# *The legal implications of using AI in the medical field*

# *الآثار القانونية لاستخدام الذكاء الاصطناعي في المجال الطبي*

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**Date of transmission: 02/05/2024 date of acceptance: 25/05/2024 date of publication: 01/06/2024**

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## Abstract:

The topic of legal responsibility in medical work has always been of interest to scholars and legal professionals, and this interest has increased after the revolution in the technical field and the use of robots and artificial intelligence. The medical work has witnessed a continuous increase in the use of modern technologies in the diagnosis and use of advanced medical devices based on the machine, radiography and various medical activities. Therefore, it was necessary to raise the responsibility arising from the use of artificial intelligence and highlight various aspects of the topic. The legal implications of using AI in the medical field are significant and multifaceted. As AI systems become more prevalent in healthcare for tasks like diagnosis, treatment recommendations, and administrative activities, there are several key legal issues that need to be addressed. The legal implications of using AI in the medical field are significant and multifaceted. As AI systems become more prevalent in healthcare for tasks like diagnosis, treatment recommendations, and administrative activities, there are several key legal issues that need to be addressed.

**Keywords**: artificial intelligence, The medical field health, health care, legal responsibility

**ملخص:**

لطالما كان موضوع المسؤولية القانونية في العمل الطبي محل اهتمام العلماء والمحامين، وتزايد هذا الاهتمام بعد الثورة في المجال التقني واستخدام الروبوتات والذكاء الاصطناعي.

شهد العمل الطبي زيادة مستمرة في استخدام التقنيات الحديثة في التشخيص واستخدام الأجهزة الطبية المتطورة المعتمدة على الآلة والتصوير الإشعاعي والأنشطة الطبية المختلفة. ولذلك كان لا بد من رفع المسؤولية الناشئة عن استخدام الذكاء الاصطناعي وتسليط الضوء على مختلف جوانب الموضوع.

الكلمات المفتاحية: الذكاء الاصطناعي، المجال الطبي، الرعاية الصحية. العمليات الجراحية. رعاية المرضى، المسؤولية القانونية.

**الكلمات المفتاحية**: الذكاء الاصطناعي، المجال الطبي، الرعاية الصحية، المسؤولية القانونية.

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## Introduction:

The tremendous development in technology has touched the medical field, as medicine has become dependent on advanced medical devices and even robots in the process of diagnosis, performing surgical operations and prescribing medication, and in various medical process from beginning to end, as the world has recently witnessed the attribution of the so-called artificial intelligence to all fields, including the medical field, the use of it has led to the improvement of the entire medical service. The experience of covid-19 has proven the effectiveness of resorting to the use of robots as well as the use of artificial intelligence, as it finds the danger of infection in dealing with patients, and it has become an urgent necessity to use experiments in this field, as well as to benefit from medical reports, clinical and medical experiments in this field. [1]

**The importance of the study:** The study of the legal implications of using AI in the medical field is crucial due to the complex and multi-faceted challenges it presents. The legal landscape surrounding AI-based medical decision-making raises questions about accountability in cases of errors, such as determining responsibility between clinicians, software developers, software rights holders, and healthcare institutions.

**Objectives of the study:** The study discussed the legal implications of using Artificial Intelligence (AI) in the medical field. It highlighted the challenges and potential liability issues associated with AI technology in healthcare. The research emphasized the importance of ensuring the safety and effectiveness of AI in medicine while addressing the need to protect patients and provide recourse in cases of medical errors involving AI.

**Problem of study:**The use of AI in healthcare raises significant legal issues that must be addressed to ensure ethical and lawful practices. Determining liability for AI-generated medical decisions is a complex challenge requiring clear regulations. Ensuring the privacy and security of sensitive patient data used by

[1]HossamIssa, Civil Liability for Damages Resulting from the Use of a Robot, Journal of Social and Legal Sciences, Volume 6, Cairo University, 2019, p. 735.

AI systems is essential to comply with laws like HIPAA. Obtaining informed consent from patients for AI-driven procedures is crucial to respect patient autonomy and meet legal requirements. Healthcare AI must adhere to regulatory standards like FDA guidelines to ensure patient safety and avoid legal repercussions. Addressing bias and discrimination in AI algorithms is necessary to comply with anti-discrimination laws and ensure fair treatment of patients. Proactively tackling these legal implications is vital for the successful and responsible integration of AI in medicine while upholding ethical principles and protecting patient rights.

**First topic: the use of artificial intelligence in the medical field**

The use of artificial intelligence in the medical field at the end of the twentieth century, the world witnessed a revolution in Information Technology, Software, computer world and robotics, and since the medical field is a vital field in human life, this sector was one of the most important polarizers of new technologies in the field of indications.

**The first requirement: photos of the use of artificial intelligence**

Undoubtedly, the proper use of artificial intelligence in the medical field leads to the improvement of the health service in the country, contributes to the quality of the health system, this technology helps the possibility of developing and using medicines, prescribing treatment and proper diagnosis of the disease. And their care and even in the field of management of medical resources.[1]

**Section I: diagnosis of the disease and description of the drug:**

Proper diagnosis of a disease is crucial for ensuring the success of the entire treatment process. Accurate diagnosis allows healthcare professionals to identify the specific disease or condition affecting a patient, understand its underlying causes, and determine the most appropriate course of action.

With an accurate diagnosis, healthcare providers can prescribe the necessary medications that target the specific disease or condition. Medications can help alleviate symptoms, slow [2]down the progression of the disease, or even cure it in some cases. Additionally, the prescribed medication may be tailored to the individual patient, taking into account factors such as their medical history, allergies, and potential drug interactions.

[1]Muhammad Hussein Mansour, Medical Liability, The Origins of Knowledge, Alexandria, 2002, p. 40.

Moreover, an accurate diagnosis enables healthcare professionals to develop a comprehensive treatment plan that may include additional interventions such as surgery, physical therapy, lifestyle changes, or other forms of medical intervention. This holistic approach to treatment addresses not only the symptoms but also the underlying factors contributing to the disease, which can lead to better long-term outcomes for the patient.

It is worth emphasizing that the process of diagnosis is a complex and dynamic one. Healthcare professionals rely on a variety of tools, including medical history, physical examinations, laboratory tests, imaging studies, and increasingly, advanced technologies such as genetic testing and artificial intelligence algorithms. The integration of these tools and the expertise of healthcare providers contribute to accurate diagnoses and subsequent successful treatment outcomes.

In summary, proper diagnosis plays a pivotal role in the success of medical treatment. It allows healthcare professionals to prescribe the necessary medications, develop comprehensive treatment plans, and provide personalized care tailored to the individual patient's needs. By focusing on accurate diagnosis, we can improve patient outcomes and contribute to the overall well-being of individuals.

**First: diagnosis of the disease**

The diagnosis of a disease typically involves a combination of medical history, physical examination, and laboratory tests. For instance, in the case of diabetes, a patient's medical history is crucial in identifying risk factors such as family history and obesity. A physical examination may reveal signs such as increased thirst and urination, while laboratory tests like blood glucose tests and hemoglobin A1c (HbA1c) tests help confirm the diagnosis. Additionally, imaging tests like ultrasound or MRI may be used to rule out other conditions that could be causing similar symptoms. The results of these tests are then analyzed by a healthcare professional to determine the likelihood of a particular disease and to develop an appropriate treatment plan.

Using artificial intelligence, it is possible to diagnose as many diseases as possible in a short time, and this also contributes to achieving early detection of some incurable diseases at the first stages and perhaps before they occur, which is one of the biggest advantages of using artificial intelligence, which allows

medical staff to treat these diseases radically and accurately. This also contributes to rationalizing the health burden on the state.

The use of artificial intelligence helps in the early detection of serious diseases, such as cancer, as the doctor relies on the analysis of data and prediction provided by this advanced technology, with the great role of the doctor who performs the reading and analysis process[1]

The use of artificial intelligence helps to accurately diagnose diseases, using applications and wearable devices that accurately monitor disorders of the body's vital signs, and they enable to predict the likelihood of health crises before they happen to the person being diagnosed.[2]

**Second: description of the drug**

The advent of artificial intelligence (AI) has revolutionized the field of drug discovery, enabling the creation of novel and effective medications. AI's ability to analyze vast amounts of data, including genomic and proteomic information, allows it to identify potential therapeutic targets and design medications that can modulate biological processes. This is achieved through the use of sophisticated algorithms that simulate chemical interactions and predict binding affinities, thereby streamlining the process of identifying drug candidates. AI can also optimize drug candidates by considering various factors such as efficacy, safety, and pharmacokinetics, leading to the development of medications with improved therapeutic profiles. Furthermore, AI's capacity to analyze large-scale biomedical data enables the repurposing of existing drugs for new indications, accelerating the drug discovery process and reducing costs. This synergy between AI and human expertise has the potential to transform the pharmaceutical industry, offering more effective treatments and improving patient outcomes.

After the successful diagnosis using algorithms, the drug can be prescribed to the patient both according to his genetics and his health characteristics, and there is a great integration between the diagnosis using artificial intelligence and various diseases in the response processes to various pharmacological drugs. A good diagnosis leads to accurate clinical reports from the methods of medical staff, conducting successful experiments, and in the end, this makes the

[1] ) Abdullah Moamen, Artificial Intelligence - A Revolution in Modern Technologies, Egyptian Dar Al-Kutub, Cairo, 2019, p. 99.

[2] ) Ibid., p. 98.

induction process feasible and effective, valuing resorting to the use of artificial intelligence techniques.[1]

It can be asserted that the stages of diagnosis and prescribing medication are one of the most important stages that make resorting to the use of artificial intelligence technology successful, and attract praise and appreciation.

**Section II: conducting surgical operations and practical experiments**

The use of artificial intelligence did not stop at the diagnosis and prescribing of medication, but went beyond it to the conduct of microsurgical operations, as well as scientific tests and experiments.

**First: performing surgical operations:**

It is an integration process between human intelligence and artificial intelligence in operating rooms. The surgeon uses the robot at this stage where my hand cannot reach, or avoids opening the patient's body to a greater degree, so he inserts the robot through a very precise opening that enables him to reach the point he wants with the least possible surgery.[2]

Many commercial entities have entered the field of competition in the field of producing more effective robots that help medical staff in surgical operations, and provide optimal health care for the disease at all stages of indication.[3]

There are many areas of robot use in hospitals, from its use in microsurgical operations to clinical care, to the detection of germs and viruses inside patient rooms to sampling with disease, and giving analytical data, all in a very accurate manner, which contributes to the development of the precision medical field.[4]

**The second requirement: the risks of using artificial intelligence in the medical field**

Undoubtedly, everything has advantages and disadvantages, as artificial intelligence has many advantages in the medical field, its use has many caveats as well.

**Section I: the risk of disrupting artificial intelligence technologies**

One of the potential risks facing artificial intelligence technologies is the partial or total disruption of programs used in the medical field, as they are hacked and

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[1] Ahmed Shawqi Omar, Criminal Law and Modern Medicine, Dar Al-Nahda Al-Gharbiyya, Cairo, 2007, p. 145.

[2]Muhammad Hussein Mansour, previous reference, p. 42.

[3] Ahmed Ibrahim, Legal Liability Resulting from Artificial Intelligence Errors in UAE Law, PhD thesis, Ain Shams University, 2020, p. 144.

[4]Asmaa Al-Sayed, Applications of Artificial Intelligence and the Future of Educational Technology, PhD thesis, Minya University, 202, p. 121.

controlled by third parties, all this leads to unexpected results, artificial intelligence has not yet reached the degree of mastery and perfection.[1]

All computer programs are subjected to hacking by The Professionals of this serious cybercrime, this process leads to the penetration of information and privacy or sabotage, and perhaps programs dedicated to the medical field are often exposed to these illegal actions. Hacking professionals remove information and add other erroneous ones that lead to tampering with the approved programming system[2].

There is also a possibility that the robot received wrong instructions or a programming error, the consequences of which may be serious errors that may lead to the death of the patient.

**Section two: using artificial intelligence to penetrate privacy**

Artificial intelligence is used to prepare data on patients and their health conditions, diagnose their diseases, and all treatment procedures and protocols prepared for this, which data allows the creation of algorithms that facilitate treatment decision-making processes, and therefore any penetration of it disrupts the treatment processes.

Another very important problem is that artificial intelligence and its related programs cannot be subject to the requirements of the ethics of practicing the medical profession, since all software intended for use in the medical field is for the purpose of achieving medical goals regardless of any other ethical or humanitarian consideration. It cannot take into account the problems related to the ethical aspect that AI-based diagnostics may cause.

**Second topic: legal responsibility for the use of artificial intelligence**

In the past, theories that crimes were committed only by human individuals dominated legal thought. With the advent of modern technology, we now have the ability to design and program robots and intelligent systems to carry out certain tasks automatically.

However, we must realize that this technology is not outside the scope of existing laws and regulations. Instead, the use of robots and AI software requires compliance with a range of applicable laws and legislation. For example, in some countries, there may be restrictions on the collection or use of personal data collected by robots. There could also be restrictions on the use of robots in

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[1] Muhammad FahmyTolba, Computer and Artificial Intelligence, Egyptian Office Press, Alexandria, 1997, p. 54.

[2]Wafaa Muhammad, Liability for Artificial Intelligence Crimes, Spirit of Laws Magazine, Cairo University, Issue 96, 2021, p. 103.

certain sensitive industries or sectors that pose a risk to public safety or compromise privacy.

In addition, ethical and legal issues can also arise regarding the actions of robots and AI programs. For example, in the event of an accident caused by a robot or artificial intelligence system, the manufacturer could be held legally liable for damages resulting from that accident.[1]

**The first requirement: based on a programming error**

AI system is to ensure that it is free from programming errors. This is crucial because even a single mistake in the code can lead to unpredictable and potentially catastrophic outcomes. For instance, a faulty algorithm can cause the AI to misinterpret data, misclassify objects, or even make decisions that are detrimental to its users. To prevent such errors, developers must thoroughly test and validate their code, utilizing techniques such as unit testing, integration testing, and debugging to identify and rectify any issues. Additionally, incorporating robust error handling mechanisms and implementing checks for edge cases can further mitigate the risk of errors. By prioritizing error-free programming, AI developers can create more reliable and trustworthy systems that are better equipped to handle complex tasks and make accurate decisions.[2]

If there is a malfunction or error in the programming of a robot or any artificial intelligence program, the legal responsibility typically falls on the party responsible for the negligence or error. It is important to note that legal liability can also be periodically assessed to ensure compliance with regulations and standards.

When a programming error or negligence occurs in the operation of a robot, legal liability is often determined based on unintentional liability. To establish liability, it is necessary to prove elements such as negligence, failure to exercise due care and precaution, and a breach of legal obligations.

Legal responsibility, in general, refers to the condition or quality of an individual being held accountable for the consequences of their actions if they

[1]Sreenivasulu A, Selvam JD, Sajith S, Vasumathy M, Barwant MM, Alagarsamy S, et al. comprehensive revision on the nanocarrier drug delivery systems with special reference to artificial intelligence. Int J Health Sci.2022 May 23; 7163–93.

violate the law. It places the burden of the individual's actions on them, and they may face legal consequences for any wrongdoing.

It's worth noting that a robot itself may not bear legal responsibility if it is used to perform surgical operations and there is an error in transferring viruses from patients or in dialysis, for example. In such cases, the responsibility may lie with the person operating the robot, who is ultimately in control of the machine and responsible for its actions. The robot is often considered a tool or instrument in the hands of a skilled professional, such as a doctor, who is expected to exercise due care and skill in its use.[1]

Overall, the legal responsibility and liability surrounding robots and artificial intelligence involve various considerations, including negligence, compliance with regulations, and the actions of individuals responsible for their operation. Establishing a clear legal framework and accountability measures is crucial to address any legal challenges that may arise in this rapidly evolving field..[2]
A robot is just a machine that has no Will, and it cannot choose,and if it is the basis of legal responsibility (specifically criminal), then if freedom of Will is violated, and there is no freedom of choice, then there is no responsibility at all, neither criminal and non-negligent. The crime is the pillars, and perhaps the moral pillar is the most important pillar in the establishment of criminal responsibility, which is denied by the robot.

**The second requirement: based on the behavior of the robot**

The robot's behavior is that it should be able to adapt to different situations and environments. This means that the robot should be able to adjust its actions based on the context in which it is operating. For example, if the robot is in a noisy environment, it should be able to adjust its volume or communication method to ensure effective communication. Similarly, if the robot is in a crowded space, it should be able to adjust its movement and navigation to avoid collisions and ensure safe passage. This adaptability will enable the robot to effectively interact with humans and other robots in various settings, making it a valuable tool for a wide range of applications.
Regardless of the accuracy and intelligence of artificial intelligence programs, it is important to recognize that a robot used in the medical field is essentially a

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[1] **Vora LK**, Gholap AD, from website :Artificial Intelligence in Pharmaceutical Technology and Drug Delivery Design. See 30/04/2024
[2]Ibid., p. 154.

tool controlled by a programmer or user who is a human being. The robot itself lacks human characteristics such as intelligence, consciousness, perception, and the ability to make decisions. It operates based on the programming and instructions provided by the programmer or user.

Due to its lack of human traits and agency, a robot has an incomplete legal personality. This means that while it may acquire certain rights, it does not bear the same level of legal responsibility as a human. It can be likened to a weapon used in a crime, where the legislator pays attention to it only in specific circumstances or crimes.[1]

The theory of the moral actor can be applied to the use of a robot in medical work. The actions of the robot are ultimately attributed to the moral actor who controls and directs it, which is either the programmer or the user. Therefore, the moral actor is held accountable for any actions or consequences stemming from the robot's operations, as they are considered the potential source of criminal intent.[2]

The responsibility for the robot's actions primarily lies with the programmer or program designer. The programmer designs the entire workflow of the robot, and the robot merely executes the programs that have been prepared. In the event of an error or malfunction that leads to legal liability, the responsibility falls on the designer or programmer.[3]

The user of artificial intelligence programs in the medical field is a natural person with the competence to effectively interact with these intelligent programs. However, it is crucial to note that any misuse or abuse of these programs can result in errors that may be classified as crimes punishable by law. The user is expected to exercise due diligence and adhere to ethical and legal standards when utilizing artificial intelligence in medical practices.

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[1]"The Role of AI in Drug Discovery: Challenges, Opportunities, and Strategies" by Alexandre Blanco-González et al., published in Pharmaceuticals in 2023.

[2]Alshawwa SZ, Kassem AA, Farid RM, Mostafa SK, Labib GS.Nanocarrier Drug Delivery Systems: Characterization, Limitations, Future Perspectives and Implementation of Artificial Intelligence. Pharmaceutics.2022 Apr 18; 14 (4): 883.

[3] . Krishnababu K, Kulkarni GS, R Y, Paarakh PM. Revolutionizing the Pharmaceutical Industry with Artificial Intelligence. J ArtifIntell Mach Learn Neural Netw.2023 May 25; (34): 26–37.

the legal responsibility for the actions of a robot in the medical field lies with the human moral actor, whether it is the programmer or the user. While the robot itself lacks agency and consciousness, the individuals who design, program, and operate it are accountable for any legal consequences that may arise from its use. In the two cases mentioned above, the perpetrator of the crime is the robot that only executed the instructions directed to it by the programmer or the user, and hence the responsibility is based on it according to the theory of the moral actor.

**Conclusion :**

The world has witnessed a recent development in the field of artificial intelligence, which made countries urgently obliged to work on finding an arsenal of clear laws defining legal responsibility in the field of using this technology. Perhaps the medical field is the most important necessity as it has become using modern technologies from the beginning of diagnosing pathological conditions to the end of the entire medical process.

In conclusion, the integration of Artificial Intelligence (AI) in the health field has the potential to revolutionize the way healthcare is delivered, making it more efficient, effective, and personalized. By leveraging AI's capabilities in data analysis, machine learning, and automation, healthcare professionals can better diagnose and treat patients, streamline administrative tasks, and enhance patient outcomes. The future of healthcare is likely to be shaped by AI's ability to analyze vast amounts of medical data, identify patterns and trends, and provide insights that inform clinical decisions.[1] As AI continues to evolve and improve, it is crucial that healthcare professionals, policymakers, and industry leaders work together to ensure that AI is used responsibly and ethically, prioritizing patient safety, privacy, and well-being.

**Recommandations:**

The use of Artificial Intelligence (AI) in the health field is a rapidly growing area with significant potential to improve patient outcomes, enhance healthcare efficiency, and reduce costs. AI can be effectively applied in various aspects of healthcare, including disease detection and diagnosis, personalized treatment, medical imaging analysis, and clinical decision support. Here are some key recommendations for the integration of AI in healthcare:

[1] Das KP, J C. Nanoparticles and convergence of artificial intelligence for targeted drug delivery for cancer therapy: Current progress and challenges. Front Med Technol.2023 Jan 6; 4: 1067144.

1. Focus on Specific Applications: AI can be particularly effective in areas where there is a high volume of data and a clear need for automation, such as medical imaging analysis or clinical decision support. Identify specific areas where AI can have the most significant impact and focus on developing and implementing these applications.

2. Collaboration and Integration: AI should be integrated into existing healthcare systems and workflows to ensure seamless adoption and maximum benefit. Collaboration between healthcare providers, AI developers, and data scientists is crucial to ensure that AI solutions are tailored to the specific needs of healthcare providers and patients.

3. Data Quality and Security: The quality and security of healthcare data are critical to the success of AI applications. Ensure that data is accurate, complete, and securely stored to prevent any potential risks or biases in AI decision-making.

4.Continuous Training and Updates: AI models need to be continuously trained and updated to reflect new medical knowledge and advancements in healthcare. This ensures that AI-driven recommendations remain accurate and effective over time.

5.Patient Education and Involvement: AI-driven healthcare should prioritize patient education and involvement in the decision-making process. Patients should be informed about how AI is used in their care and have the opportunity to provide input on their treatment plans.

6. Addressing Ethical Concerns: AI in healthcare raises important ethical concerns, such as bias, privacy, and accountability. Ensure that AI applications are designed with these concerns in mind and that there are mechanisms in place to address any issues that arise.

7. Monitoring and Evaluation: The effectiveness of AI applications in healthcare should be continuously monitored and evaluated to ensure they are meeting their intended goals and improving patient outcomes. This includes tracking metrics such as patient satisfaction, treatment outcomes, and cost savings.

8. Investment in AI Education and Training: Healthcare providers and professionals need to be educated and trained on the use and limitations of AI in healthcare. This includes understanding how to interpret AI-driven recommendations and how to integrate AI into their workflows.

9. Addressing the Digital Divide: The integration of AI in healthcare may exacerbate existing healthcare disparities if not addressed. Ensure that AI applications are accessible and usable by all patients, regardless of their socioeconomic status or geographic location.

10. Fostering a Culture of Innovation: AI in healthcare requires a culture that encourages innovation, experimentation, and continuous improvement. Foster an environment where healthcare providers and professionals feel empowered to explore new AI applications and share their experiences and best practices.

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