

THE HEALTHCARE SECTOR IN THE SULTANATE OF OMAN AND THE LEGAL CONTROL OF THE UTILIZATION OF AI SYSTEMS

O SETOR DE SAÚDE NO SULTANATO DE OMÃ E O CONTROLE LEGAL DA UTILIZAÇÃO DE SISTEMAS DE IA

Article received on: 8/27/2025

Article accepted on: 11/28/2025

Enas Qutieshat*

*Sohar Univeristy, Sohar, Oamn

Orcid: <https://orcid.org/0000-0002-0100-632X>

equtieshat@su.edu.om

The authors declare that there is no conflict of interest

Abstract

Integrating artificial intelligence with medicine is quickly becoming an international trend. It is understandable that medical professionals appreciate this emerging technology's potential in improving diagnosis, automating tasks, monitoring and managing medical conditions, and performing functions that were traditionally carried out by humans. The Oman Vision 2040 and The National Digital Health Strategy both consider the Digital Shift in Health Systems a main pillar of the Fourth Industrial Revolution. In the context of AI and analytics in virtual medicine, it aims to improve the provision of healthcare services. This also aligns with the Omani Health Ministry's Health 2050 document. Rapid advances in artificial intelligence technology present a host of ethical and legal challenges, including algorithmic bias, opacity, privacy violations, diminished patient self-determination, and legal accountability gaps surrounding malpractice. This study seeks to examine the primary legislative initiatives concerning the Omani legislative response to artificial intelligence in the healthcare system and to consider the scope of artificial intelligence and its systems and entities, as well as the civil liability it may entail. This research examines these challenges and the processes of case documenting the attempts to control the use of artificial intelligence technology through a descriptive-analytical method. The study, to the extent available legal structures reach, examines the legal challenges for which, in the absence of consideration, far more robust legal structures need to be developed. Such structures need to be ethically designed centered on the principles of autonomy, justice, transparency, and accountability to safeguard the rights and safety of the patients within the frameworks of equity and social justice.

Resumo

A integração da inteligência artificial à medicina está se tornando rapidamente uma tendência internacional. É compreensível que os profissionais médicos apreciem o potencial dessa tecnologia emergente para melhorar o diagnóstico, automatizar tarefas, monitorar e gerenciar condições médicas e desempenhar funções que tradicionalmente eram realizadas por seres humanos. A Visão de Omã para 2040 e a Estratégia Nacional de Saúde Digital consideram a Transformação Digital nos Sistemas de Saúde um dos principais pilares da Quarta Revolução Industrial. No contexto da IA e da análise em medicina virtual, o objetivo é melhorar a prestação de serviços de saúde. Isso também está alinhado com o documento Saúde 2050 do Ministério da Saúde de Omã. Os rápidos avanços na tecnologia de inteligência artificial apresentam uma série de desafios éticos e legais, incluindo viés algorítmico, opacidade, violações de privacidade, diminuição da autodeterminação do paciente e lacunas de responsabilidade legal em torno da negligência médica. Este estudo procura examinar as principais iniciativas legislativas relativas à resposta legislativa de Omã à inteligência artificial no sistema de saúde e considerar o âmbito da inteligência artificial e seus sistemas e entidades, bem como a responsabilidade civil que ela pode acarretar. Esta pesquisa examina esses desafios e os processos de documentação de casos que tentam controlar o uso da tecnologia de inteligência artificial por meio de um método descritivo-analítico. O estudo, na medida em que as estruturas jurídicas disponíveis o permitem, examina os desafios jurídicos para os quais, na ausência de consideração, é necessário desenvolver estruturas jurídicas muito mais robustas. Tais estruturas precisam ser projetadas eticamente, centradas nos princípios



Keywords: Artificial Intelligence. Healthcare Sector. Medical Diagnosis. Digital Transformation. Digital Healthcare.

de autonomia, justiça, transparência e responsabilidade, a fim de salvaguardar os direitos e a segurança dos pacientes dentro das estruturas de equidade e justiça social.

Palavras-chave: *Inteligência Artificial. Setor de Saúde. Diagnóstico Médico. Transformação Digital. Saúde Digital.*

1 INTRODUCTION

The last few decades have seen the global health care sector change the most with the advent of digitalization and the development of new AI technologies. Unlike previous technologies, which have been used only to assist, these new advancements are used in medical diagnosis, therapy decision making, management of health records, and, increasingly, decision making in critical care. Research shows AI applications have decreased mistakes in diagnosis by 30% and increased the success of treatment by 20% (Kumar *et al.*, 2025).

Overall, these kinds of technologies give value to the health care sector by improving the quality of care, decreasing cost, and reducing the number of mistakes that are made in patient care. (Pabalkar & Chanda, 2023)

In the Sultanate of Oman, the positive effect of the growing interest in Artificial Intelligence (AI) reflects the Oman Vision 2040 where digital transformation is given top priority and focuses on the creation of a smart and resilient health care system to meet the emerging needs. This orientation is in line with the Ministry of Health's Health Vision 2050, which emphasizes the need to invest in the technologies of the Fourth Industrial Revolution, especially artificial intelligence, to construct a preventive, sustainable, and efficient health care system (Omani Ministry of Health 2014).

In healthcare systems, more and more dependence is being placed on AI; however, the relevant legal scholarship on the regulations in new jurisdictions is still quite fragmented and overwhelmingly descriptive. In the context of Oman, in particular, the available literature is either in the realm of techno-policymaking or the more traditional paradigms of medical malpractice, with no comprehensive legal scholarship addressing the integrated jurisprudential issues specific to the distinct and unprecedented legal challenges of AI-centric medical systems. This research endeavors to fill this gap by offering an organized, comprehensive legal evaluation of the intersection of AI and

healthcare, focusing on the regulations and associated legal liabilities, utilizing primary sources of national legal frameworks and supplemented with secondary sources from the available literature in the field of comparative law. This research gap expresses the imbalance disparity between the rapid advancement of AI in the healthcare domain and the corresponding development of the law to regulate its adoption and application.

The central problem addressed in this study lies in the doctrinal and legal debate surrounding the application of AI systems in the medical sector and the legal consequences arising from their use. Current Omani legislation—whether regulating information technology or healthcare practice—does not explicitly address the use of AI systems in medical contexts, notwithstanding the This study focuses on the doctrinal and legal questions linked to the use of AI Systems in the medical field and the implications of their use. The laws in Oman—whether governing information technology or the practice of medicine—do not contain any provisions dealing with the application of AI Systems in medicine, despite the importance and sensitivity of the field. Consequently, the sort of legal interpretation that has been undertaken tends to apply the provisions of the law in a purely formalistic manner, which is likely to avoid any and all the problems associated with intelligent and/or autonomous systems; that is, it is likely to be very insufficient. As a result, legal interpretation has largely relied on traditional legal provisions applied by analogy, a method that may reveal significant limitations in addressing the novel risks and challenges posed by intelligent and semi-autonomous systems.

In this context, the study aims to answer the following question: How adaptable the current legal and regulatory structures in Oman are for the technological advancements regarding the application of AI in healthcare and medical services?

The importance of this study derives from the pioneering nature of applying AI technology to the healthcare industry, which, as a developing worldwide phenomenon, warrants definitive scrutiny and legal regulation. On the domestic front, the study aligns with Oman Vision 2040 and Health Vision 2050, which also emphasize the prioritization of digitalization in the healthcare sector. In addition, this study attempts to protect justice, equity, and patient safety by avoiding technological advancement paradox to the improvement of healthcare services and systems, including the accessibility and reliability of services, while addressing the legal and ethical concerns of AI systems in the practice of medicine.

The analysis presented in this paper is framed descriptively and analytically and involves scrutiny of the legal documents pertaining to the interface of healthcare and the medical and allied professions and the relevant legislative and regulatory documents on the AI in the Sultanate of Oman. Based on the above, the study comprises five main sections, the introduction and the conclusion being additional parts. The first section focuses on the definition and the fundamental attributes of artificial intelligence. The second attempts to explain the absence of AI system-related technologies. The third examines the policy and legal AI in the Sultanate of Oman. The fourth examines the civil (non-criminal) aspects of legal liability of AI in the context of healthcare. The last section attempts to assess some of the international initiatives in the regulation of disparate AI systems.

2 DATA AVAILABILITY AND OPEN SCIENCE STATEMENT

As the study is based on the analysis of the doctrine of law and the normative approach of the publicly available legal instruments, policies, and legal documents, it does not create or utilize empirical datasets, statistical data, or computational scripts. The materials utilized and upon which the study is based are publicly published and cited in the study. Therefore, no additional data has been uploaded to any external repository.

Section One: The Concept of Artificial Intelligence and Its Applications in the Healthcare Sector

The rapid development of digital technology and the growing use of Artificial Intelligence (AI) Systems in the industry has prompted the need for legal scholars and practitioners to consider the legal implications of the use of AI in the medical field. This requires, first, an adequate definition of AI systems, and an overview of their use in the medical field, and subsequently an assessment of the legal issues in relation to current national legal frameworks, policies and strategies. (Song, 2023)(Edidin *et al.*, 2024). The European Commission states that AI is “a system capable of autonomous operation and adaptable to achieve specific and/or general goals using input to provide output that includes predictions, creation of content and decisions, and that may cause changes to a physical or virtual environment (content/decision recommendation)” (Regulation (EU) 2024/1689). Some define AI as a field of computer science that builds systems so that computers can perform tasks that mimic human behaviors and solve complicated

problems with little or no human involvement (Hassan, 2025, p. 66). AI can also be understood to mean a response from a machine or a computer that is a response that has the appearance of being intelligent. This can also be viewed as the response of a machine or a part of the machinery of a computer that is designed to perform the tasks that require intelligence in order to assist humans within a specified environment (Bakoush, 2025, p. 40).

The construction of AI constitutes understanding it as sophisticated methods of machine replication of various dimensions of thinking. AI performs mental tasks that are simple or complicated as dictated by specific algorithmic formulas. In the context of computer systems, AI is defined as the replication of human intelligence, through mental and emotional reasoning, perception, and the associated senses (Azibi, 2024). Concerning health services, AI is understood as a fundamental service or a set of services provided by healthcare institutions to offer health care solutions to a range of ailments and medical conditions (Azibi, 2024).

There is no specific statutory definition of AI under Omani law. However, AI as a concept has been mentioned in some legal documents. In the Regulation on the Conduct of Aviation and Aerial Activities Using Unmanned Aircraft published in Official Gazette No. 1256 of September 6, 2020, and in Ministerial Decision No. 1412/2023 concerning the Regulation of Unmanned Aerial Vehicles (Drones), the definition of a drone includes “an aircraft that is controlled remotely by wired or wireless connections, or a step by step programmed aircraft, or an aircraft that is able to direct itself through pre-installed AI (AI) algorithms.” However, the law does not attempt to elucidate the meaning or definition of AI and its scope or parameters.

The National AI Program in the Sultanate of Oman considers AI to be a discipline within computer science that centers on the creation of technologies, algorithms, and systems that can analyze and learn from data to emulate some human cognitive functions like vision, language understanding, problem solving, and decision making. Such systems perform defined functions and can do so based on pattern recognition and reasoning from the data provided, and can be applied to systems that are either quite narrow and specific, or to broader systems that attempt to replicate human intelligence in a holistic sense (Ministry of Transport, Communications and Information Technology, 2024).

Given the above, the primary focus of the embedding of AI technologies within the health care systems can be described as medical artificial intelligence. Smart

algorithms and systems are employed to analyze data and offer clinical or operational recommendations in the support of medical research. Such systems are built to handle large volumes of information and, in so doing, support constructive clinical decision making. (Kejriwal, 2022) The roles of AI in health care are extensive, and include automating administrative functions, improving the quality of health care, and increasing efficiency, as well as the designing of treatment regimens, monitoring of those regimens, and diagnosing disease.

AI systems possess the capability to function and make action-oriented decisions without the supervision of an individual human being. AI's systems can learn independently and adapt to new challenges sufficiently. AI systems can also operate without full or clear information by evaluating previous experiences or datasets. AI systems have become increasingly utilized to the point of taking over human jobs, including functions in the support of human labor in the health care industry. AI systems can support health care specialists and others with the analysis of diagnostic imaging, record keeping with electronic health records, robotic surgery, remote monitoring of patients with smart devices, and analysis of large data in order to predict the occurrence of diseases.

Different approaches have been made to define AI in the various legal, policy, and technical frameworks, and they almost always converge to identify three core elements: the application of algorithms for reasoning, learning from data, and some level of self-functionality. In the opinion of law, this particular combination, rather than any individual attribute, is what sets an AI from any other software application or medical device. (Sibilla, 2025) (Ganapathy, 2021) In this sense, the healthcare AI influence is primarily from the fact that it does not only possess the ability to compute, but it can also influence or augment clinical decision making, reallocate responsibility, and alter the way accountability is structured.

The continuing progress of technology has given rise to numerous types of AI systems and applications. These can be categorized:

First: The Classification of AI Systems by Their Structural Composition

This classification deals with the various technological architectures of AI systems, such as rule-based systems, expert systems, machine learning, neural networks, and deep learning:

- Rule-Based or Symbolic AI, which is based on the use of predefined logical rules built on some conditional structure (if–then). Such systems may work well for simple and well-defined tasks but completely lack adaptability to new and complicated environments.
- Expert Systems, which duplicate element of human expert behavior (decision making) through the use of knowledge and inference systems. In the field of healthcare, these systems are extensively applied to the field of medical diagnosis and clinical support systems.
- Machine learning, or the ability systems to learn from historical data without any programming. There are three different types of Machine Learning which are: supervised learning, unsupervised learning, and reinforcement learning. This is a common practice in analytics, and in clinical data.
- Neural Networks, which are modeled in the same way the human brain is modeled, which have multiple cycles and are used in the domain of in image, and speech, and pattern recognition.
- Deep Learning, a sub-class of machine learning that uses multi-layered neural networks in the domains of data that is large and complicated, and in the domains of radiology, genomics, and natural language processing.

3 SECOND: CLASSIFICATION OF AI BY SCOPE

AI systems can be analyzed by functionality, from which perspective they can be viewed as narrow, general, or super artificial intelligence. General AI is when systems can achieve a multitude of cognitive tasks that can be done by a human being, such as with reasoning. Narrow AI is when systems are built to accomplish singular functions, and it is also the most common kind of AI that is in use today (Bhagat *et al.*, 2024). Super artificial intelligence, which would exceed the capabilities of human specialists in particular disciplines, is still theoretical and has not yet been developed (Suresh & Sasidharan, 2025). One of the most notable examples of AI in healthcare is robotics, which consists of programmable machines that perform certain tasks, with or without human control.

4 SECTION TWO: THE TECHNICAL DIFFICULTIES THAT AI SYSTEMS FACE

AI systems have widespread problems which have legal implications that need to be addressed by the relevant authorities to reduce the number of legal breaches. Following are the most common AI Systems' ranges:

4.1 Systems are not transparent

From a legal perspective, there must be reasons stated for a decision (or else it is unenforceable). Because AI systems are also stated to be making decisions, there must be a reason as to why they make specific choices. The problem, however, is that many AI systems are designed to have no *real* reason for their choice. This is often referred to as Black Box AI (Quakulinski *et al.*, 2022). Because of this, many people are left without an answer as to why an AI chose a certain solution. This seems to be an inevitable problem with AI systems that utilize deep neural networks. The use of deep neural networks allows computers to emulate the way a human brain works. Because of immense complexity with human minds, it is difficult to draw cause and effect conclusions with an AI system just as it would be very difficult to do the same with a human brain. Aberrations of the brain may result in even lost abilities, called Neural Plasticity. The same malfunction that can cause irregular abilities in a brain can also cause lost abilities in a neural network, (Bathae, 2018).

4.2 Bias in AI Systems

People view AI as a neutral and logical approach because it lacks human emotion and does not show bias and discrimination. However, AI can still produce unfair and inaccurate results. These biases can come from one of two sources: (1) inadequate or unrepresentative AI training data, or (2) the algorithms and instructions that guide AI behavior. AI learns from datasets, and these datasets can include a variety of data that reflects data biases, data discrimination, or data inequity. Biased AI data can lead to discrimination in the processes and outcomes of the AI (UN Women, 2025).

In the field of health and medicine, many research studies, particularly studies that analyze AI-based diagnostic tools in the field of radiology and/or dermatology, show that these biased AI tools yield varying diagnostic accuracy across different demographic groups and populations. These AI-based diagnostic tools yield best accuracy for light-skinned males; these diagnostic tools yield lower levels of accuracy for females and individuals of minority ethnic groups. In a large number of studies, this accuracy discrepancy has been documented and attributed to the bias of the training datasets that are predominantly selected and used from European and North American countries for the development of these diagnostic tools (Wójcik, 2022). In the above stated and similar situations, the biases of these AI diagnostic tools endanger and impact the safety of patients and the principle of accessibility to health and medical services for everyone.

4.3 Cybersecurity

Protecting personal data is interconnected with the privacy concerns of AI systems themselves and from cyberattacks. AI systems work through digital infrastructures that are hosted on the cloud or on dedicated servers, and therefore, strong measures are needed to guard against unauthorized access, manipulation, or data loss (Diviya *et al.*, 2024). The Omani Personal Data Protection Law outlines the measures that can be taken to protect personal data and empowers the competent authority to take corrective actions, suspend any processing activities, and breach notify data subjects. In addition, the Omani Cybercrime Law makes unauthorized access to information systems and personal data a crime, and imposes harsher penalties when the data involved is personal or sensitive. Thus, medical entities have a legal duty to provide healthcare, and to protect the confidentiality and security of the data they hold about patients. Careless or illegal access to or disclosure of medical data can lead to liability under the Penal Code, and professional liability under the Law Regulating the Practice of Medicine and Allied Health Professions.

4.4 Consent mechanisms in the use of artificial intelligence

The utilization of AI by service providers and employers is increasingly becoming common practice, however, acquiring informed consent from service users is still legally

required. In the field of healthcare, patient consent is both a legal and moral necessity. Omani law states that patients are entitled to receive relevant information pertaining to their diagnosis, the nature of the treatment and relevant medical procedures, and are entitled to provide or withhold their consent to such medical procedures (Bogomazova, 2024). This has been re-iterated in the guidelines by the World Health Organization on the usage of AI in the field of Medicine, which emphasize the importance of patient autonomy and the need to provide informed consent.

Furthermore, policy documents from Oman which deal with Artificial Intelligence, stipulate that the transparency of the system and the processes should be made clear to the users, and prior consent should be obtained from individuals, especially when the automated processes have significant legal or medical repercussions. Moreover, patients cannot be prohibited from exercising their consent or from seeking to alter, limit, or control the processing of their personal data, or from obtaining a copy of their personal data, as provided in the Data Protection Law.

As a whole, these technical challenges illustrate that the difficulties posed by AI in the health care system are not operational or ethical, but rather legal in nature (Farooqui *et al.*, 2024). The legal challenges posed by the opacity in algorithms are the undermining of informed consent and judicial review, the undermining of equality and non-discrimination by the bias of algorithms, the potential for exposing health care providers to civil and criminal liability due to inadequate cybersecurity, the weakening of the legitimacy of AI-assisted medical interventions due to the deficiencies in consent mechanisms and the list goes on. Therefore, the legal regulations on medical AI must go beyond principles and consider these technical challenges as a source of legal risk.

5 SECTION THREE: THE STRATEGIC AND LEGISLATIVE FRAMEWORK GOVERNING THE USE OF AI IN THE SULTANATE OF OMAN

On September 2024, Sultanate Oman announced the National Program for AI and Advanced Digital Technologies. The Program has three primary pillars, one of which is the governance of AI applications and advanced digital technologies through a human-centered lens. This involves continuous revision of the legislative and regulatory frameworks to keep pace with the rapid advancements and deployment of AI

technologies, while ensuring the technologies are in alignment with the best interests of society.

This is in alignment with Oman Vision 2040 which emphasizes innovation as a critical component of national development, especially in the health sector. Oman Vision 2040 considers digital health as a vital component of sustainable development and lays out a number of strategic initiatives such as integrating AI in the health system, building a comprehensive national health database, and enhancing cooperation with the private sector and international technology partners (Ministry of Transport, Communications and Information Technology, 2024).

The Omani Ministry of Health released “The Health 2050” document, outlining the future of the national healthcare system. It states that medical technology or the broad type of technology has become essential for the process of diagnosis and treatment (Omani Ministry of Health, 2014). The document states that the Omani Ministry of Health (2014) has numerous technologies for enhancing the care delivery process to improve the diagnosis and treatment process. These technologies include the management of patient records, treatments that are less intrusive, and rehabilitation care.

The Sultanate of Oman's National Health Policy for 2025 is a strategy that aims to formulate and expand the healthcare system, improve the efficiency of the services, and ensure the attainment of the ‘*health for all and by all*’ principle through the implementation of the One Health novel approach, among other innovative and enduring national policies (Omani Ministry of Health, 2025).

The National Health Policy stresses the need for the formulation of laws and regulations of medical liability, professional practice, and accountability, the marking and reducing of medical errors and their implications and the regulation of professional ethics in pain of the policy framework (Omani Ministry of Health, 2025). This is to be accomplished through the adoption of the national and international regulations which aim at the protection of public health in the policy related decisions, along with the legislative and regulatory frameworks aimed at achieving the goals of the policy. The policy also recommends the application of the most modern scientific and technological advancements in all area of health, upon assessment, and in a manner that is congruent with the Omani societal norms and values, and with the focus on safety, sustainable development, and compliance with the ethical standards. (Omani Ministry of Health, 2025).

In light of the legal concerns associated with artificial intelligence, notably due to its self-learning and self-adapting capacities, it is important to examine the level of Omani legislation designed to address these issues. Certain AI systems, in contrast to conventional medical technology, are not fixed in their performance; they are adaptable, thus complicating liability determination in the event of a malfunction.

In the context of the Use of AI in Healthcare, we will consider Civil Liability. Simply put, civil liability arises when a person is legally obligated to compensate another person by virtue of his/her breach of duty to the other. This is a legal consequence of an obligation which is imposed by law, and in line with the law, with the maxim that one should inflict or suffer no harm. In the absence of tailored laws governing AI in Oman, the only legal source, to apply and determine civil liability for AI Systems in Healthcare, will be the Omani Civil Transactions Law.

As we prepare to address the general rules of civil liability, we must first distinguish the categories of AI systems, in terms of functionality and levels of autonomy.

1. Systems that operate automatically according to fixed, predetermined rules and algorithms and which do not have the capacity to make independent decisions.
2. Systems that have the capability of self-learning and autonomous growth or development, based on preprogrammed algorithms, and which do not have direct human oversight.
3. Systems that have the ability to function, to a limited extent, autonomously under the supervision and control of a human.

Classifying this issue is necessary for assigning the relevant blame when there is no other provision for the legal liability of AI systems acting as legal people. Addressing the first category, such systems, one might argue, can be treated as things needing special care. Nonetheless, this will trigger the liability of the supervisor on the basis of Article 199 of Omani Civil Transactions law, where a person is liable for damage caused by special care things under their control, be it a mechanical device, unless it is proved that the damage was a result of an external cause beyond their control. While the Omani legislator did not give an express definition of things, scholars have understood that this word pertains both to the tangible and the intangible elements that can be hazardous (Fath al-Bab, 2016).

Considering the field of medical care, the use of automation in AI is legal because, in the case of automated electronic intermediaries, as defined in the Omani Electronic

Transactions Law, such intermediaries can operate without human supervision. They can receive, process, or send electronic documents, and, in the case of automated intermediaries, documents delegating authority will be enacted and attributed to the original, even if the original is an automated electronic intermediary.

Regarding the second and third categories, which are learning and decision-making systems (partially controlled or totally controlled by humans), legal scholars are divided on the issue of accountability. Some support the application of the vicarious liability theory of subordinate acts, per Article 196(1)(b) of the Civil Transactions Law, which holds liable the person in authority and the person in control of the subordinate. Others suggest the application of the agency theory by considering AI as an agency that acts for and on behalf of the principal, which is the operator.

Nonetheless, both theories face major obstacles. Legal personality, liability, and damage compensation remain out of reach for AI systems. Additionally, from an agency theory perspective, free will exist and be coupled to the outcome of an uncoerced contract, something AI systems will never have. As a result, both theories remain inadequate in a regulatory function within this scope arguing for the need for a regulatory function within this scope.

Given this observation, this study contends that the existing liability frameworks, while modifiable to a degree, remain conceptually challenged in the context of autonomous learning AI systems. The traditional classification of such systems as mere “things” does not account for their interactive character, while agency and vicarious liability frameworks assume legal and mental capacities that AI does not have, creating the need for tailored liability structures for medical AI that redistribute risk based on operational control, advantage, and predictability rather than legal analogies.

6 SECTION FIVE: INTERNATIONAL APPROACHES TO REGULATING AI SYSTEMS

This section takes a comparative regulatory approach to the selected jurisdictions to assess how they address the legal issues concerning AI systems. Description of all available options is not the objective of this work. Instead, the focus is on available dominant regulatory structures and policies—especially those relevant to the healthcare sector and the Omani legal system, to which they may be responsive.

The regulatory framework to govern the AI systems for international jurisdictions is, to a large extent, informal, and therefore, subjective. The United Kingdom, for example, is the only country providing a “light-touch” regulation for AI by giving a primary duty of supervision to a particular sector, making no conscious attempt to create a general regulation for artificial intelligence(Ritchie *et al.*, 2025).

In a juxtaposed scenario, the European Union adopted its first comprehensive regulation of AI on 04 March 2024, following all draft stages of the AI Act, which was initially proposed in 2021. The Act classifies the AI systems into four risk categories: negligible, limited, high, and unmitigated(Trisnawati, 2024). The Act also prohibits certain systems, including social scoring systems and unmitigated real-time biometric surveillance. The regulation will apply as of 04 August 2024, and the applicable prohibition on the use of the systems will commence on 04 February 2025.

No US federal AI law exists, but certain states have begun to implement some forms of AI regulations. In May 2024, Colorado enacted the first all-encompassing state AI legislation, which tackles issues such as algorithmic bias and discrimination as well as transparency obligations. In comparison, California opted to not enact comprehensive AI legislation to minimize innovation restraints. Targeted legislation, most often aimed at deep fakes, has also been implemented in New York, Utah, and Florida.

Among the first countries to implement a national AI strategy, China first adopted AI strategies in 2017 and has consistently updated its regulations pertaining to AI and algorithm-driven technology. China proposed a comprehensive AI bill in 2024, in addition to an AI security governance framework that required digital watermarks to thwart misinformation. Japan implemented its first AI Strategy in 2022, which emphasized adaptive governance and self-regulation within the private sector; Japan also adopted the Basic Act for the Promotion of Responsible AI in 2024, which followed the principles of the Hiroshima AI Process and the AI Process in 2023 (Sherman, 2025).

In the region, a number of Arab countries have implemented national strategies and ethical frameworks for AI, including Saudi Arabia, Egypt, and the United Arab Emirates. However, as of this most recent writing, there are no jurisdictions that have enacted any specific legislation pertaining to the application of AI to the healthcare system. Most countries continue to use general frameworks of civil, commercial, and criminal legislation, supplemented with strategic documents and ethical guidelines. This

is a combination that is increasingly unable to cope with rapid advancements in technology.

The key factor in the development of regulatory frameworks internationally has been a lack of commitment to implementing specific legislation to govern the intersection of AI and healthcare. Most jurisdictions focus on general civil and criminal legislation, along with horizontal frameworks for AI and ethical guidelines, in combination with a limited form of sectoral regulatory control (Busch *et al.*, 2025). This combination of frameworks certainly offers a broader range of regulations, but it also offers a greater degree of risk in a medically oriented environment wherein the possibility of error carries profound, even fatal, consequences. For the Sultanate of Oman, and for many other countries, this combination of approaches indicates a clear need to develop a sophisticated regulatory plan that integrates general governance on AI with specific legal restrictions for the use of AI in healthcare, rather than relying solely on a prevailing regulatory framework.

The comparative reading shows a prevailing global pattern of preferring functional regulation over the formal attribution of legal personality to the AI systems. Across various jurisdictions, the allocation of responsibility is dominated by control, risk, and benefit, and the central presence of human oversight regulation. These patterns indicate a prevailing view of the governing of AI, especially in the healthcare sector, as a high-risk technology instrument, rather than an autonomous legal person. This is particularly useful for the Sultanate of Oman as it prepares for future legislative changes.

7 CONCLUSION AND RECOMMENDATIONS

Regulatory patterns, particularly the comparative sectoral analysis, and the special consideration of the unique risks of AI in healthcare, support the following recommendations focused on achieving a more articulate, risk-sensitive, and human-centered regulation for the Sultanate of Oman.

Medical AI systems, including medical robots, embody characteristics that allow them to be considered, functionally, human-like. They have a physical presence, operational autonomy, and the ability to make independent decisions. The current legislation that addresses the practice of medicine, the conduct of civil and electronic transactions, and cybercrime, do not anticipate the rapid acceleration of technology.

Therefore, a dedicated legal framework is needed to address the regulation of AI systems and the legal ramifications of their operation.

7.1 Recommendations

7.1.1 First, the enactment of a dedicated legal framework for medical artificial intelligence

The study recommends implementing legislation that provides details on regulations concerning the use of AI (AI) systems in the medical sector. The proposed legislation should go beyond the rules of civil and medical liability and encompasses the praxis of medicine and the use of technology in the area of medicine. More specifically, the legislation should provide rules on civil liability concerning the Medical AI ecosystem, such as in the case of, the system developers, the employer (healthcare facility), the provider (healthcare professional), and the executing contractor (the tech company), for all of the different scenarios related to the design, deployment, supervision, and use of the system. Moreover, the legislation should propose a liability framework that is aligned with the level of autonomy, responsiveness, and dilemma (or danger) the AI system might possess. Furthermore, with regard to the emerging international standards, the legislation must propose mandatory risk assessment regulations that will include licensing and/or approval requirements prior to the deployment of medical AI technologies graduated to high levels of risk.

7.1.2 Second: strengthening human oversight and accountability mechanisms

The use of AI in the provision of healthcare must be accompanied by the preservation of meaningful human oversight. AI systems must continue to act as decision-support systems and not as decision-makers in important healthcare situations. Laws must impose obligations on healthcare providers related to human oversight, the creation of internal audit control systems, and the retention of reviewable audit trails concerning AI-assisted decisions. This not only improves patient safety, but also legal accountability by making sure there are legal consequences associated with human decision makers.

7.1.3 Third: the changing scope of the practice of medicine due to artificial intelligence

As AI systems continue to be utilized in the diagnosis, treatment, and clinical decision-making processes, the study suggests that the current definitions of the practice of medicine in Omani law be reviewed. While the law must continue to keep the practice of medicine in the hands of natural people, AI systems should be regarded as instruments of medicine with the potential to impact the practice of medicine. This also means that legal frameworks must address the practice of medicine with AI, including use control, recordkeeping, and the accountability of healthcare professionals.

7.1.4 Fourth known obstacles: rejection of ai legal personality and emphasis on functional regulation

There is a vibrant academic and policymaking debate on the legal personality of AI (AI) systems. This study demonstrates the recognition of legal personality for AIs to be neither necessary nor desirable for the current state of technological development. The systems' autonomy does not eliminate the imperative of AI human control along three distinct dimensions—economic interest, operational control, and accountability. Therefore, the most promising areas of regulation remain focused on functional governance through the distribution of liability, compliance, and enforcement discretion, rather than attributing an independent legal personality to an AI system.

7.1.6 Fifth, the institutionalization of interdisciplinary governance and regulatory expertise

The establishment of permanent bodies of interdisciplinary advisory advocacy, which include legal professions, the medical field, and the data and engineering sciences, is recommended for the development of interdisciplinary advisory advocacy structures for the governance and regulation of medical artificial intelligence. These bodies would draft and provide technical standards, counsel regulatory bodies, assess the ethics of AI and guide the modification of applicable legal structures to emerging technologies. This approach aims to adapt regulations to be evidence-based, responsive, and integrated within national health frameworks.

Sixth, the study's proposal for the introduction of compulsory insurance schemes which would include damage caused by AI-assisted medical malpractice, is meant to increase patient protection and legal certainty.

These insurance schemes require healthcare providers, tech companies, and system developers to pay into liability and equity compensation schemes, which are designed to be proportional to the level of control or benefit associated with each party. This would allow for the quick distributive justice for victims of malpractice, decrease the number of lawsuits, and increase the level of interpersonal trust in the use of AI in medicine, and especially in health care, the most controversial and sensitive area of the use of technology.

Seventh: The Improvement of Data Governance and Algorithmic Transparency

Lastly, the study emphasizes the need for the enhancement of legal obligations surrounding the governance of health data and the transparency of algorithms. This encompasses the documentation of training data, bias assessment and mitigation, and explainability concerning adverse outcomes of AI-assisted medical decisions, especially in high-stakes situations. There should be provisions for regulatory bodies to carry out algorithms audits and to restrict the use of AI systems in ways that violate the principles of equity, patient autonomy, or the protection of personal data.

REFERENCES

- Al-Adwan, M, and Qutieshat, E. Artificial Intelligence in Medicine: Legal Pathways to Sustainable Development Goals (SDGs). *Journal of Lifestyle and SDGs Review* 5, no. 2 (2025): e04475. <https://doi.org/10.47172/2965-730x.sdgsreview.v5.n02.pe04475>.
- Azibi, Y. (2024). Artificial intelligence. *Journal of the Higher Institute for Qualitative Studies*, 4(8), 2967–3140.
- Bakoush, L. (2025). *Civil liability for damages caused by artificial intelligence: The robot as a model*. Dar Al-Nahda.
- Bathae, Y. (2018). The artificial intelligence black box and the failure of intent and causation. *Harvard Journal of Law & Technology*, 31(2), 889–938.
- Bhagat, I. A., Wankhede, K. G., Kopawar, N. A., & Sananse, D. A. (2024). Artificial intelligence in healthcare: A review. *International Journal of Scientific Research in Science, Engineering and Technology*, 11(4), 133–138. <https://doi.org/10.32628/ijrsrset24114107>

- Bogomazova, I. O. (2024). Use of artificial intelligence in healthcare: Legal and ethical dimensions. *Medyczne Prawo*, 2(34), 9–16. <https://doi.org/10.25040/medicallaw.2024.02.009>
- Busch, F., Geis, J. R., Wang, Y., Kather, J. N., Al Khori, N., Makowski, M. R., Kolawole, I. K., Truhn, D., Clements, W., Gilbert, S. A., Adams, L. C., Ortíz-Prado, E., & Bressemer, K. K. (2025). AI regulation in healthcare around the world: What is the status quo? *medRxiv*. <https://doi.org/10.1101/2025.01.25.25321061>
- Colorado General Assembly. (2024). *Consumer protections for artificial intelligence*.
- Diviya, M., Bhuvanewari, R., Prabu, M., Subramanian, M., & Natarajan, A. K. (2024). Securing healthcare systems integrating AI for cybersecurity solutions and privacy preservation. In *Advances in healthcare information systems and administration* (pp. 330–344). <https://doi.org/10.4018/979-8-3693-7457-3.ch015>
- Edidin, B., Bunkov, A., & Krymskaya, K. V. (2024). The use of AI in medicine: Health data, privacy risks and more. *Legal Issues in the Digital Age*, 5(2), 57–79. <https://doi.org/10.17323/2713-2749.2024.2.57.79>
- European Parliament & Council of the European Union. (2024). *Regulation (EU) 2024/1689 laying down harmonised rules on artificial intelligence (Artificial Intelligence Act)*. Official Journal of the European Union.
- Farooqui, M. O., Qureshi, T., Kisswani, N., & Mishra, D. (2024). Artificial intelligence: Legal and ethical perspectives in the health care sector. *Science of Law*, 2024(4), 8–14. <https://doi.org/10.55284/sol.v2024i4.152>
- Fath Al-Bab, M., & Batikh, M. (2016). *Introduction to the study of law*. Dar Al-Nahda Al-Arabia.
- Ganapathy, K. (2021). Artificial intelligence and healthcare regulatory and legal concerns. *Trends in Telemedicine & E-Health*, 6(2). <https://doi.org/10.30953/TMT.V6.252>
- Hassan, N. (2025). *Artificial intelligence and the acquisition of intellectual property rights: Patents as a model*. Dar Al-Nahda.
- Kejriwal, R., & Mohana. (2022). Artificial intelligence (AI) in medicine and modern healthcare systems. In *Proceedings of the International Conference on Artificial Intelligence and Smart Systems* (pp. 25–31). <https://doi.org/10.1109/ICAISS55157.2022.10010939>
- Kumar, T. K. S., Rana, T. K., & B, M. K. (2025). The role of AI in healthcare. *International Research Journal of Advanced Engineering and Management*, 3(8), 2612–2619. <https://doi.org/10.47392/irjaem.2025.0411>
- Ministry of Health (Oman). (2014). *Future outlook of the health system (Health 2050) in the Sultanate of Oman*.
- Ministry of Health (Oman). (2025). *National health policy of the Sultanate of Oman*.

- Ministry of Transport, Communications and Information Technology (Oman). (2024). *National programme for artificial intelligence and advanced digital technologies*. Retrieved November 23, 2024.
- Ministry of Transport, Communications and Information Technology (Oman). (2025). *National programme for artificial intelligence and advanced digital technologies*. Retrieved August 23, 2025.
- National Council for Artificial Intelligence (Egypt). (n.d.). *Responsible artificial intelligence charter*.
- National Council for Artificial Intelligence (Egypt). (2025). *National artificial intelligence strategy (2025–2030)*.
- Othman, A. (2025). *The implications of artificial intelligence on civil law: A comparative study*. Dar Al-Nahda.
- Pabalkar, V., & Chanda, R. (2023). Role of artificial intelligence in healthcare. In *Artificial intelligence in healthcare* (pp. 353–360). Springer Nature. https://doi.org/10.1007/978-981-99-2746-3_37
- Quakulinski, L., Koumpis, A., & Beyan, O. (2022). Establishing transparency in artificial intelligence systems. In *Proceedings of the IEEE International Conference on Transdisciplinary AI* (pp. 116–121). <https://doi.org/10.1109/TransAI54797.2022.00027>
- Ritchie, O., Anderljung, M., & Rachman, T. (2025). From Turing to tomorrow: The UK's approach to AI regulation. *arXiv*. <https://doi.org/10.48550/arxiv.2507.03050>
- Royal Decree No. 6/2022. *Personal data protection law* (Sultanate of Oman).
- Royal Decree No. 39/2025. *Electronic transactions law* (Sultanate of Oman).
- Saudi Data and Artificial Intelligence Authority. (n.d.). *National strategy for data and artificial intelligence*.
- Saudi Data and Artificial Intelligence Authority. (n.d.). *Principles and ethics of artificial intelligence*.
- Saudi Data and Artificial Intelligence Authority. (n.d.). *Principles of generative artificial intelligence*.
- Sherman, N. (2025). *AI regulations around the world*.
- Sibilla, B. (2025). Artificial intelligence in medicine. In *Artificial intelligence in healthcare* (pp. 252–270). <https://doi.org/10.69635/978-1-0690482-4-0-ch14>
- Song, G.-B. (2023). The use of artificial intelligence (AI) in the medical field and legal issues. *Han'gug Gyeongchal Yeon'gu*, 22(1), 99–124. <https://doi.org/10.38084/2023.22.1.4>

- State Council of the People's Republic of China. (2017). *New generation artificial intelligence development plan*.
- Sultanate of Oman. (2019). *Law regulating the practice of medicine and allied health professions (Royal Decree No. 75/2019)*. Official Gazette No. 1317.
- Sultanate of Oman. (2023). *Law regulating the operation of unmanned aerial vehicles (drones)*. Official Gazette No. 1516 (October 22, 2023).
- Suresh, S., & Sasidharan, C. (2025). Artificial intelligence. *International Scientific Journal of Engineering and Management*, 4(3), 1–7. <https://doi.org/10.55041/isjem02419>
- Trisnawati, T. (2024). Artificial intelligence governance and regulation: A roadmap to developing legal policies for artificial intelligence deployment. *Journal of Governance and Administrative Reform*, 5(2), 185–194. <https://doi.org/10.20473/jgar.v5i2.65194>
- UAE Artificial Intelligence and Digital Economy Office. (n.d.). *Charter for the development and use of artificial intelligence*.
- UK Government. (2022). *AI strategy 2022*.
- UN Women. (n.d.). *How AI reinforces gender bias—and what we can do about it*.
- Wójcik, M. A. (2022). Algorithmic discrimination in health care: An EU law perspective. *Health and Human Rights*, 24(1), 93–103. <https://doi.org/10.2307/48673197>

Authors' Contribution

All authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

How to cite this article (APA)

Qutieshat, E. THE HEALTHCARE SECTOR IN THE SULTANATE OF OMAN AND THE LEGAL CONTROL OF THE UTILIZATION OF AI SYSTEMS. *Veredas Do Direito*, e234254. <https://doi.org/10.18623/rvd.v23.n2.4254>