Ethical use of digital tools in medicine – a review on key-concepts and challenges

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Abstract: *In an era where technology is reshaping every aspect of our life, medical practice is subject to profound transformations as artificial intelligence (AI) is already modifying doctor-patient relationship, patient empowerment and doctor`s decision-making processes. Aiming at exploring the ethical dilemmas health professionals may experience as well as responsibilities and ethical challenges we tried to deepen our understanding of how the digital realm may impact our awareness and ability to facilitate a high-quality medical act having as always patient`s well-being in the forefront of our values. We explored topics such as data confidentiality, protection, digital literacy, ethical use of digital tools with a focus on telemedicine, mobile devices and generative AI trying to offer a critical and comprehensive ethical perspective on the questions the digital environment poses onto us, as professionals as well as patients. Focusing on keeping the essential out of the medical services digitalization we encouraged a balanced approach as well as highlighting the urgent needs of guidelines and policies for including digital tool as assistants in our current medical practice.*

Keywords: digital ethics, medical practice, digitalization, ethical, artificial intelligence.

1. Introduction

Digitalization and artificial intelligence (AI) technologies face challenges from socio-technical dogmatism and technological skepticism, which highlight academics' concerns over the ethical issues related to rights, virtues, and consequences (Watson et al., 2024). Socio-technical dogmatism is a notion that emphasizes the capacity of technological advancement to drive economic and social development (Andreessen, 2023), guaranteeing a prosperous future as long as it is not impeded or constrained (Kurzweil, 2005). Conversely, socio-technical skepticism emphasizes technology's potential to inflict damage or intensify existing social and economic injustices and inequities. The latter pertains to the necessity for increased laws, encompassing enhanced supervision of the design and utilization of AI systems. Socio-technical pragmatism is a paradigm that constructively integrates both views, emphasizing the historical contradictions

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between the necessity of utilizing technology and the obligation to comply with existing regulations governing its usage (van Dijk, 2024). Prominent contemporary philosophers contend that the effects of digitalization and AI predominantly hinge on design (Floridi, 2021) and argue that ethical discussions surrounding AI-driven decision-making must consider social inequality (Kearns & Roth, 2019), while other scholars stress the necessity of regulation prior to innovation (Mesko et al., 2023). In medicine, we must emphasize patient safety and benefits, which entails utilizing current technology to produce new pharmaceuticals or to diagnose properly. Indeed, there exists bureaucracy associated with training the reactions of these digital instruments, as well as limitations on the future advancement of life-saving AI-based treatments. Consequently, a genuine ethical conflict emerges between innovation, regulation, and growth, as well as between pro-social and pro-corporate results (Watson et al., 2024).

During the COVID-19 pandemic, efficiency and time savings were demonstrated; nevertheless, difficulties related to data utilization in healthcare and research necessitate an ethical revision that incorporates humanistic and civic values (Seroussi et al., 2024). In an age where digital technology is sufficiently advanced to induce significant usage mistakes, and its prevalence is expected to persist in the next decades, the paradigm of patient care will undergo transformation. However, in what manner? Unethical behaviors can engender suspicion, anger, and frequently unwarranted disputes in the doctor-patient relationship (Hansson et al., 2024). Technologies like as telemedicine, artificial intelligence algorithms, medical data, self-monitoring, and electronic medical records can enhance the quality of patient treatment. From an ethical standpoint, the notions of digital accountability and "digital empowerment" for patients may evolve, necessitating informed strategies from medical practitioners, while the paternalistic dynamic with a new authoritative entity represented by the digital system will inevitably transform patient interactions with healthcare professionals (Mesko et al., 2017; Seroussi et al., 2024). Digital ethics in medicine upholds fundamental medical ethical principles, including autonomy, confidentiality, beneficence, justice, and non-maleficence, while applying the ethical standards of in-person healthcare to digital service delivery (Beauchamp et al., 2019).

2. Methods

We employed a mini-review methodology integrating existing literature from multiple academic sources, focusing on recent advancements and databases such as PubMed, Scopus, and Google Scholar. The search strategy included key terms such as "digital ethics in medicine," "artificial intelligence in healthcare," "telemedicine ethics," "electronic medical records security," "data privacy in digital health," and "ethical decision-making in AI-driven healthcare." We prioritized peer-reviewed journal articles, books, and policy reports published in the last years, with a particular focus on publications from 2022 onward. Key ethical dilemmas, including decision-making transparency, algorithmic bias, patient empowerment,

and data security, were identified and critically examined. A thematic analysis was conducted to extract the most relevant ethical concerns and recommendations for medical practitioners and policymakers.

3. Digital ethics principles in medicine

The digital aspect of medical ethics incorporates the social, technological, cultural, and political frameworks within which services are delivered, with digital implementation presenting challenges concerning privacy, security, data protection, transparency, equity, accessibility, and digital accountability (Seroussi et al., 2024). Among the medical ethical principles pertinent to digital ethics, we highlight the principle of autonomy: honoring patients' rights to make informed decisions regarding their care, now revised to encompass consent for data utilization in health interventions within telemedicine or health monitoring applications, which introduces dilemmas concerning decision-making accountability (Hansson et al., 2024); beneficence: the imperative to guarantee that the employed technologies serve exclusively the patient's benefit and do not adversely impact the outcomes of digital interventions, including the necessity to ensure that the initial design of these technologies adheres to ethical standards; Non-maleficence entails the prevention of harm to patients resulting from the improper, negligent, or malicious application of digital technologies, errors in evaluation, diagnosis, and treatment by algorithms, reliance on medical critical thinking, and the emergence of cognitive biases due to excessive dependence on digital technologies, alongside the implications for professionals' digital competencies (Choi et al., 2024). Justice involves ensuring equitable access to health-promoting technologies, preventing the digital literacy deficit from adversely affecting patient health, and addressing issues of digital inequity or exacerbating existing inequalities (Lang et al., 2023; Nickel et al., 2024). The principle of confidentiality now encompasses safeguarding against unauthorized data access on digital platforms and preparing for medical emergencies where confidentiality may be compromised (Floridi et al., 2021; Lang et al., 2023; Hansson et al., 2024).

4. Ethical usage of digital tools

Whether we are discussing electronic medical records, telemedicine platforms, AI-based diagnostic tools, or mobile health applications, these tools have already proven their efficiency, accuracy, and ease of accessibility. Thus, specific ethical challenges deserve to be debated considering the risk of increasing inequity in healthcare provision (Chesire et al., 2022; Lewis et al., 2024).

4.1 Electronic medical records

Electronic medical records enhance the efficiency of patient treatment by promoting cooperation and accessibility, while simultaneously improving patient

compliance and quality, and decreasing medical mistakes (Ozair et al., 2015). Ethical considerations encompass confidentiality and data protection, which may be compromised by sensitive material that can readily result in isolation and stigmatization. Consequently, securing consent must be a paramount consideration for professionals when permitting third-party access to documents. The capacity to input data, ensure its accuracy, and enable exchange with other information systems without compromising the data's meaning can be undermined by errors, resulting in consequences such as insufficient diagnoses, modified treatments, and diminished patient prognosis, among others (Paccoud et al., 2024).

4.2 Artificial intelligence technology

Artificial intelligence (AI) denotes a computer or software's capacity to emulate intelligent human behavior, execute rapid computations, resolve issues, and assess fresh data based on prior evaluations (Tang et al., 2023). This technology represents a singular opportunity for the advancement of healthcare by transforming professional duties and enhancing workflow and administrative efficiency, all while promising patient-centered treatment (Hansson et al., 2024). The transparency of AI-based algorithms, defined as a comprehensive knowledge of the mechanisms by which AI generates solutions, would greatly enhance the confidence of both professionals and patients (Kenig et al., 2024). Furthermore, experts must elucidate to patients the concepts underlying this technology, which is immediately engaged in the medical procedure, but only when they possess a comprehensive understanding of it (McCoy et al., 2024). A crucial subject is the necessity of ongoing human supervision and the entire assumption of accountability in medical choices, viewing AI technology as a supportive tool rather than a total substitute for professionals (Talyshinskii et al., 2024). Research indicating patients' perspectives towards AI now reveals an optimistic perspective; but, concurrently, they see threats to their safety, privacy, and autonomy (Bahadir et al., 2024). Discussions suggest that the autonomy to determine the inclusion or exclusion of AI in medical practice, to challenge the diagnosis, and to receive an explanation of the diagnosis, is exclusively the patients' prerogative. Significant worries exist over the privacy and security breaches of medical data for both patients and professionals; nonetheless, this is unavoidable since machine learning algorithms necessitate extensive data for development (Rogers et al., 2021). Currently and in the near future, patients will not obtain a direct diagnosis from a machine learning software; instead, it will serve as one of the resources utilized by the diagnosing physician (Ploug & Holm, 2020).

4.3 Decision-making

Decision-making is a critical component in the discourse on digital ethics in medicine, as AI-driven judgments appear to lack transparency (Yu et al., 2022). Artificial intelligence might exacerbate pre-existing prejudices within the medical sector due to the inherent bias in the testing dataset, which can result in erroneous

and biased learning, hence perpetuating inequities and producing misleading predictions (Ionescu et al., 2024; Obermeyer et al., 2019). A further problem may arise from digital paternalism in the therapeutic interaction characterized by the "algorithm/computer knows better" paradigm (Risling et al., 2017). Conversely, a departure from the conventional paternalism of physicians, manifested as the "medical emancipation" of patients, may result in an increased moral accountability for the firms developing the AI systems. A significant issue with algorithms is that their failures can result in errors that people do not often commit (Alvarado, 2022). AI cannot rectify these errors independently and may persist in generating anomalous outcomes, in contrast to humans who can amend their own faults. Finally, once an AI system gains access to extensive data capable of predicting health and sickness, can we contemplate the potential for AI algorithms to categorize patients as "winners" and "losers" in the context of disease?

4.4 Telemedicine

Increased availability of virtual consultations can yield advantages, including enhanced convenience for patients and improved access and comfort for experts. The standard of medical treatment in the digital age should match that of conventional medical care, and practitioners must distinctly determine whether traditional consultation is warranted for the patient. The omission of a physical examination, a specific nuance disregarded, may lead to compromises for convenience, as severe conditions like atrial fibrillation or valvular diseases can pose critical challenges in making complex decisions where the physical examination is vital for identifying subtle signs. Telemedicine now yields varying degrees of patient satisfaction, and rigor is a crucial element for enhancement (Adams et al., 2021). Nonetheless, if in-person consultations are intrinsically superior, the proliferation of telemedicine might inadvertently create a dual system for already marginalized patients, so intensifying structural disparities (Tolchin et al., 2020; Hull et al., 2022).

4.5 Mobile health applications

Concerning mobile health applications, medical professionals should ensure that both they and patients fully understand which third parties may have access to the data collected (Deniz-Garcia et al., 2023). Additionally, the recommendation of these applications should be made only after rigorous documentation and not involving other individual or institutional conflicts of interest. Having clear benefits in self-determination and empowerment in rapid accessibility or reducing stigma, this self-management approach may not benefit certain vulnerable groups such as those suffering from mental disorders. Professionals need to ensure that self-monitoring is truly appropriate to the individual resources of patients, resources that include aspects of digital literacy, among others (Morley et al., 2020). Taking the subject of autonomy further, it is worth mentioning that it can easily become an ambivalent concept, leading self-monitoring to acquire a

disciplinary effect, forcing patients into a routine dictated by technical equipment (Rubeis et al., 2022). This contradicts personalization, one of the supposed main advantages of mobile applications, so that when users must adapt to technology instead of technology being tailored to their needs and resources, self-determination is challenged (Morely & Floridi, 2020). This can be perceived as a severe burden and a psychological stress factor by users (Mittelstadt & Floridi, 2016). At the same time, Big Data technologies are inherently data-hungry and require increasingly larger datasets to provide useful results and be validated. The total volume of collected data poses the risk that users may not be able to monitor what data is being used and for what purpose (van Genugten et al., 2020; Rubeis, 2022).

4.6 Datafication

Over the last decades, the capacity to collect, store, and analyze individuals' physiological, behavioral, and locational data has influenced several aspects of daily life, including entertainment, education, urban planning, and epidemiology (Anderson, 2008). Datafication in medicine transpires at several levels, encompassing data-driven medical research and public health infrastructures like biobanks and public databases, along with fitness and health equipment and smartphone applications. Data extraction frequently necessitates reduction and oversimplification, perhaps overlooking the distinctiveness of the patient's experiences. Furthermore, the data requires pre-processing, necessitating the definition of variables for the systems to generate them (Abbe et al., 2016). In this regard, the potential for prejudice obviously emerges. Furthermore, patient information may be "translated" into a predefined schema, so reducing individual features to conventional domains (Becker et al., 2018), a process already driven by the cost efficiency of therapies and data collecting (de Laat, 2019). Consequently, the emphasis transitions from the individual to the collective. Consequently, customization, the primary aim of contemporary medicine, may face ethical scrutiny (Tai et al., 2019). It is essential to highlight biases, particularly when analyzing the data of a person whose traits are absent from the machine learning training dataset (Challen et al., 2019). Consequently, we are examining ethnic, gender, and particularly socioeconomic variables that may significantly influence this process when they lack transparency (Carr et al., 2020).

5. Discussions and perspectives

Advancing digital ethics principles in medicine needs the reassurance that innovation will serve as enhancing human expertise not replacing it. Regular updates with the technological advancements and ethical principles alignment should include openness, patient autonomy and of course, digital equity. We advocate for regulatory guidance and supervision as the consequences of healthcare access inequities will undermine health systems and society. Telemedicine, mobile

health applications will enhance accessibility but there is need to consider the importance of the quality of patient-physician interaction as one of the most important clinical challenges digital medicine will put. Our reflection made us question whether digital inequity will lead to overprescription of telemedicine interactions rather than physical ones in the name of accessibility. More than that, we are concerned that human supervision in decision-making practices should be a key-concept and priority to mitigate the risks of automation biases. We support the concept of collaborative strategy including lawmakers, medical professionals and digital specialists to facilitate the development of regulatory frameworks suitable for Romania in relationship with the current technological advancements having as the main aim patient well-being and the integrity of medical professionals.

From an educational perspective we actively contributed by creating in 2023 the first course of Digital Ethics in Medicine in Romania for first-year medical students thus helping to lay the basics of digital ethics theoretical foundations and awareness among future doctors.

6. Conclusions

The integration of digital instruments in medicine offers tangible advantages to medical practice, although it also presents several ethical dilemmas that we have endeavored to delineate above. It has frequently been underscored that AI systems need to serve as instruments for experts rather than substitutes. This concept can only be implemented effectively if top decision-makers acknowledge the risks associated with the depersonalization of healthcare. From a social justice point, there is a significant danger that those with little resources would resort to inexpensive health applications instead of seeking consultation with a healthcare expert.

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