Legal and Ethical Challenges of Using Artificial Intelligence in Physiotherapy and Digital Rehabilitation

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Submitted: 2025-07-15; **Accepted**: 2025-09-06; **Doi:** *https: doi.org. 10.22037/jcpr. v10i1.50869*

Abstract

Introduction: Artificial Intelligence has vast potential to transform physiotherapy and digital rehabilitation by improving the accuracy of diagnosis, treatment planning, and patient outcomes. Its fast adoption into the healthcare industry, however, requires an in-depth review of the legal and other ethical concerns involved. These issues cut across key domains of information privacy, algorithm discrimination, transparency, accountability, and the maintenance of human-centered care, which are essential in the responsible use of Artificial Intelligence. **Methods:** The article is based on a descriptive-analytical approach to discovering, summing up, and evaluating the legal and ethical issues related to the artificial intelligence in physiotherapy and rehabilitation. The reviewed databases were Medline (PubMed), Embase (OVID), Scopus, Web of Science, Google Scholar and SSRN. Articles that were published within the period of 2010 to 2025 were searched so that only the most recent development and discussion in this field are reflected. **Results:** The potential of Artificial Intelligence is indeed great, but there are numerous compound ethical and legal challenges to its application. Among the ethical concerns, there is patient data privacy. Algorithm's bias develops the possibility of unfair outcomes. Some Artificial Intelligence systems have a black box character, which contests transparency and explainability and undermines trust and informed decision-making. It is legally unclear how to delineate accountability and liability in the case of errors caused by Artificial Intelligence because there are no established regulatory frameworks. **Conclusion:** The ethical and successful introduction of Artificial Intelligence into physiotherapy and digital rehabilitation is determined by a proactive approach to the challenges that this technology poses in the legal and ethical context. This necessitates the formulation of sound regulatory policies, explicit ethics, and thorough training of medical workers. The importance of data privacy, reducing algorithmic bias, improving transparency, and better understanding accountability is of utmost priority in making Artificial Intelligence an extension and not a replacement of human-centered care. The future of Artificial Intelligence in this aspect relies on a fine line between the technological innovation and the firm adherence to the ethics and the best interests of patients.

Keywords: Artificial Intelligence, Legal, Ethical, Physiotherapy, Digital Rehabilitation.

***Please cite this paper as*:** Kalantari KK, Ghanbari A. Legal and Ethical Challenges of Using Artificial Intelligence in Physiotherapy and Digital Rehabilitation. J Clin Physio Res. 2025; 10(1): e1. Doi: *https: doi.org. 10.22037/jcpr. v10i1.50869*

Introduction

Artificial intelligence (AI) has become a revolutionary product in different fields of the society such as physiotherapy and digital rehabilitation (1). Recent progress in machine learning (ML) and artificial intelligence, especially in the field of developing algorithms, computer capabilities as well as access to massive data has multiplied the effectiveness of these technologies in a variety of healthcare areas (2). AI is in the process of use in physiotherapy to improve the accuracy of diagnostics, individual treatment plans, and clinical decision-making (3). Nonetheless, similarly to any emerging technology, AI in physiotherapy gives rise to the issue of the juridical and ethical aspects of the practice. The importance of this problem is also supported by the fact that AI can automate the functions that have traditionally been regarded as part of the field (4). Initial studies and use of AI in physiotherapy were aimed at determining its

ability to improve care delivery plans and other factors of the profession (5). C. Tack (2019) and other authors also pointed to the seemingly promising nature of intelligent machines as an addition to physiotherapy, prompting practitioners to be more aware of such technologies.

On the same note, M. Alsobhi, (2022) examined the knowledge and attitudes of the physical therapists about AI, where the study found out that the use of AI in rehabilitation is increasing at a very high rate and the perceptions of the physical therapists towards AI (6). Their results demonstrated that the general AI knowledge was available, but the specific AI application knowledge in rehabilitation was less, which revealed the gap in education and experience.

A number of systematic reviews and extensive analyses have been carried out in order to survey the terrain of AI in physiotherapy. As an example, K. Aytutuldu et al. (2025) carried out a bibliometric test of 187 articles published in 2001-2024, with publications in 2023 recording the highest number of publications. Their search found "machine learning," "rehabilitation" and "artificial intelligence" to be among the most prevalent words, which indicates the increasing applicability of AI-based technologies in clinical practice, therapeutic decision making, as well as in the context of rehabilitation research.

Although AI has many positive aspects, the introduction of AI into the process of physiotherapy and rehabilitation is associated with serious legal and ethical issues that need to be overcome. These issues include the problem of data privacy, algorithm bias, transparency, responsibility, and care human aspect (7).

The article is a contribution to the current body of knowledge, as it synthesizes a multi-perspective report on the recent findings and outlines the current situation and future characteristics of AI applications in physiotherapy. Although other authors have already conducted extensive research on different areas in this direction, the novelty of this article is that it consists of different perspectives, certain numerical data, and clear concise manner of presentation that highlights both progress and issues.nature of the RTS process.

Material and Methods

The article is based on the descriptive-analytical approach, in which the legal and ethical issues related to artificial intelligence use in physiotherapy and rehabilitation are identified, summarized, and analyzed. The databases that were reviewed were Medline (PubMed), Embase (OVID), Scopus, Web of Science, Google Scholar, and SSRN.

The main search terms were artificial intelligence, AI, machine learning, ML, deep learning, ethics, ethical concerns, legal issues, legal implications, physiotherapy, and physical therapy, and rehabilitation, and digital rehabilitation. The search was narrowed to the articles within the period of 2010 and 2025 to include the latest developments and debates in this field. Articles that were to be included in the review were determined by the following criteria:

Type of Study, it included systematic reviews, original research articles, review articles, and theoretical articles. Articles needed to directly focus on either ethical or legal issues associated with the use of AI (including machine learning and deep learning) in physiotherapy, rehabilitation, or digital healthcare. Articles published in other languages were excluded. Articles should be within the period of 2010 and November 2025. The articles regarding the use of AI in other medical areas that are not closely related to physiotherapy and rehabilitation were not included in the review.

Also, non-scholarly materials, news articles, and blogs were not included. The obtained data were subjected to a qualitative thematic analysis. This analysis sought to determine recurrent patterns, inconsistencies, and gaps in the literature on research to give a holistic view of the ethical and

legal issues surrounding AI in the physiotherapy and digital rehabilitation. Following the ultimate article filtering, the necessary data related to the legal and ethical issues of AI in physiotherapy and digital rehabilitation was taken out of each article.

Results

Studies have suggested that the use of artificial intelligence in physiotherapy and rehabilitation has greatly grown over the past few years (3). The keywords that are popular in this area are usually machine learning, rehabilitation, and artificial intelligence. The accuracy and individualization of patient treatment are improved with the help of multivariate prediction models, which evaluate long-term patient results, especially in the case of hip fracture (8). With the use of machine learning algorithms, a patient can have tailor-made care plans based on their medical records and the reaction to previous treatment (9).

AI can also be used to automate the processes that are currently being conducted manually and this means that physiotherapy professionals can have more time to concentrate on the human part of patient care (10). Nonetheless, the current limitation to the implementation of responsible AI is the issue of data quality, bias, and privacy (11).

Sufficient majority of physiotherapists (80.9%) think that AI will be provided into the practice of physiotherapy in the future and 78.6% predict a significant influence on their work (12). High enthusiasm notwithstanding, such challenges as absence of formal AI training and organizational unpreparedness have been pointed out. We have identified a setting where the potential of AI is high, but its application is full of complicated ethical and legal challenges.

Ethically, the main aspects are patient data privacy as AI requires considerable data quantities. Due to the possibility of perpetuating or increasing inherent biases within training data, algorithmic bias presents the risk of unfair outcomes. The lack of transparency and explainability in some AI systems makes them a black box, which undermines trust and affects informed decision-making processes.

Moreover, the human aspect of empathy and therapeutic relationship cannot be easily copied by AI posing the risk of dehumanizing care and losing jobs. Regularly, accountability and liability of AI-induced errors are indefinitely determined because of the absence of standard regulatory laws.

The current rules are not able to keep up with the innovations of AI, which demonstrates the importance of having more directives about the management of data, intellectual property, and scope of practice. research reveals the absence of formal AI training among physiotherapists and organizational ill-equipment, which indicates a severe necessity to implement specific educational interventions and interdisciplinary cooperation. The total contributions of many researchers have facilitated a background knowledge of the role of AI in physiotherapy, which preconditions more sophisticated and morally adequate practices.

Discussion

Ethical and Legal Challenges

The introduction of artificial intelligence into the fields of physiotherapy and digital rehabilitation brings numerous opportunities to enhance assessment, treatment planning, and patient engagement. However, it also raises a range of ethical and legal issues that must be carefully considered to ensure that this technology is used responsibly, safely, and for the benefit of patients. Key concerns include patient privacy and data security, informed consent for data collection and AI-driven decisions, transparency and explainability of AI tools, accountability for clinical outcomes, potential biases in algorithms, equitable access to advanced technologies, and compliance with regulatory standards and

professional guidelines. Addressing these issues through robust governance, multidisciplinary collaboration, and ongoing evaluation is essential to maximize positive impact while minimizing harm.

Ethical Challenges in Healthcare AI

Artificial Intelligence (AI) application in healthcare presents a lot of ethical issues, and it is important to pay close attention to them to make sure that this technology is used responsibly (13). These are prejudice and discrimination, data confidentiality, transparency, and informed consent (14). One of the significant issues is algorithmic bias and discrimination because AI algorithms can replicate or even increase existing prejudice and have an unfair impact on certain groups (15). This may cause some inequalities in healthcare delivery (16). Data privacy and security are also most critical since AI systems involve massive amounts of sensitive patient data (17). It is necessary to ensure that this data is not accessible to unscrupulous persons, or it will cause the trust of the patients and their rights will be breached.

Numerous developed AI models are not transparent and explainable, that is, their decision-making logic is not easily readable (18). Such a lack of transparency may cause clinicians and patients to understand AI decisions as hard, as well as challenge the accountability (19). The problem of informed consent is complicated in the situation connected to the use of AI in clinics because patients are not always aware of how their data is gathered, processed, and used by AI systems (20). The use of AI has the potential to alter the conventional relationship between the patient and the physician. Although AI could be useful in clinical decision-making, there is a risk of losing human qualities of care, including empathy and trust (21).

So, in summary, AI in healthcare brings ethical challenges like bias, data privacy, transparency, and informed consent, which require careful management for responsible use. Algorithmic bias can worsen disparities in care, while data protection is crucial due to the extensive sensitive information involved. Lack of transparency hinders understanding and accountability, and AI integration may affect the physician-patient relationship unless humanistic aspects of care are preserved.

Legal Challenges in Healthcare AI

The fast advancement of AI in the healthcare industry has posed complicated legal issues that require new legal systems and even a revision of the current law (22). Specifically, accountability and responsibility in the event of an error or damage done by AI systems is one of the most serious legal issues.

The question of who is to bear the responsibility; it is the developer, the service provider (e.g., a hospital or clinic), or the end-user (e.g., a physician or physiotherapist), has a lot of ambiguities, which need legal resolutions, Data Protection and Privacy fall under the legal field. This issue is particularly pertinent in healthcare, where potential errors can have serious consequences for patient well-being. The integration of AI systems into healthcare necessitates a re-evaluation of existing legal frameworks to clarify responsibility (23).

This re-evaluation is complicated by the fact that AI is increasingly used in healthcare, and the sharing of responsibility and accountability when an AI-based recommendation causes clinical problems is not yet clear. Traditional legal principles regarding product liability, which ascribe liability to defective equipment and medical devices, may not adequately cover AI systems, as some, are treated as consulting physicians rather than products.

Data protection and privacy are integral components of the legal framework for AI in

healthcare. Regulations such as the General Data Protection Regulation (GDPR) in Europe and the Health Insurance Portability and Accountability Act (HIPAA) in the United States aim to govern the handling of sensitive health data (24). However, the unique characteristics of AI, particularly its need for vast amounts of data for training and its potential for complex decision-making, necessitate a revision and further evolution of these laws. The United States, unlike other countries, has adopted a sector-specific approach to privacy and data protection, with HIPAA reigning in healthcare. The assimilation of new technologies like AI in healthcare, where confidentiality is crucial, mandates strict regulations to safeguard patient privacy.

The problems associated with intellectual property when it comes to algorithms, training data, and the results of AI have not been addressed exhaustively yet (23). This involves the right to code, copyright on the data that is used to train the models, and the outcome of the same (17). One of the main issues is adjusting regulations and laws to the fast development of AI. New regulations should be developed, and the laws that are already in place should be harmonized to promote the safety, effectiveness, and ethical application of AI in the healthcare sector (25). The Federal Trade Commission (FTC) and the Food and Drug Administration (FDA) in the United States are important players in this field although their approaches are still piecemeal.

There are also concerns regarding the licensing and clinical approvals of AI products, as the complex and dynamic nature of AI may render conventional licensing approaches insufficient. The use of AI in diagnosis and treatment presents complicated legal issues that require redefinition, especially concerning medical malpractice in the chain of use. The regulatory framework for medical liability when AI is applied is 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 or end-users.

Since AI is a complex and dynamic issue, the conventional approaches to licensing might not do the job (23). The concerns regarding the use of AI in diagnosis and treatment are a complicated legal issue that needs to be revisited and redefined (20) when it comes to medical malpractice issues in the chain of use.

Conclusions

Artificial intelligence development used in physiotherapy and digital rehabilitation presents the greatest opportunities to make the treatment process more accurate, personal, and better with regard to patient outcomes. Nevertheless, this innovation is surrounded by a sophistication of ethical and legal issues. To make the introduction of AI in these spheres responsible and ethical, there is an evident necessity of creating strong regulatory systems, effective ethical principles, and thorough training of healthcare specialists. To ensure patient and professional trust, as well as make sure that AI can support, but not substitute the therapeutic relationship, it is essential to address such issues as data privacy, algorithmic bias, transparency, and accountability. The future of AI in physiotherapy is bright, yet its success will be determined by a delicate balance between technological advancement and the principles of compassionate and patient-centered care. Therefore, it is proposed to develop a comprehensive framework for AI in digital physiotherapy and rehabilitation that balances innovation with ethics and patient safety, with key components including:

- Transparent regulatory policies and professional ethics guidelines appropriate to AI-enabled care;

- Mandatory training programs for healthcare professionals on the use of AI, data privacy, bias reduction and accountability;

- Standards for data management, informed consent, transparency and explain ability of AI tools;

- Regular independent audits, oversight, and a defined chain of accountability between developers, providers, and healthcare institutions.

Acknowledgment

None.

Ethical consideration

Ethical considerations in terms of honesty and integrity in texts and sources have been observed.

Funding support

This research did not receive any grants from funding agencies in the public, commercial, or non-profit sectors.

Conflict of interest

None.

Authors' contributions

All authors contributed equally to the preparation of this article.

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