensitive data, compatibility with different families of models, or development stage. Thus, when developing a model, practitioners need to make some decisions regarding *how* and *when* to introduce fairness interventions... These decisions are often taken by considering the technical and computational implications of the available alternatives." [36] It is clear that AI cannot be free of shortcomings and risks, yet it is well embraced in most domains. Yet it must be taken into consideration that many developers are not aware of the intricacies and complexities of healthcare parameters.

During situations like the above, the regulations must not further stifle innovation and progress. The vision of "Health for All" and the implementation of "Universal Health Coverage" must guide the path for health care innovations. It must be noted that rules can't solve every potential problem, and the demand for perfect safety has dangers of its own.[37]

Transparency and Explainability

Most of the AI systems are hardcoded to understand the final outcomes and lack transparency. The lack of transparency can burden both HCOs and doctors during the delivery of patient care due to AI embedded into e-medical devices and the lack of availability of complete technical specifications during device selection and procurement. The distributed liability and lack of accountability are thus inevitable outcomes.

AI algorithms have "black boxes," which means that the decision-making processes are not transparent or easily understood. This can make it difficult to identify and correct biases and can lead to a lack of trust in the system. This lack of transparency is problematic in healthcare, especially when the rationale behind a diagnosis or treatment recommendation is expected by the patient. When clinicians can't explain an AI system's recommendation to a patient, it may lead to a lack of trust or confusion. Clinicians must be able to understand the underlying reasoning of AI models [38] so they can trust the predictions and be able to identify individual cases in which an AI model potentially gives incorrect predictions.[39, 40]. Agreeably, AI is essential for general patient care, and its effective utilization might also reduce numerous preventable harms during both therapeutic and diagnostic interventions.

Accountability, Responsibility and Liability

Informed Consent and Understanding AI Manipulations

Informed consent (IC) is crucial for safe and ethical clinical practice. Inadequate information resulting from discrimination, paternalistic approaches, or non-personal approaches of treatment providers may reduce the quality of the IC.[41]

However, AI has led to individuals rushing through digital consent forms without understanding the information. This issue is also prevalent in privacy policies, terms of use notices, and medical IC forms. The consent-taking delegates often lack sufficient time and clinical knowledge to adequately promote patient autonomy and informed decision-making.

Conversational AI using large language models (LLMs) could improve delegated procedural consent in the delivery of healthcare. Studies show that AI chatbots provide accurate and comprehensive information, enhancing informed decision-making. These chatbots engage patients in non-paternalistic, interactive discussions, adapting their responses to each patient's educational background and knowledge level. This personalized approach significantly contributes to their effectiveness in obtaining informed consent (IC).[42] Patients may not fully understand how AI is being used in their care. It is important to provide clear and understandable information about the role of AI in diagnosis, treatment recommendations, and other aspects of care.

The ethical implications of delegating consent to LLMs in medicine conclude that, at least in certain clinical situations, the benefits of LLMs potentially far outweigh those of current practices.[43] A recent study has shown AI can learn to identify vulnerabilities in human habits and behaviors and use them to influence human decision-making.[44], AI can be used to manipulate people's behavior.[45] AI can be misused to exploit vulnerable people. A joint study by Trend Micro, the United Nations Interregional Crime and Justice Research Institute (UNICRI), and Europol elaborates on different ways AI can influence human decisions.[46]

AI can be misused to manipulate clinical trial data, exaggerate drug effectiveness, or conceal adverse effects in order to gain regulatory approval for a pharmaceutical product.[47, 48] Patient data can be used in targeting scams. AI can be used to identify vulnerable patients or potential targets for medical scams or fraudulent health products, preying on people's fear or desperation for treatment.[49,50,51]

Using AI-consented tools and influencing the health insurance coverage decisions are also reported. AI can be used to generate fraudulent billing codes, fake insurance claims, or manipulate billing systems to extract money from healthcare providers, insurers, or patients. (Resecurity)[52]

Choice and Control

The patient needs to be made aware of AI system usage, and the specific consent must be obtained where applicable by the HCO. Patients may have the option to decline the use of AI in their care and should be able to choose alternative approaches if they prefer. In cases where an AI system makes an error that leads to harm, it is unclear who would be held accountable—the software developers, the healthcare providers, or the institutions using the technology.

A situation where AI is used for the manipulation of choices with autonomous digital marketing tools (WJS)[53] on the therapeutic procedures raises concerns about "true choice" and "coercion into decisions." The ethical discussions in the healthcare system with the "refusal of AI during treatment" and the "right of choice" during patient care are ongoing.

Medical Errors

If an AI system makes an error that leads to patient harm, it can be difficult to determine the responsibility. Clear lines of accountability need to be established. Creators of autonomous AI should assume liability for harms when the device is used properly and on-label and obtain medical malpractice insurance. Responsibility for the proper use and maintenance of devices remains with the HCOs. In the case of assistive AI, the physician becomes liable.[54] Most countries have yet to frame regulations around this aspect.

Overreliance on AI

Healthcare providers should not over-rely on AI and should use their own clinical judgment in conjunction with AI recommendations. "The regulatory framework on medical liability when AI is applied is therefore inadequate and requires urgent intervention, as there is no single and specific regulation governing the liability of various parties involved in the AI supply chain, nor for end-users."[55]

Liabilities

Parallel studies have indicated that a significant number of healthcare stakeholders show poor compliance with AI training, which reduces the accuracy and predictive capabilities of AI. The failure of intended outcomes can be due to human errors, and the liability falls on manufacturers of AI devices or healthcare providers. The liability on the patient must be minimal, as the receiver of care.

"In the area of e-medicine, the professional responsibility of patients resides with health care professionals responsible for identifying and mitigating the following potential errors:

- 3.4.5.1 Production defects of the equipment;
- 3.4.5.2 Errors in the installation or implementation of the various components of IT support;
- 3.4.5.3 Omitted/defective/ineffective maintenance;
- 3.4.5.4 Errors in the use of the equipment;
- 3.4.5.5 Errors in data transmission" [56]

Consensus on ethical concerns is nearly impossible when binding responsibility is not legally levied on every profile and stakeholder associated with AI-based healthcare products. Therefore, the authors agree with and recommend a rigorous internal and external validation of AI models in e-medicine devices to achieve explainability goals and advise against requiring it for clinically deployed models. It is suggested that end users, including clinicians, lawmakers, and regulators, should be aware of classified AI's limitations in policy, use, and reporting. [57]

The impact of AI in swaying the decision-making behaviors of humans indicates a direct impact of AI on the mind and mental health status of an individual or group of individuals. The integration of AI in digital media raises ethical concerns about its impact on mental health. Studies highlight the addictive nature of AI and its potential for manipulation. Real-world testing of AI models can reveal hidden behavioral patterns, highlighting the need for responsible AI deployment. Researchers and policymakers should collaborate to determine standard practices for testing AI models with diverse groups, including vulnerable populations, to ensure that the models do not exploit people's psychological preconditions.[58]

AI-embedded gadgets are packaged as wellness devices with non-evidence-based, unverified, and non-scientific procedures, potentially straining trust-based connections and potentially causing patients to contest evidence-based practical data. Establishing liability becomes complex, especially if the AI system is used autonomously without regulatory oversight. Enhancing AI utilization during additional mechanization, digitization, and an objective AI consent should foster a partnership between stakeholders, grounded in responsive design and ongoing informed consent [59], and this trend might eventually be extended into e-medicine devices and healthcare.

Impact on Clinician-Patient Relationship

Over-reliance on AI could potentially erode the clinician-patient relationship. Patients value empathy, compassion, and human interaction, which AI cannot provide. If AI recommendations conflict with a clinician's judgment, it can create tension, and patients may not know whom to trust, potentially undermining their confidence in their care.

Certain studies have revealed that many patients with serious illnesses want their clinicians to make sensitive, acknowledging, and supportive statements. It is observed that very personal and emotional communication can cause discomfort for certain clinicians. Intimate and emotional communication is often seen as complex clinical behavior that is impacted by cognitive, social, economic, and cultural aspects. Thus, the AI model that suggests the content during communication is not always beneficial.[60]. AI in e-medicine is another tool towards better healthcare, and the clinician continues to remain the face of patient care.

The insurance industry, the clinical research systems, and the medical education are appendages bloating the connected resources of the healthcare industry. Cost-related ethical concerns could be resolved with the use of the Health Technology Assessment for developing the e-medicine device, initial AI training, device deployment, and ongoing AI modeling.[61]

The range of global healthcare models, wherein patients engage directly with the healthcare system for care, or approach individual doctors for treatment, and have the freedom to choose from various options, projects the importance of autonomy in decision-making for patients. However, this freedom also introduces the risk of unethical practices, especially if AI-enabled devices in healthcare are not effectively regulated. Robust oversight is crucial to ensure that these technologies uphold ethical standards and prioritize patient safety.

Equity and Access

The real measure of the nation's wealth is its health and wellness data. AI's introduction into the healthcare industry improves the efficiency and positive indicators of health and wellbeing. Enhancing resources can lead to "Health for All"

and improved quality of life index (QLI). The data collection will entail e-medicine devices, whether or not they use artificial intelligence. Access to AI or cost-effective healthcare is still a dream for many nations.

"Equity refers to the fair distribution of resources, opportunities, and support tailored to meet the needs of individuals or groups. It acknowledges that different people face different barriers and seeks to eliminate systemic inequalities by providing solutions that address specific challenges.

Access refers to the ability of individuals or groups to obtain and use resources, services, or opportunities. It emphasizes removing physical, financial, cultural, and social barriers that prevent participation or utilization."

Four main reasons for the delayed implementation of AI in healthcare are discussed.

Digital Divide

Not everyone has equal access to advancing technology and internet connectivity, which could exacerbate existing health disparities if AI-powered e-medicine becomes the primary mode of care.

Cost

AI-powered e-medicine platforms may be expensive to develop and implement, potentially making them inaccessible to underserved populations.

Inconsistent Data

The data that is not standardised is collected from e-medicine devices often without good clinical practices and disclosure of collection methodologies.

Steep Learning for Human Resources

Most large teams cannot keep pace or pivot easily with collaborative skills and research strategies essential for the design and manufacturing of the e-medicine device with embedded AI.

Significant resources are needed to implement AI in healthcare, and not all healthcare practitioners or geographical areas may have access to them. With cutting-edge AI-driven services only accessible in well-funded hospitals, this could exacerbate healthcare disparities. Rural or underprivileged communities may have unequal access to high-quality AI-enabled care as a result of the digital gap.

Using data from lower socioeconomic groups of a nation to create AI models that are later unavailable for use in the nation's healthcare system is another issue. [62] A scoping review by Istasy P et al. (2022) [63] revealed themes on the impact of AI on health equity, pertaining to AI's ability to help address health disparities, its potential to mitigate or exacerbate bias, and its capability to help elucidate determinants of health.

There are parts of the world that are not yet connected to the spirit of competition and live by cooperative social ethics. AI access to the internet, smartphones, and appropriate e-medicine devices necessitates the healthcare industry to keep pace with the extent of connectivity with mutual respect. Digital connectivity can be considered the sixth vital sign for effective delivery of e-medicine. [64]

Data ownership

It is not always clear who owns or controls patient data collected by AI-powered e-medicine platforms. Some laws indicate patients should have clear rights to access, control, and delete their data. There can be competing interests among healthcare providers, application developers, data aggregators, and product owners who have been funded to embed the AI research into e-medicine devices over who owns and controls healthcare data. Some laws contend that the organizations that gather and handle the data should be the ones in charge of it, while others suggest that the people from whom the (health) data was gathered should own it and have control over it. The European Economic Area (EEA), which adopted the General Data Protection Regulation (GDPR) and made it obvious that people have more explicit control over their data, is one place where this issue is more resolved than in the US. [65]

"The ongoing debate on secondary use of health data for research has been renewed by the passage of comprehensive data privacy laws that shift control from institutions back to the individuals on whom the data was collected. Rights-based data privacy laws, while lauded by individuals, are viewed as problematic for the researcher due to the distributed nature of data control." [66] The recent emergence of generative AI systems, which collate vast quantities of data from the internet to learn how to create new text, images, or audio, has already stirred disputes over data rights. Achieving this clarity is made even more challenging by the complex and obscure ways in which businesses derive value from datasets today. [67]

Beyond improving trial inclusivity, distributed clinical trial models that make it easier to incorporate lived experience and social determinants of health into trial design are also supported by the use of remote collection with AI and e-medicine devices. Continuous research and stakeholder collaboration are required to strike a balance between technological advancement and patient rights. Additional research is necessary in privacy protection, human-AI interaction, and bias mitigation as the healthcare industry undergoes digital transformation. [68]

Job Displacement and Workforce Impact

In a recent study by Thirunavukarasu et al. (2024) [69], published as "Large language models approach expert-level clinical knowledge and reasoning," it was shown that AI has better memory-based output compared to data retrieved during clinical recollection. The researchers are of the opinion that large language models aren't likely to replace healthcare professionals but have the potential to improve healthcare as part of the clinical workflow.

AI's ability to automate certain tasks might reduce the need for some healthcare roles, potentially leading to job losses, particularly in diagnostic fields. This raises ethical questions about how the healthcare workforce will be supported, retrained, or adapted as AI continues to evolve. Machine learning can process significantly more complex

data sets than human beings can. Whereas a human may become overwhelmed trying to read a particularly complicated scan or interpret a particularly large set of data, a computer does not have those cognitive limitations.[70] In another study, the participants felt that it would be appropriate to work in cooperation with AI. However, despite this willingness, they did have some concerns. Each new technological innovation leads to a change in societal attitudes, especially when this technology may replace an individual's job, so an increase in the anxiety felt by physicians is understandable.[71]

Three of four respondents were generally ignorant of artificial intelligence and were afraid that it would replace workers. Furthermore, there is a need for awareness and training because the majority of respondents were ignorant of the benefits and most frequent difficulties associated with artificial intelligence applications in the healthcare industry. The findings also demonstrated that because technicians' professions don't involve a lot of direct human connection, they were more commonly affected by AI applications.(72) Even those opposed to AI identified the need to incorporate a basic understanding of AI and connected systems into their curricula.[73]

Medical professionals are aware of their personal humanity and are able to connect with their patients' human spirit. Doctors are able to genuinely care for each patient; this is empathy. Throughout the spectrum of care, the design of human care is irreplaceable. It has been identified that healthcare professionals who provide patients with loving and compassionate care cannot be replaced by artificial intelligence.[74] Empathy has both cognitive and affective components, and it usually leads to prosocial action. Research suggests that the cognitive facet of empathy (empathic accuracy) can decline with age, whereas the affective facets of empathy (emotional congruence and sympathy) remain stable or improve with age. The study predicted that emotionally demanding healthcare occupations provide opportunities to practice empathy.[75] In the current scenario, healthcare stakeholders might need to be empathetic towards other stakeholders who have no regulation, or worse, are displaced while implementing AI.

The healthcare system will have to uphold humanity and make patient-centric decisions while adhering to the legalities of the land and implementing AI.

Medico-legal complications and AI

Legality and ethics are not mutually exclusive, and the relationship between the two is complex. Laws are based on legalities established by the representing government of the state, while ethics are based on human rights and wrongs and are agreed upon by societal norms. Legalities, guidelines, and ethics for treating physicians are straightforward.[76] The treating physician can be unaware of the AI being used in the diagnostic medical devices, and this emerges as a legal dilemma even during legal proceedings. There are case reports of misinformation by improperly trained AI. models.[77]

Operators are restricted from fully understanding and verifying the logical processes underlying the AI's decision-making. The human-machine interactions—particularly in cases where AI systems make autonomous decisions—raise significant concerns regarding liability in the event of harm to third parties. New technological approaches introduce new realities that might be unlikely to fit within the solid edges of the current law.[78,79] There needs to be a neutral platform for reporting cases on various grounds, including ones due to inappropriate reliance by healthcare professionals, flaws built into algorithms, or inadequate selection and maintenance of AI tools in Healthcare Organizations.[80] A well-implemented quality assurance and quality management approach for AI in E-Medicine Devices can significantly reduce the incidence of medical-legal complications for HCOs.

Ethical concerns with data collection by a wellness device with AI

A number of wearables, like digital watches and rings, collect human data under the pretext of being wellness devices. This data is often processed by AI-driven systems.

Wellness data includes, but is not limited to, the following:

Physical Activity Tracking

steps, exercise intensity, and activity levels, including sports.

Vital Signs

Heart rate (ECG), blood pressure, SpO_2 (oxygen saturation), respiratory rate, temperature, end-tidal CO_2, and blood sugar monitoring.

Sleep Analysis

Sleep duration, quality, and stages. Diagnosing conditions like sleep apnea with AI models analyzing breathing patterns

Personalized Insights

Nutrition, hydration, and exercise guidance derived from body composition and lifestyle data.

Behavioral Encouragement

Goal-setting and motivation for healthier habits using predictive modeling and reinforcement algorithms.

Cardiology Monitoring

Early detection of arrhythmias or heart rate variability changes.

Posture Monitoring

AI detects posture deviations and suggests corrective actions.

Stress and Posture Analysis

Feedback to improve mental health and ergonomics.

Menstrual Monitoring in Females

Predicting and providing feedback about menstrual cycle duration and pattern.

The 'biometric' AI collecting numerous data, including real-time facial-scanning technologies, and other large aggregates of data for commercial purposes pose similar risks to user privacy, surveillance, and data safety.[81] The computational knowledge and power over AI systems tend to be held by private organizations, with arrangements and access to data sets containing information about large parts of the

population. This raises privacy concerns as well as concerns about how historic bias that is embedded in data will affect the decision-making of public authorities.[82] (UN Human Rights, 2021) Governing organizations using medical devices for surveillance have increased the ethical concerns.

The FDA 2024 does not regulate a low-risk general wellness product (GWP).[83] E-medicine device manufacturers can make a regulatory changeover and submit to the FDA for permission or approval once enough data has been gathered and a workable business plan has been created.[84] The wellness industry has numerous e-medicine devices that collect data and train AI.

Data acquired without the proper clinical research procedures is risky and speculative in terms of its ethical implications.

Cross-border jurisdiction, global compliance, and ethical concerns

The AI Act, implemented since August 2024 in the European Union, requires providers of regulated e-medical devices with AI functionality to comply with certain obligations prior to placing such medical devices on the EU market or putting them into service under their own trademark. Non-compliance with the AI Act can result in complaints, investigations, fines, litigation, operational restrictions, and damage to a company's reputation. The GDPR continues to apply where AI systems process personal data.[85]

Considering the disparities across implemented regulations on healthcare and the lack of appropriate regulations within a few nations, healthcare data is a potential treasure that needs to be protected, even for the exploration of AI developments. The AI-embedded gadgets have faced challenges during global imports and exports. The primary cause of the local industry's opposition is that, according to them, the EU regulatory framework allows companies to identify themselves as legitimate manufacturers even if they are not actually producing the product. This has resulted in "pseudo manufacturing" in the EU, since, unlike in the US and India, the country of origin is not indicated on the label of medical devices in the EU and the UK.[86]

The regulations imposed on AI-based hardware, which are often implemented by the nation without understanding the impact on e-medicine devices, result in disturbances to the seamless delivery of healthcare. The trade commissions and customs departments hold these e-medicine devices due to a mismatch of regulatory requirements.

AI-focused IP legislative for e-medicine devices

The patentability of medical AI systems and innovations is an important consideration for ethical discussion. Numerous patents are being globally filed for AI in healthcare and are exponentially increasing.

A patent for an AI trained for automated cancer detection utilizing MRI was obtained by the US Department of Health and Human Services. A neural network-based model method for determining whether cancer tissue is benign or malignant was detailed in a European patent. A patent for AI-based medical picture segmentation techniques and systems was acquired by Siemens Healthcare. Ai Medical Service Inc. obtained a patent for a diagnostic aid technique that employs endoscopic pictures of a digestive organ to identify diseases using a convolutional neural network (CNN).

The six main application directions of artificial intelligence in the medical field are mapped, namely genomics, drug research and development, medical imaging, electronic medical records, health management, and AI robots.[87] The patent legislation might need to incorporate AI in these fields to segregate e-medicine products.

Subject matter eligibility, which is a two-step test by the United States Patent and Trademark Office (USPTO) of whether the purpose of the product is "directed to a patent-ineligible concept" (laws of nature, abstract thought, etc.) and whether the new product is different enough from other patented products to be considered original, is the most urgent question regarding the patentability of medical AI systems.[88] "The patent laws on diagnostic methods, methods of medical treatment, or surgical methods that might be derived from discoveries made with the benefit of AI technology or that may themselves incorporate AI technology are eligible for patent protection in Australia. However, bare claims to an AI algorithm per se or an AI algorithm implemented by a generic computer will likely fail to qualify for patent protection in Australia."[89]

The patent process and human creativity in the face of competition and business ramifications have turned into competitiveness in intellectual property. To prevent harm, guarantee peaceful use, uphold ethics, and safeguard the developer's rights, every legal document that constitutes the law of the land effectively erects a barrier around scientific procedures.[90] Choosing the right intellectual property (IP) strategy for AI in healthcare hinges on understanding the technology's nature, use, and control. Factors such as public-facing visibility, susceptibility to reverse engineering, and data sharing requirements influence the decision between trade secret and patent protection for AI.[91] While intellect is not a property in and of itself, it is a virtue. When one needs to safeguard the knowledge, strategies, and ethical values, protecting IP is inevitable.

Ethic washing and E medicine

Ethics washing is a popular media term that is encountered when topics of ethics and AI are discussed. The practice of ethics washing means implementing diversion strategies and action steps by organizations to mitigate and resolve the challenges posed by AI without appropriate tools and services. This unethical practice is said to be misleading the concerned AI stakeholders.

A Forbes article titled "AI Ethics And Legal AI Are Flustered By Deceptive Pretenses Known As AI Ethics-Washing Which Are False Claims Of Adhering To Ethical AI" was published (Eliot, 2022), describing the four major variants of AI ethics washing [92]

- The AI Ethics Washers That Don't Know They Are: AI

ethics washing by ignorance or illiteracy about AI and/or AI ethics
- The AI Ethics Washers That Fall Into It: AI Ethics washing by inadvertent slippage, though otherwise genuine about AI Ethics and AI
- The AI Ethics Washers That Thinly Stretch: AI Ethics washing by purposeful intent, though just by a smidgeon and at times nearly excusable (or not)
- The AI Ethics Washers That Know And Brazenly Peddle It: AI Ethics washing all-out and by insidious and often outrageous design

The scientific literature on the topic of "Ethic Washing" is limited; we consider this as grey literature, but socio-political literature is available.[93] However, the concerns of these "ethic washing" discussions are not different from the discussion on classification and attribute training of AI in e-medicine devices and steps taken (or not) in order to resolve the issues emerging during the project deployment. Empirically speaking, the boundaries between ethics as academic inquiry and ethics as practiced in industry are thus not hard to draw.

AI, which was once a sophisticated tool of hackers, military, basement geniuses, and large corporations, is now available for almost everyone with access to smart gadgets. It is suggested by the authors that the term "ethic wash" could support e-medicine devices to indicate the level of demographic training AI has achieved, along with specific attributes that have been embedded in the sample or demographics from which it has been trained. The ML/DL impact of demographic training on AI is based on both qualitative and quantitative factors. [94] The healthcare AI and e-medicine devices might be able to declare the ethical wash and training levels to exhibit the demographic training AI has achieved; this, in turn, might enable patients in the future to select the services of AI.

RECOMMENDATIONS

Suggestions to mitigate ethical concerns with AI in e-medicine devices

Addressing the ethical concerns with the AI chatbot

To ensure the ethical development and implementation of AI in e-medicine, a multi-faceted approach is needed, including:

Diverse and Representative Data

AI systems should be trained on diverse and representative datasets to minimize bias.

Transparency and Explainability

AI algorithms should be transparent and explainable so that their decision-making processes can be understood and audited.

Strong Data Security and Privacy Protections

robust security measures should be in place to protect patient data.

Clear Informed Consent Processes

Patients should be fully informed about the use of AI in their care and should have the opportunity to provide meaningful consent.

Established Accountability Frameworks

Clear lines of accountability should be established for AI-related medical errors.

Equitable Access

Efforts should be made to ensure that AI-powered e-medicine is accessible to all populations, regardless of socioeconomic status or geographic location.

By proactively addressing these ethical concerns, we can harness the potential of AI to improve healthcare while mitigating the risks.

The above is generated by an AI chatbot. An AI program that generates dialogue and human-like text. The utilization of chatbots can enable suggestions that are worthy of consideration to begin the process of reducing ethical concerns. We shall continue our discussions here on. We have utilized ChatGPT and Grok.ai for the above (4.1) discussion.

Classification and Regulation of AI in e-medicine

The classification of e-medicine devices along with AI might have to be revised based on the complexities of intended use, intended purpose, and indications of use. This would allow governing organizations to record, register, and regulate the evolving AI in the healthcare system. The classification of AI is essential to regulating licenses for operation if installed in any machines, utility gadgets, wellness devices, and e-medicine devices.

"There are 7 main types of artificial intelligence, as agreed by numerous stakeholders. :
- Narrow AI: AI designed to complete very specific actions; unable to independently learn.
- Artificial General Intelligence: AI designed to learn, think, and perform at similar levels to humans.
- Artificial Superintelligence: AI is able to surpass the knowledge and capabilities of humans.
- Reactive Machine AI: AI capable of responding to external stimuli in real time; unable to build memory or store information for the future.
- Limited Memory AI: AI that can store knowledge and use it to learn and train for future tasks.
- Theory of Mind AI: AI that can sense and respond to human emotions, plus perform the tasks of limited memory machines.
- Self-Aware AI: AI that can recognize others' emotions, plus has a sense of self and human-level intelligence; the final stage of AI."

The above types of AI classification can also be largely understood by examining two encompassing categories: AI capabilities and AI functionalities, as elaborated by industry user IBM (2023).[95] The classification of AI has to be compared with other classifications based on the impact assessment. It helps distinguish AI applications according to their potential impact on individuals, society, and the planet. [96] The AI can also be mapped with attributes that are made mandatory for

disclosure to be installed in any e-medicine devices. There are challenges with each framework and the complexities of AI involved. Only by addressing these challenges through innovative methodologies and interdisciplinary collaboration can we harness the full potential of AI to solve complex problems and drive societal progress. The existence of multiple frameworks indicates the need for a common and mutually agreed classification for AI in e-medicine devices.[97] This might have to be advocated by the governing agencies at the earliest.

Utilization of appropriate tools to store healthcare data, DHD, and AI training

Eleven principles have emerged from detailed content analysis. These are: transparency, justice and fairness, non-maleficence, responsibility, privacy, beneficence, freedom and autonomy, trust, dignity, sustainability, and solidarity.[98] These ethical values can be selected and mapped with scores for AI-trained medical devices. AI can develop super-high prediction capabilities with large and labeled data provided by e-medicine devices.

If the data is collected in ways that the above principles are not compromised, and blockchain technology appears like a potential candidate for healthcare data with certain documented risks [99] Blockchain's decentralized and cryptographic strengths, paired with AI's advanced analytics, can transform data management, pharmaceutical supply chains, clinical trials, and health insurance.[100] The data can also be stored in the cloud environment using various security measures, encryption approaches, access controls, disaster recovery and backup processes, and constant monitoring and threat detection.[24] The best option for particular HCOs can be arrived at using available resources.

The healthcare institute or physician is bound to inform patients regarding the use of either AI or both AI and e-medicine, along with the potential concerns of the use. To provide a better chance of success to AI evolution or even "revolution," we must provide the possibility to healthcare services developers and researchers to access scientifically studied and validated state-of-the-art AI methods and health information databases to enhance healthcare processes and healthcare outcomes. These AI methods and databases should be accessible transparently and without high costs or regulatory barriers.[101]

Specificity, sensitivity, and margin of error

Specificity, sensitivity, and margin of error must be legibly demonstrated in language understood by the users of e-medicine devices with embedded AI. If the laboratory or diagnostic model utilizes AI- or e-medicine-based devices, sharing this information in the laboratory-generated or diagnostic report might be beneficial. The clinical research on diagnostic E-medicine devices (from PPG sensor-based SpO2 devices, digital BP apparatus, digital stethoscopes, and healthcare wearables to any E-medicine devices with basic AI) and the clinical validation conducted on specific demographics will be published with the credentials of the manufacturer and of the team conducting the study.

The study methodology should engage in full disclosure of algorithms, particularly deep learning models, that function as "black boxes" with decision-making processes that are not easily interpretable. Every AI needs to be graded if it is interacting with humans in the healthcare or entertainment domains. The impact of AI on moods due to social media is well-documented. Training against algorithms that enhance rewards and incentive experiences, the AI can become addictive to the users. Certain AI attributes that result in addiction behaviours must be mandatorily declared if embedded in applications, wellness devices, or e-medicine.

Breach of confidentiality

Sharing of personal data and breach of privacy might need to attract legal and/or financial penalties and be considered criminal liability. The laws of patient confidentiality that apply to physicians must be extended to stakeholders in AI and e-medicine. To address these ethical concerns, a strong regulatory framework is essential, along with guidelines for developing, deploying, and using AI responsibly in healthcare. Involving ethicists, policymakers, healthcare professionals, and patients in the policy development process can support e-medicine devices with embedded AI to evolve better and promote good practices.

"It is worth reiterating that de-identification of health data, as is performed to comply with HIPAA, does not necessarily render the data non-personal data under data protection regulations. Moreover, "de-identified" data can still be used to re-identify an individual using AI/ML methods. So-called pseudonymous data devoid of HIPAA identifiers should be treated like personal data for which informed consent is obtained." When the data is not directly collected from an individual, such as synthetic data or when random noise is used to alter the data from its source from an individual, it can be considered anonymous and not covered by privacy regulations.[66] This suggests that we could use AI to consolidate data during the collaboration processes in specific modalities to reduce the chances of data breaches.

Rodríguez (2023) discusses some best practices that healthcare data scientists and developers can incorporate to address the challenges of using algorithms and AI. These apply to e-medicine devices and are considered while structuring healthcare AI.

"These include

- Have a more diverse body of people review and supervise the algorithms and AI.
- Use methods or techniques to best manage situations where there is not enough information available, like using synthetic data.
- Work with diverse communities to ensure the algorithms are helpful and don't cause harm.
- Introduce the algorithms gradually and carefully instead of all at once.
- Create ways for people to provide feedback and improve the algorithms over time.

- Involve diverse members of your workforce in developing the algorithms and validating patient data from various racial and ethnic backgrounds." [35]

The consequences, the contracts, and the regulations for AI and its use within the geopolitical boundaries will require appropriate discussions with all the stakeholders before implementation. The best options can be considered, taking all stakeholders and their liabilities into consideration. It might not be long before AI-implemented devices attract different taxation slabs in certain economies.

Guidelines to cope with errors by e-medicine devices embedded with AI

There is an urgent need for regulations based on recommendations on digital interventions for healthcare.[102]Data is being generated and continues to be published across the scientific communities. The errors in the generated digital data and AI-embedded devices used as wellness devices must be shared. This can allow the decision-makers to structure appropriate regulations.[103]. The research on potential e-medicine devices with AI must be standardised and shared appropriately.[104]

Modification of patent and trade secret clauses for e-medicine devices

Different parts of an AI system need to be protected differently. The patent or trade secret applications in healthcare have increased. Together, they afford more robust protections for AI/ML-based inventions. When patenting AI-related inventions, applicants should avoid using black box terminology and instead define the technological improvements with sufficient specificity to set the invention apart from abstract ideas and generic techniques.[105] This strategy will be stretched across e-medicine devices, too. Timelines for patents on AI used in healthcare need to be discussed from a social impact standpoint before being granted.

AI, e-medicine devices, and insurance

The insurance industry is yet to react to errors by AI in the healthcare systems. Specific insurance products to address AI-related risks in the healthcare system are bound to evolve with time. The DHD and AI present a promising tool for evaluating insurance coverage and claims, but their implementation has faced significant challenges, including class-action lawsuits and scrutiny from congressional committees.[106] The support of the insurance industry for AI use in e-medicine will be an indicator for trust and the development of quality AI in healthcare.

HTA implementation for E-Medicine devices with AI

According to a recent review[107] the current body of literature appears to portray AI health technologies as being exceptional to Health Technology Assessment (HTA).

"This exceptionalism is expressed along 5 dimensions:

- AI Health Technology's distinctive features;
- their systemic impacts on health care and the health sector;
- 4.9.3) the increased expectations towards AI in health;
- 4.9.4) the new ethical, social, and legal challenges that arise from deploying AI in the health sector; and
- 4.9.5) the new evaluative constraints that AI poses to HTA."

The multidimensional HTA component can improve the quality of e-medicine devices. The comparison between e-medicine devices can be achieved, and the data can further be utilised to improve the future generation of devices.

Health care with compassion

Evolution and shifting of value systems can be recorded by AI in the emerging large storing capability databases, which utilize generative, propagative logical programming codes and also interface with any user. The self propagative AI is a dramatic fear of every human, as indicated by the number of movies being made on this topic. This potential AI can be trained with values that are human-centric.

AI and e-medicine devices are tools that are used for the treatment of patients. In healthcare systems, the principle of "do no harm" is often advocated. Most regulatory healthcare structures are built to avoid harm. Gen AI chatbots currently utilised can enhance the language of love, compassion, and empathy in caregivers by supporting refined patient-centric communication.

Compassion is a key component of healthcare, named as a core value in healthcare charters, medical codes of ethics, and guidance on patient-centered care. (Chatburn et al., 2024) [108] "Compassionate care that is associated with improved patient outcomes, including quicker recovery times, reduced anxiety, reduced rates of hospital re-admission, lower rates of post-discharge post-traumatic stress disorder following emergency department admission, and improved patient satisfaction. Patients have even said that compassionate care can make the difference between living and dying."

CONCLUSION

Artificial Intelligence (AI) is here to stay. Although speculative, the course of evolution of AI and its related future innovations is predicted to challenge every contemporary human imagination. The "last brainchild" the human ever needed to produce is human intellect coded into a program. The ethical discussions are initiated since societies nurture different value systems. The regulatory disparities and equity gaps can create ethical conflicts in the connected healthcare ecosystem. These ethical concerns can be addressed with planned intervention by every profile and stakeholder, developing and utilizing the AI in e-medicine. The evolving AI might be ahead of the regulatory implementation curve, resulting in predictable setbacks for certain stakeholders.

The demographic training on DHD with the cooperative, competitive, and collaborative approaches is something on which the authors are conducting continued research. The AI research into perioperative, teleradiology, digital imaging, telemedicine, tele-ICU, and telesurgeries is also being explored. Researchers and regulators are invited to explore the impact analysis of industry-driven research. Appropriately regulated AI use in e-medicine and wellness devices will

stand as a guiding light towards creating a healthcare model that transcends every known limitation to improve quality of life. The current and emerging AI-based e-medicine devices in healthcare need to be constructive and not a destructive technology for a human-centric world. The AI applications have to complement the reduction of human errors, enhance productivity, refine quality, achieve precision, and gain scalability for universal healthcare applications.

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