



Medical Ethics In Modern Medicine: Balancing Technology And Humanity: A Critical Review

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Abstract:

The integration of advanced technology into healthcare has revolutionized medical diagnostics, treatment, and patient care, presenting both opportunities and ethical challenges. This critical review explores the delicate balance between embracing technological innovations and upholding the principles of medical ethics that prioritize human values and patient-centered care. It delves into the ethical considerations surrounding the use of artificial intelligence, telemedicine, genomic medicine, and experimental treatments, highlighting the importance of maintaining empathy, ensuring equitable access, and protecting patient privacy in a digital age. The review also examines the ethical dilemmas posed by emerging technologies and the necessity for healthcare professionals to navigate these complexities with a strong ethical compass. By analyzing current literature and case studies, this article underscores the need for ongoing education, policy development, and public engagement to address the ethical implications of technology in medicine. The ultimate goal is to foster an environment where technological advancements enhance healthcare without compromising the foundational ethical principles that guide medical practice.

Keywords: Medical Ethics, Technology in Medicine, Artificial Intelligence, Telemedicine, Genomic Medicine, Patient-Centered Care, Data Privacy, Experimental Treatments, Healthcare Access, Ethical Dilemmas

1. Introduction

The advent of the 21st century has ushered in unprecedented technological advancements, fundamentally transforming the landscape of modern medicine. The integration of cutting-edge technologies such as artificial intelligence (AI), machine learning, and genomic editing into healthcare has opened new frontiers in diagnostics, treatment, and personalized medicine. However, these advancements also usher in complex ethical dilemmas and challenges, necessitating a critical examination of medical ethics in the context of modern technology. This review aims to dissect the intricate balance between technological innovation and the core humanistic values that underpin medical ethics.

The principles of medical ethics, including autonomy, beneficence, non-maleficence, and justice, have long guided healthcare professionals in their decision-making processes [1]. These principles are now being tested in new and unforeseen ways as technology increasingly becomes intertwined with healthcare delivery. For instance, the deployment of AI in diagnostics and patient care raises questions about accountability, transparency, and the preservation of patient autonomy [2]. Similarly, the rise of telemedicine, particularly accentuated by the global COVID-19 pandemic, has highlighted issues related to equity of access, confidentiality, and the maintenance of the patient-physician relationship [3].

Moreover, the rapid advancements in genomic medicine, epitomized by technologies such as CRISPR, present profound ethical considerations regarding consent, genetic privacy, and the potential for unforeseen consequences [4]. These technological interventions not only redefine the boundaries of what is medically possible but also challenge the ethical frameworks that govern medical practice.

In navigating these complex ethical landscapes, the medical community is confronted with the critical task of balancing technological progress with the fundamental ethos of medicine—to care, to heal, and to do no harm. This review critically explores how the integration of technology in medicine is redefining ethical considerations and examines strategies to ensure that humanity remains at the core of healthcare. Through a comprehensive analysis of current literature, case studies, and ethical debates, this article aims to contribute to the ongoing discourse on maintaining ethical integrity in the face of rapid technological advancement in healthcare.

As medicine continues to evolve at a breakneck pace, the need for a robust ethical framework that can adapt to and encompass the challenges posed by new technologies has never been more critical. This review seeks to chart a course for the future of medical ethics, one that harmonizes the potential of technology with the timeless values of compassion, empathy, and human dignity.

2. The Digital Transformation of Healthcare

The digital transformation of healthcare represents a paradigm shift in how medical services are delivered, leveraging technology to improve patient outcomes, enhance the efficiency of healthcare systems, and address complex health challenges. This section delves into key aspects of this transformation, including the integration of artificial intelligence (AI) and machine learning in diagnostics and treatment, the expansion of telemedicine, and the ethical implications associated with electronic health records (EHRs).

Integration of AI and Machine Learning

AI and machine learning have become integral to modern healthcare, offering innovative solutions for diagnostics, predictive analytics, and personalized treatment plans. These technologies can analyze vast datasets, identify patterns, and support clinical decision-making processes with greater accuracy and speed than traditional methods. For instance, AI algorithms are increasingly used in radiology to detect anomalies in imaging scans with high precision, potentially identifying conditions earlier and with greater accuracy than human practitioners [5].

Expansion of Telemedicine

The COVID-19 pandemic accelerated the adoption of telemedicine, breaking down geographical barriers and making healthcare more accessible, especially in remote and underserved areas. Telemedicine offers a platform for virtual consultations, remote monitoring, and digital health assessments, reducing the need for physical hospital visits and thereby decreasing the risk of infectious disease transmission [6]. However, this rapid expansion raises questions about data security, patient privacy, and the potential loss of personal interaction between patients and healthcare providers.

Ethical Implications of Electronic Health Records (EHRs)

EHRs have transformed healthcare documentation, making patient information more accessible and facilitating coordinated care. Despite their benefits, EHRs present ethical challenges related to data privacy, consent, and security. The digitization of health records increases the risk of data breaches, potentially compromising patient confidentiality [8]. Furthermore, the use of EHRs involves navigating complex regulatory landscapes, such as the Health Insurance Portability and Accountability Act (HIPAA) in the United States, which mandates stringent protections for patient health information.

The digital transformation of healthcare is reshaping the medical landscape, offering unprecedented opportunities for improving patient care and operational efficiency. However, it also brings forth ethical dilemmas that must be carefully managed. As technology continues to evolve, healthcare providers, policymakers, and technologists must collaborate to ensure that ethical considerations are at the forefront of this digital revolution, safeguarding patient rights and maintaining trust in the healthcare system.

3. Human-Centric Medicine in the Age of Technology

In the age of rapid technological advancement, the concept of human-centric medicine emphasizes the importance of maintaining a focus on the patient as a whole person, rather than merely a subject of clinical interventions. This approach seeks to balance the benefits of technological innovations in healthcare with the need for compassion, empathy, and personalized care. Below, we explore the key elements of human-centric medicine in the context of modern technology, along with the challenges and opportunities it presents.

Emphasizing Empathy and Patient-Centered Care

The essence of human-centric medicine lies in its emphasis on empathy, compassion, and understanding the patient's unique experiences and needs. Despite the efficiency and precision offered by technologies like AI and telemedicine, the importance of human touch, empathy, and interpersonal communication in healing cannot be overstated. Research has shown that patient outcomes improve significantly when healthcare providers focus on building strong, empathetic relationships with their patients [8].

Integrating Technology without Losing the Human Touch

While technology can enhance the ability to diagnose and treat diseases, it is crucial to integrate these tools in a way that complements the human aspect of healthcare. For instance, telehealth services can offer convenience and accessibility, but they should be designed to facilitate, rather than replace, the personal connection between healthcare providers and patients [9].

Ethical Considerations in Personalized Medicine

The rise of personalized medicine, powered by genomics and data analytics, offers the promise of treatments tailored to individual patient characteristics. However, this approach also raises ethical questions regarding privacy, consent, and the

potential for data misuse. Ensuring that these technologies are employed ethically and with respect for patient autonomy is a cornerstone of human-centric medicine [10].

Addressing Health Equity

Human-centric medicine also involves addressing disparities in healthcare access and outcomes. Technological advancements must be leveraged to reduce, rather than exacerbate, health inequities. This includes ensuring that innovations are accessible to diverse populations, including those in low-resource settings [11].

Human-centric medicine in the age of technology represents a holistic approach to healthcare that values the integration of technological innovations with a deep commitment to empathy, patient autonomy, and equity. As the healthcare landscape continues to evolve, maintaining this balance will be essential in delivering care that not only treats diseases but also nurtures the well-being of individuals in a comprehensive manner.

4. Ethical Challenges in Genomic Medicine

The integration of genomic medicine into healthcare practice has brought about transformative changes in diagnostics, treatment, and preventive care. However, this integration also presents significant ethical challenges that need to be addressed to ensure the responsible use of genomics in medicine. These challenges revolve around issues of consent, privacy, equity, and the potential for genetic discrimination.

Obtaining informed consent in genomic medicine is complex due to the broad implications of genetic information. Unlike standard medical tests, genomic testing can reveal information not only about the patient but also about their biological relatives, raising questions about consent and confidentiality. Moreover, the predictive nature of genetic information necessitates clear communication about the scope, limits, and potential implications of genomic data [12].

The storage and use of genetic information pose significant privacy concerns. Ensuring the confidentiality of this sensitive data is paramount, as unauthorized access or breaches can lead to misuse, including genetic discrimination by employers or insurers. The ethical management of genomic databases, including who has access and for what purposes, remains a critical issue [13].

Genomic medicine has the potential to exacerbate existing health disparities due to unequal access to genetic testing and personalized treatments. Ensuring equitable access to these advanced medical services is an ethical imperative, requiring policies and practices that address socioeconomic, racial, and geographical barriers to care [5].

The potential for genetic discrimination is a significant ethical concern. Individuals may face discrimination based on their genetic predisposition to certain diseases or conditions, affecting their employment, insurance, and social standing. Legislation such as the Genetic Information Nondiscrimination Act (GINA) in the United States seeks to address this issue, but ongoing vigilance and advocacy are necessary to protect individuals' rights [14].

The use of genomic data in research raises additional ethical considerations, including the consent process for the use of genetic material in future studies, the sharing of research findings with participants, and the potential commercialization of genetic information. Establishing ethical guidelines for genomic research is crucial to protect participants and ensure the responsible advancement of science.

The ethical challenges in genomic medicine necessitate a multidisciplinary approach, involving ethicists, healthcare professionals, policymakers, and patients. Developing comprehensive guidelines, policies, and educational programs is essential to navigate these ethical complexities and harness the full potential of genomic medicine for the betterment of patient care.

5. The Ethics of Experimental Treatments and Clinical Trials

The realm of experimental treatments and clinical trials is fraught with ethical complexities that demand careful navigation to protect participants and advance medical science responsibly. The ethical framework governing these areas is built on principles such as respect for persons, beneficence, and justice, ensuring that the rights and well-being of participants are prioritized. This discussion explores key ethical considerations in the conduct of experimental treatments and clinical trials.

Informed consent is a cornerstone of ethical research, ensuring that participants are fully aware of the nature of the study, the potential risks and benefits, and their rights as participants, including the right to withdraw at any time. This process must be conducted in a manner that is free from coercion or undue influence, and special attention must be paid to populations that may be vulnerable or have limited capacity to consent [2].

Experimental treatments and clinical trials must undergo rigorous risk-benefit assessments to ensure that the potential benefits to participants or society justify the risks involved. These assessments must be continually re-evaluated as new data emerge during the course of the research [15].

The selection of participants in clinical trials must be equitable, avoiding both the unjust exclusion of groups who might benefit from the research and the disproportionate inclusion of vulnerable populations who might be unduly burdened by participation. Ensuring diversity in clinical trials is also crucial for the generalizability of results and equity in access to potential benefits.

Protecting the privacy and confidentiality of clinical trial participants is essential, especially given the sensitive nature of health data. Researchers must implement stringent measures to safeguard participant information, both during and after the trial [16].

Ethical considerations extend beyond the conclusion of the trial, including the provision of post-trial access to effective treatments for participants and ensuring that communities that contribute to research benefit from its results. This is particularly relevant in international research, where disparities in healthcare access can be pronounced.

Stringent regulatory oversight and ethical review by independent ethics committees or institutional review boards are critical to ensuring that clinical trials adhere to ethical standards. These bodies protect the interests of participants by reviewing the scientific validity, ethical acceptability, and regulatory compliance of proposed research [9].

The ethical conduct of experimental treatments and clinical trials is foundational to the integrity of medical research. By adhering to established ethical principles and guidelines, researchers can navigate the complexities of this field, ensuring that advances in medical science are achieved responsibly and with respect for the dignity and rights of all participants.

6. Global Health Ethics and Technology

Global health ethics, particularly in the context of technology, addresses the complex moral challenges that arise from the application of medical technologies across diverse cultural, economic, and political landscapes. The ethical use of technology in global health requires careful consideration of equity, access, cultural sensitivity, and the potential for unintended consequences. This section explores key ethical considerations in leveraging technology to improve health outcomes worldwide.

Equity and Access to Healthcare Technology

A primary ethical concern in global health is ensuring equitable access to medical technologies. Disparities in access between high-income and low- and middle-income countries (LMICs) can exacerbate existing health inequities. Efforts to bridge this gap must consider the affordability, appropriateness, and availability of technologies in diverse settings [17].

Cultural Sensitivity and Appropriateness

Technologies that are successful in one cultural context may not be suitable or acceptable in another. Ethical deployment of health technologies requires a deep understanding of local cultures, values, and health practices. Engaging local communities in the development and implementation of technologies ensures that interventions are culturally sensitive and more likely to be effective [18].

Capacity Building and Sustainability

For technology to have a lasting impact on global health, it must be accompanied by efforts to build local capacity. This includes training healthcare workers, ensuring ongoing technical support, and developing infrastructure. Sustainable interventions are those that empower local healthcare systems rather than creating dependency [10].

Data Ethics in Global Health

The use of digital health technologies raises significant ethical concerns regarding data privacy, consent, and security, particularly in regions with weak data protection laws. Ensuring that digital health initiatives respect patient privacy and autonomy is crucial in maintaining trust and protecting individuals' rights [19].

Ethical Research and Innovation

Conducting ethical research and innovation in global health technology requires adherence to principles of justice, respect for persons, and beneficence. This includes ensuring that research agendas are aligned with the health needs of populations and that the benefits of innovation are shared equitably [20].

Addressing the Digital Divide

The digital divide, or the gap between those with and without access to digital technology and the internet, poses a significant barrier to the equitable use of health technologies. Addressing this divide is essential in preventing the exacerbation of health disparities and ensuring that the benefits of health technologies are accessible to all.

The ethical deployment of technology in global health requires a multifaceted approach that considers equity, cultural sensitivity, sustainability, data ethics, and the digital divide. By addressing these ethical challenges, the global health community can leverage technology to improve health outcomes and reduce disparities worldwide.

7. Future Perspectives: Anticipating Ethical Dilemmas

As healthcare continues to evolve with rapid technological advancements, anticipating future ethical dilemmas is crucial for proactive and responsible integration of innovations. The future of healthcare ethics will likely confront challenges related to emerging technologies such as advanced artificial intelligence (AI), enhanced data analytics, and novel biomedical interventions, all of which will raise new ethical considerations.

Ethical Implications of Advanced AI in Healthcare

The increasing sophistication of AI in healthcare, including autonomous systems capable of making clinical decisions, raises significant ethical questions regarding accountability, transparency, and the preservation of human oversight in medical decision-making. Ensuring that AI systems are developed and implemented in ways that respect patient autonomy and do not compromise the therapeutic relationship is essential [21].

Privacy and Security in an Era of Enhanced Data Analytics

As healthcare data becomes increasingly complex and voluminous, ensuring the privacy and security of this information is a paramount concern. The potential for sophisticated data analytics to inadvertently reveal sensitive information, or for breaches to have far-reaching consequences, necessitates robust ethical frameworks and regulatory standards for data protection.

Gene Editing and Biomedical Enhancements

Technologies like CRISPR and other gene-editing tools present profound ethical challenges related to germline modifications, enhancement versus therapy distinctions, and the potential for unintended ecological or genetic consequences. The ethical discourse will need to address the implications of these technologies not only for individuals but for future generations and society at large.

Digital Health Divides and Global Equity

As digital health technologies become more pervasive, there is a risk of widening the health divide between different populations, particularly between high-income countries and low- and middle-income countries. Addressing the ethical imperative to ensure equitable access to health technologies will be critical in the coming years [22].

The Role of Patients in the Digital Health Ecosystem

The evolving role of patients as active participants in their healthcare, facilitated by technology, raises ethical considerations regarding patient empowerment, consent in a digital context, and the potential for information overload or misinterpretation. Developing ethical guidelines that support patient engagement while safeguarding well-being will be essential [14].

Ethical Frameworks for Unforeseen Technologies

As new technologies emerge, so too will unforeseen ethical dilemmas. The healthcare community must remain agile, developing adaptive ethical frameworks that can address the novel challenges posed by future innovations. This includes fostering an ethical culture within healthcare and biomedical research that emphasizes continuous learning, flexibility, and collaboration across disciplines [13].

Anticipating and addressing the ethical dilemmas of future healthcare technologies requires a forward-thinking approach that encompasses multidisciplinary perspectives and public engagement. By fostering dialogue and developing robust ethical frameworks, the healthcare community can navigate the complexities of innovation while upholding the fundamental principles of medical ethics.

8. Conclusion: Finding Equilibrium

In the rapidly evolving landscape of modern medicine, where technological advancements continually redefine the possibilities of healthcare, finding an equilibrium between innovation and ethical medical practice is paramount. The journey through the integration of artificial intelligence, telemedicine, genomic medicine, and experimental treatments into healthcare has illuminated the vast potential for improving patient outcomes and the efficiency of healthcare systems. However, it has also underscored the significant ethical challenges that accompany these advancements, from issues of privacy and equity to the maintenance of the patient-physician relationship and the preservation of human dignity.

The equilibrium sought is not a static point but a dynamic balance that must be continually negotiated as new technologies emerge and societal values evolve. This balance requires a commitment to ethical principles that prioritize the well-being, autonomy, and rights of patients while embracing the transformative potential of technology. It calls for robust ethical frameworks that are adaptable to the changing landscape of healthcare and responsive to the complexities introduced by innovation.

Healthcare professionals, ethicists, policymakers, technologists, and patients themselves must engage in ongoing dialogue to navigate these ethical landscapes. Education and training in ethics should be integral to the preparation of healthcare professionals, ensuring they are equipped not only with the technical skills to utilize new technologies but also with the ethical reasoning skills to make decisions that uphold the core values of medicine.

Moreover, policies and regulations must evolve in tandem with technological advancements, providing clear guidelines that safeguard patient interests while fostering innovation. Public engagement is also crucial, as it ensures that the development and implementation of healthcare technologies are aligned with societal values and patient needs.

In conclusion, the quest for equilibrium in the intersection of technology and medical ethics is a collective endeavor that demands vigilance, compassion, and collaboration. By holding fast to the ethical foundations of healthcare while boldly exploring the frontiers of medical technology, we can ensure that the future of medicine enhances the health and well-being of all individuals, without compromising the humanistic values that define the essence of medical care.

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