

Telehealth and AI: An Ethical Examination of Remote Healthcare Services and the Implications for Patient Care and Privacy

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Abstract

Background: The integration of artificial intelligence (AI) in telehealth has revolutionized healthcare delivery, offering unprecedented opportunities for remote diagnosis, treatment, and patient monitoring. This research aims to critically examine the ethical implications of this technological convergence.

Objective: To explore the ethical dimensions of AI-enhanced telehealth, focusing on accessibility, quality of care, patient privacy, data security, informed consent, regulatory challenges, and the long-term societal impacts.

Methods: The study employs a comprehensive literature review and ethical analysis framework, examining current practices, patient outcomes, and regulatory policies related to AI in telehealth.

Results: The findings highlight the potential of AI-enhanced telehealth in increasing healthcare accessibility, especially in remote and underserved areas. However, challenges such as digital divide, data privacy concerns, and the risk of algorithmic bias are identified as key ethical issues. The lack of comprehensive regulatory frameworks and standards for AI in healthcare poses significant challenges in ensuring equitable and safe care. Furthermore, the study underscores the importance of informed consent in the context of AI-driven healthcare services.

Conclusion: While AI-enhanced telehealth offers significant benefits in healthcare delivery, it raises critical ethical concerns that must be addressed. Ensuring equitable access, safeguarding patient privacy, maintaining the quality of care, and developing robust regulatory frameworks are essential for the responsible integration of AI in telehealth services. Future research should focus on developing ethical guidelines and policies that keep pace with technological advancements in healthcare.

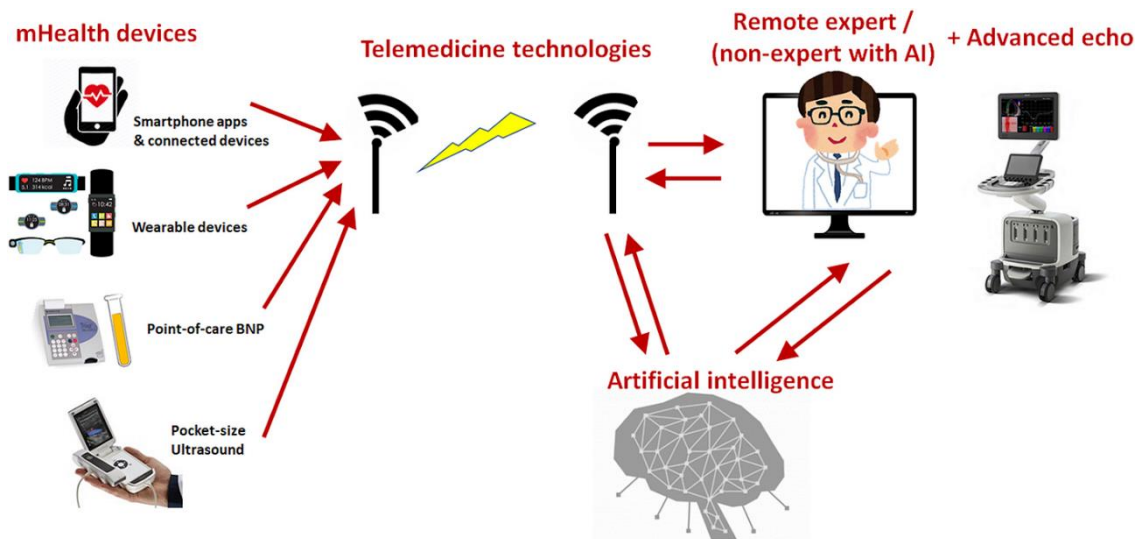
Keywords: Telehealth, Artificial Intelligence, Healthcare Ethics, Patient Privacy, Digital Health, Healthcare Accessibility.

Introduction

Telehealth, augmented by artificial intelligence (AI), has emerged as a transformative force reshaping the landscape of healthcare delivery, particularly in response to the unprecedented

challenges posed by the COVID-19 pandemic. Leveraging advancements in AI, telehealth platforms have enabled healthcare providers to extend their reach beyond traditional brick-and-mortar settings, offering remote consultations, diagnoses, and treatment options to patients regardless of geographical constraints. This expansion of telehealth services has not only facilitated access to healthcare for individuals in remote or underserved areas but has also mitigated the risk of viral transmission by reducing the need for in-person visits, thereby supporting public health initiatives aimed at curbing the spread of infectious diseases [1]–[6].

Figure 1. Artificial Intelligence for Telemedicine



Furthermore, the integration of AI technologies within telehealth systems has enhanced diagnostic accuracy and personalized patient care. AI algorithms can analyze vast amounts of medical data, including patient history, symptoms, and diagnostic tests, to assist healthcare providers in making timely and informed clinical decisions. Machine learning algorithms, for instance, can recognize patterns in medical imaging scans, such as X-rays or MRIs, aiding radiologists in detecting abnormalities with greater precision and efficiency. Moreover, AI-driven chatbots and virtual assistants can engage with patients in real-time, gathering relevant medical information and providing personalized health recommendations, thereby improving patient engagement and adherence to treatment plans.

In addition to diagnostic support, AI-powered telehealth solutions have revolutionized remote monitoring and chronic disease management. Wearable devices equipped with AI algorithms can continuously collect and analyze biometric data, such as heart rate, blood pressure, and glucose levels, enabling healthcare providers to remotely monitor patients' health status and intervene proactively in case of any deviations from normal parameters. This proactive approach not only empowers patients to take more active roles in managing their health but also helps prevent complications associated with chronic conditions, ultimately reducing healthcare costs and improving patient outcomes.

Despite the numerous benefits offered by AI-enhanced telehealth, challenges and ethical considerations persist. Concerns related to data privacy, security, and the potential for algorithmic bias necessitate robust regulatory frameworks and ethical guidelines to safeguard

patient confidentiality and ensure equitable access to care. Furthermore, disparities in digital literacy and access to technology must be addressed to prevent exacerbating healthcare inequities. Additionally, the human-machine interaction within telehealth encounters raises questions about the preservation of patient-provider relationships and the potential for depersonalization of care [1].

The continued integration of AI into telehealth holds immense promise for advancing healthcare delivery and improving patient outcomes. As technology continues to evolve, further innovations in AI-driven diagnostics, predictive analytics, and personalized medicine are expected to enhance the efficiency, accessibility, and quality of telehealth services. However, realizing the full potential of AI in telehealth requires collaborative efforts among healthcare stakeholders, policymakers, and technology developers to address regulatory challenges, ethical concerns, and disparities in access, ultimately ensuring that AI-powered telehealth remains a catalyst for transformative change in healthcare delivery [10]–[12]. While this integration of technology in healthcare offers numerous benefits, it also raises several ethical concerns.

Ethical Examination of Remote Healthcare Services

Accessibility and Equity

Telehealth stands as a pivotal tool in expanding healthcare accessibility, especially for individuals residing in remote or underserved regions. By transcending geographical barriers, telehealth platforms enable patients to connect with healthcare professionals, receive consultations, and access medical services from the comfort of their homes. The integration of AI technologies within telehealth systems further amplifies this accessibility by offering advanced diagnostic capabilities and tailored treatment recommendations. AI algorithms can analyze diverse datasets to assist healthcare providers in making accurate clinical assessments, thereby enhancing the quality of care delivered remotely.

Aspect	Description
Purpose	Telehealth serves as a crucial tool for expanding healthcare accessibility, particularly for individuals in remote or underserved areas.
Functionality	Telehealth platforms enable patients to connect with healthcare professionals, receive consultations, and access medical services remotely, transcending geographical barriers.
Integration with AI	AI technologies integrated into telehealth systems enhance accessibility by offering advanced diagnostic capabilities and tailored treatment recommendations. AI algorithms analyze diverse datasets to assist healthcare providers in making accurate clinical assessments, thereby improving the quality of remotely delivered care.
Concerns	The widespread adoption of telehealth and AI in healthcare raises concerns about exacerbating existing health disparities. Not all individuals have equitable access to necessary technology infrastructure or reliable internet connectivity, disproportionately affecting marginalized populations such as rural communities and socioeconomically disadvantaged individuals. Disparities in digital

	literacy, especially among older adults, present additional barriers to accessing telehealth services.
Strategies for addressing disparities	Multifaceted strategies are necessary to address disparities in telehealth access and utilization. Collaboration among policymakers, healthcare organizations, and technology developers is crucial to ensure equitable distribution of telehealth resources. Efforts should include improving broadband infrastructure in underserved areas, providing training programs to enhance digital literacy among vulnerable populations, and implementing culturally competent outreach and education initiatives to raise awareness about telehealth options.
Importance of inclusivity	Prioritizing inclusivity and accessibility in telehealth implementation is essential to mitigate disparities and realize the full potential of AI-driven healthcare delivery.

However, the widespread adoption of telehealth, coupled with AI advancements, also raises concerns regarding the exacerbation of existing health disparities. Notably, not all individuals have equitable access to the requisite technology infrastructure or reliable internet connectivity essential for participating in telehealth consultations. This digital divide disproportionately affects marginalized populations, including rural communities and socioeconomically disadvantaged individuals, limiting their ability to benefit from telehealth services. Moreover, disparities in digital literacy present additional barriers, particularly among older adults, who may struggle with navigating telehealth platforms and utilizing digital health tools effectively.

Addressing these disparities in telehealth access and utilization requires multifaceted strategies aimed at bridging the digital divide and promoting health equity. Policymakers, healthcare organizations, and technology developers must collaborate to ensure the equitable distribution of telehealth resources, including efforts to improve broadband infrastructure in underserved areas and provide training programs to enhance digital literacy among vulnerable populations. Additionally, culturally competent outreach and education initiatives are essential for raising awareness about telehealth options and empowering individuals to leverage these technologies to manage their health effectively. By prioritizing inclusivity and accessibility in telehealth implementation, stakeholders can work towards mitigating disparities and realizing the full potential of AI-driven healthcare delivery [2].

Quality of Care

The integration of AI within telehealth holds promise for elevating the quality of care through enhanced diagnostic accuracy, personalized treatment strategies, and continuous patient monitoring. AI algorithms can sift through vast datasets, identifying subtle patterns and correlations that may elude human observation, thereby aiding healthcare providers in making more precise clinical assessments and tailored interventions. By leveraging AI-powered predictive analytics, telehealth platforms can anticipate potential health complications, enabling proactive interventions to prevent adverse outcomes and optimize patient outcomes.

Nevertheless, the transition to AI-driven telehealth raises concerns regarding the potential drawbacks associated with reduced in-person interaction. While AI algorithms excel in processing data and generating insights, there exists a risk of overlooking nuanced clinical cues and patient context that may be discernible through face-to-face encounters. The absence of physical examinations and direct patient-provider interactions in telehealth consultations could potentially result in misdiagnoses or the oversight of critical symptoms, underscoring the

importance of striking a balance between technological advancements and the preservation of clinical judgment and empathy [3].

Moreover, the effectiveness of AI algorithms in telehealth is contingent upon the diversity and representativeness of the data used for their training. Biases inherent in healthcare datasets, such as underrepresentation of certain demographic groups or overemphasis on specific clinical scenarios, can inadvertently perpetuate disparities in diagnostic accuracy and treatment recommendations. Addressing these biases requires concerted efforts to enhance data diversity and inclusivity, ensuring that AI models are trained on comprehensive datasets that reflect the full spectrum of patient demographics and clinical presentations. By promoting data equity and transparency in AI development, telehealth stakeholders can mitigate the risk of algorithmic bias and foster more equitable healthcare delivery through AI-powered telehealth solutions.

Patient Privacy and Data Security

The symbiotic relationship between telehealth and AI hinges on the intricate handling of extensive personal health data, encompassing collection, analysis, and storage processes. However, this reliance introduces pressing apprehensions regarding patient privacy and data security. Safeguarding the confidentiality and integrity of patient information assumes paramount importance in light of escalating cyber threats and the potential ramifications of unauthorized data breaches. Patients rightfully seek assurance that their sensitive health data remains shielded from exploitation and misuse, refraining from purposes such as targeted advertising or discriminatory practices by insurance entities [13].

To address these concerns effectively, robust measures must be implemented to fortify the privacy and security framework surrounding telehealth and AI applications in healthcare. This entails adherence to stringent data protection regulations, encryption protocols, and access controls to thwart unauthorized access to patient records and mitigate the risk of data breaches. Additionally, healthcare organizations and technology providers must prioritize transparency and accountability in their data handling practices, fostering trust among patients by openly communicating policies and procedures governing the use and disclosure of personal health information [14]. Furthermore, proactive efforts to enhance cybersecurity resilience and incident response capabilities are imperative in safeguarding patient data against evolving cyber threats. This necessitates ongoing risk assessments, regular audits, and the adoption of cutting-edge cybersecurity technologies to detect and neutralize potential vulnerabilities in telehealth and AI systems. Collaborative initiatives involving stakeholders across the healthcare ecosystem are essential for devising comprehensive strategies that balance the imperatives of data privacy and security with the imperative to harness the transformative potential of telehealth and AI in advancing healthcare delivery. By upholding the principles of patient-centricity and ethical data stewardship, healthcare organizations can engender confidence among patients, fostering a conducive environment for the sustainable growth and innovation of telehealth and AI-enabled healthcare solutions.

Consent and Autonomy

In the realm of ethical medical practice, informed consent stands as a foundational principle, serving as a cornerstone for patient autonomy and decision-making. As AI-driven telehealth solutions become increasingly prevalent, ensuring that patients possess a comprehensive understanding of the data collection processes, utilization of their information, and the

implications of AI integration in their care decisions is paramount. Patients ought to be equipped with the knowledge necessary to make informed choices regarding their participation in AI-augmented services, with the option to exercise their right to opt-in or opt-out while retaining access to uncompromised, high-quality care.

Central to upholding the tenets of informed consent in AI-driven telehealth is the provision of transparent and accessible information regarding data practices and AI utilization to patients. This entails elucidating the types of data being collected, the purposes for which it is being utilized, and the specific roles AI algorithms play in informing clinical decision-making. By fostering clear communication channels and educational resources, healthcare providers can empower patients to make well-informed decisions aligned with their preferences and values, thus reinforcing the principles of patient autonomy and agency in healthcare delivery [15].

Moreover, respecting patient autonomy necessitates affording individuals the opportunity to exercise meaningful control over their participation in AI-augmented telehealth services. This entails implementing mechanisms for obtaining explicit consent from patients regarding the use of their data for AI-driven analyses and treatment recommendations. Furthermore, patients should be afforded the flexibility to opt-out of AI utilization if they have reservations or concerns, without compromising the quality or accessibility of the care they receive. By prioritizing patient-centric approaches to AI integration in telehealth, healthcare providers can uphold ethical standards while harnessing the transformative potential of AI technologies to enhance healthcare delivery and patient outcomes.

Regulation and Accountability

The exponential growth of AI within the healthcare sector frequently surpasses the development of regulatory frameworks, accentuating the necessity for robust guidelines and standards to govern the integration of AI in telehealth practices. Clear regulatory directives are indispensable in ensuring that AI-powered telehealth services uphold principles of safety, efficacy, and equity while navigating the complexities of healthcare delivery. Establishing comprehensive regulatory frameworks can help mitigate potential risks associated with AI deployment, safeguard patient welfare, and foster trust in telehealth systems as reliable tools for healthcare delivery.

Moreover, accountability mechanisms are imperative to address the implications of AI-driven decisions in telehealth settings. Given the inherent complexities and uncertainties surrounding AI algorithms, mechanisms must be in place to identify and rectify errors or biases that may arise in the system. Transparency in AI decision-making processes is crucial, enabling healthcare providers and patients to understand the rationale behind algorithmic recommendations and facilitating accountability for outcomes. Additionally, continuous monitoring and evaluation of AI algorithms are essential to detect and mitigate biases, ensuring that telehealth systems operate equitably and in alignment with ethical principles [16].

Furthermore, collaboration among stakeholders, including regulatory bodies, healthcare organizations, technology developers, and patient advocacy groups, is indispensable in shaping effective governance frameworks for AI in telehealth. By engaging in dialogue and consensus-building processes, stakeholders can collectively address challenges related to regulatory compliance, algorithmic transparency, and accountability mechanisms, fostering a harmonized approach to the responsible integration of AI in telehealth. Ultimately, the establishment of

clear guidelines and standards, coupled with robust accountability mechanisms, is fundamental to harnessing the transformative potential of AI in telehealth while safeguarding patient safety, promoting equitable access to care, and upholding ethical standards in healthcare delivery [17]–[19].

Ethical Use of AI Algorithms

The burgeoning integration of AI in telehealth introduces a pertinent concern regarding the potential presence of biases within AI algorithms, which may inadvertently contribute to unequal treatment outcomes. To mitigate this risk, it is imperative to prioritize the development and implementation of AI systems that are trained on diverse and representative datasets. By incorporating data from varied demographic groups and clinical contexts, healthcare stakeholders can strive to ensure that AI algorithms yield equitable and unbiased recommendations across patient populations. Additionally, ongoing evaluation and validation of AI models are essential to assess their accuracy and fairness, enabling the identification and mitigation of any biases that may emerge over time.

Ethical considerations must serve as guiding principles throughout the lifecycle of AI development and deployment in telehealth. From the design phase to real-world implementation, healthcare organizations and technology developers should prioritize ethical practices aimed at maximizing benefits for patients while minimizing potential harms. This entails adopting transparent and accountable approaches to AI governance, where decisions regarding algorithmic design, data utilization, and risk management are made with careful consideration of ethical implications. Moreover, fostering a culture of ethical awareness and responsibility among stakeholders is crucial in ensuring that AI technologies in telehealth are used ethically and responsibly to promote patient well-being and equitable healthcare delivery [20]. Furthermore, promoting patient-centeredness and empathy in AI-driven telehealth initiatives is essential for building trust and enhancing the patient-provider relationship. By prioritizing patient preferences, values, and autonomy, healthcare providers can ensure that AI-enabled telehealth services are designed to meet the unique needs and preferences of individual patients. Additionally, ongoing communication and feedback mechanisms are vital for soliciting patient input and addressing concerns related to AI utilization in telehealth. By fostering collaborative partnerships between patients and healthcare professionals, stakeholders can work together to navigate ethical complexities and promote the ethical and responsible use of AI in telehealth, ultimately advancing the goals of patient-centered care and equitable healthcare delivery [21].

Long-term Impacts and Societal Implications

The integration of AI into telehealth represents a transformative shift in healthcare delivery, with potential far-reaching implications for the roles and responsibilities of healthcare professionals and the broader landscape of healthcare employment. As AI technologies increasingly automate routine tasks and augment clinical decision-making processes, the traditional roles of healthcare professionals may evolve, necessitating adaptations in skill sets and job functions. While AI has the capacity to enhance efficiency and productivity within healthcare settings, it also raises questions about the future demand for certain healthcare roles and the redistribution of tasks between human and machine counterparts.

Moreover, the advent of AI in telehealth may have profound societal implications, including impacts on healthcare employment dynamics and workforce composition. As AI-driven

technologies assume greater prominence in healthcare delivery, there is a need to anticipate and address potential shifts in employment patterns, job displacement, and workforce training requirements. Proactive strategies are essential to ensure that healthcare professionals are equipped with the necessary competencies to leverage AI technologies effectively and adapt to evolving roles within the healthcare ecosystem.

Furthermore, considerations of equity and access must underpin the integration of AI in telehealth to ensure that technological advancements align with broader societal values and needs. While AI has the potential to improve healthcare accessibility and quality, there is a risk of exacerbating existing disparities if technological innovations are not deployed equitably. Efforts to promote inclusivity and address digital divides are essential to ensure that all segments of society can benefit from AI-enabled telehealth solutions, regardless of socioeconomic status or geographical location.

In navigating the long-term societal implications of AI in telehealth, stakeholders must engage in collaborative dialogue and stakeholder engagement processes to develop policies and strategies that align with broader societal values and priorities. By fostering transparency, accountability, and ethical stewardship in the development and deployment of AI technologies, healthcare systems can harness the transformative potential of AI in telehealth while advancing the goals of equity, accessibility, and patient-centered care.

Conclusion

The emergence of AI-enhanced telehealth heralds a new era of healthcare delivery, marked by unprecedented opportunities for innovation and advancement. These technologies hold immense promise in improving patient outcomes, enhancing diagnostic accuracy, and expanding access to healthcare services. However, amidst the excitement surrounding these advancements, it is imperative to navigate the ethical challenges inherent in AI-driven telehealth with careful consideration and foresight. Striking a delicate balance between innovation and ethical responsibility is paramount to harnessing the full potential of these technologies while safeguarding the well-being and rights of patients.

At the heart of ethical considerations in AI-enhanced telehealth lies the principle of beneficence, which dictates that healthcare interventions should aim to maximize benefits while minimizing harms. While AI technologies offer myriad benefits, including enhanced diagnostic capabilities and personalized treatment recommendations, it is essential to critically evaluate their potential risks and unintended consequences. Ethical decision-making processes should prioritize patient welfare, ensuring that the deployment of AI in telehealth aligns with the overarching goal of improving healthcare outcomes and enhancing patient experiences.

Moreover, the principle of autonomy underscores the importance of respecting patients' rights to make informed decisions about their healthcare. In the context of AI-driven telehealth, this entails providing patients with transparent information about the use of AI technologies, including potential limitations, risks, and implications for their care. Patients should have the opportunity to opt-in or opt-out of AI-augmented services based on their preferences and values, empowering them to exercise agency and control over their healthcare decisions.

Ethical considerations in AI-enhanced telehealth extend beyond individual patient interactions to encompass broader societal impacts and implications. Questions regarding equity, fairness,

and access to care must be carefully addressed to ensure that AI technologies do not exacerbate existing disparities in healthcare delivery. Efforts to promote inclusivity, diversity, and cultural sensitivity in the development and deployment of AI-driven telehealth solutions are essential for advancing healthcare equity and social justice [22]–[24].

Ultimately, navigating the ethical challenges associated with AI-enhanced telehealth requires collaboration among stakeholders across the healthcare ecosystem, including healthcare providers, technology developers, policymakers, and patient advocacy groups. By fostering dialogue, transparency, and accountability, stakeholders can work together to develop ethical frameworks and guidelines that promote the responsible use of AI technologies in telehealth, thus realizing the transformative potential of these innovations while upholding the principles of beneficence, autonomy, and justice in healthcare delivery.

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