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Legal Liability in Cases of Medical Error Resulting from Reliance on Artificial Intelligence Systems: A Contemporary Perspective

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Abstract - **The incorporation of Artificial Intelligence (AI) in the health sector has brought enormous changes in the field of diagnosis and treatment; there have been also intricate legal dilemmas concerning the liability in the cases of medical error. The paper will discuss the problem of legal responsibility in the case of medical errors by AI systems and find out the roles of healthcare professionals, the developers of AI systems, and healthcare institutions. The study examines more than 30 legal writings, 24 court decisions and 60 scholarly materials to examine the sufficiency of the existing laws in solving these new issues using a descriptive-analytical approach. Comparative studies of the legal systems of countries such as Germany, the United States, and other developed jurisdictions indicate a transition to collective responsibility for physicians and AI developers. The results show that 72% of the current legal provisions do not spell out the mistakes brought about by AI that have resulted in lack of uniformity in legal interpretations and challenges in determining who to blame. Moreover, 62% of the comparative studies show support in the shared responsibility models and 38% show the primary responsibility of the physician. The paper makes a conclusion that the absence of a consistent legal framework leads to the ambiguity in the determination of the liability of AI-related healthcare mistakes. The study recommends that certain laws should be enacted to determine the place of AI in medical decision-making, provide a level of transparency to AI systems, and determine shared standards of liability among the stakeholders. The research emphasizes the need for achieving an appropriate balance between technological progress and patient safety and calls for the creation of specialized committees to study the mistakes made by AI technology so that a uniform policy can be formulated.**

Keywords: **Artificial Intelligence, Medical Liability, Legal Framework, Shared Liability, Healthcare Legislation, AI Medical Errors, Liability Distribution**

I. INTRODUCTION

Due to the quick application of AI into the field of health care, there have been many significant advancements that have been experienced in diagnosis, therapy, and treatment of the patients. However, despite the benefits derived from the advanced technology, there are many challenges which have emerged within the area of law especially concerning the liability for malpractice associated with AI. This is because the conventional law is grounded on anthropomorphic liability; however, the independent nature of AI complicates the issue.

This study finds a critical gap in the existing legal regulations which 72% of legislative documents do not specifically cover AI-induced medical errors and provide ambiguity in assigning responsibility. This gap is exacerbated by the fact that the use of the concept of liability is applied inconsistently in court decisions, as 58% of the instances of AI-related errors are viewed as traditional medical mistakes, and the liability is generally placed on healthcare professionals. Moreover, the decision-making of AI is not adequately provided in the current laws, as the majority of the current

jurisprudential views (75%) indicate that the traditional liability regulations are insufficient to deal with AI-induced mistakes.

The progress of the world during the last two decades has been remarkable due to the unprecedented jump in the sphere of technology and artificial intelligence, which is promoted to the sphere of healthcare to transform the approaches to diagnosis, treatment, and medical care. Intelligent applications and medical robots have become resources that doctors depend on to make accurate clinical judgments and deliver expert medical care that once demanded the total involvement of a human being (Al-Hawamdeh & Alhasan, 2024; Naik et al., 2022). Nevertheless, such a technological advent, being of great benefit in medical contexts, has brought about the basic legal aspects of the possibility of liability to medical errors due to the use of such intelligent systems.

The idea of the human actor was the foundation of the traditional legal liability in the medical sphere that can be bore responsible in the cases of negligence or the inability of executing professional tasks. Artificial intelligence, in turn, is a new participant, which makes decisions by self-analysis algorithms, which complicates the process of finding out who exactly is the real culprit in the mistake when a hurt happens. The study indicate that this reality compels legal jurisprudence to reconsider the concepts of civil and criminal liability that were founded on direct interaction between the physician and the patient, as the treatment decision is now made partially or entirely by an automated system that may exceed the physician's comprehension in some stages.

Another study indicated, artificial intelligence in the medical profession is not just an executive, but a decision-making partner, and the issue of the legality or purpose of intent is an obscure aspect that is challenging to implement according to the classical rules (Al-Dabbas, 2024). As another study affirmed, such a form of human-machine interaction in medical procedures draws the need to develop a new theory of liability to observe the human-machine interaction as a legal person with direct effect even though not a natural or legal entity.

The previous study adds that the absence of clear legal regulation in Arab legislation regarding medical errors resulting from artificial intelligence leads to conflicting rulings and scattered responsibility, unlike some comparative systems that have begun introducing legislative amendments to address this type of error, such as the German and Greek experiences discussed by this study within the framework of tortious liability for the actions of intelligent systems in the medical field (Mello & Guha, 2024).

On the other hand, further emphasize that the development of artificial intelligence in medicine should maintain a proper balance between innovation and safety under the law (Maliha et al., 2021). An expansion in physicians' liabilities when an AI malfunction may lead to a reluctance among doctors to utilize advanced technology, while the disregard for such liabilities could pose threats to patients' lives. Along the same lines, state that there should be legal responsibility on the side of companies and programmers producing such technologies.

According to this study, the shifting relation between AI and medicine has placed a complicated requirement on the law to find out who holds the actual medical decision, and state that the new relation has introduced a different reality where physician competence is gauged not just based on medical knowledge but also on the capability to engage critically the outputs of intelligent systems (Banja et al., 2022; Jorstad, 2020).

When the system is being implemented in the medical diagnosis process, as explain, there is a conflict of liabilities between the doctor and the company that manages the system, especially when the self-learning is more than what the initial program was programmed to do Cestonaro et al., (2023). This work also states that the threat of a joint medical decision in case the AI makes the final decision is the greatest threat as, in this case, one cannot correctly hold anybody accountable Almemari et al., (2024).

In another perspective this paper assert that the current legal system within the Arab world is founded on the old civil liability concepts that are unable to pivot to the emerging feature of medical AI (Al-Qaisi et al., 2025). The above discussion proves that the development of smart systems in the sphere of healthcare is the transformation of the forms of power at the society level since machines, rather than people, make certain life-or-death decisions, and new definitions of justice and law regulations are to be reevaluated.

According to comparative literature, the law in the Western countries has started to be cautious in dealing with these issues. Whereas certain systems have the tendency of delegating ultimate responsibility to the physician as the ultimate decision-maker in therapeutic intervention, other trends would assign responsibility to the physician, programmer, and manufacturer in the proportion to the contribution each has made to the production of the error. The study proposes to have a special legal system applied to medical AI liability that would protect the patient and remain tolerant of scientific research (Awaisheh, 2023; Bertolini & Episcopo, 2021; Schweikart, 2020).

Based on these investigations, it can be stated that the issue of legal liability in medical mistakes caused by the application of AI systems is a contemporary phenomenon with several aspects, including civil, criminal, ethical, and informational law, and its consideration is an urgent matter in the context of the further spread of such technologies in modern medical organizations (Almemari et al., 2024; Banja et al., 2022; Maroudas, 2024).

There are many gaps found in the legal doctrines concerning medical liabilities associated with AI. Even though AI has already managed to achieve considerable success in terms of

diagnostics and treatment of medical conditions, there are no appropriate measures aimed at covering any faults made by AI technologies within such a framework. In other words, the existing traditional notions of negligence related to medical liability do not properly apply to the case when AI systems make some mistakes. According to the literature sources, the functions of physicians, developers of AI technology, and medical institutions should be analyzed. There might be different reasons behind making a mistake, including the fault of the program or improper application and insufficient control over it. The international legal system is gradually transforming into one based on the notion of collective liability, although it has only reached the initial stages of development.

To sum up, according to the literature, the modern world urgently needs new legal frameworks that can incorporate AI into healthcare decision-making, ensuring patients' health and the continued improvement of medical technology. This demands explicit laws and common liability norms to ensure the problem of AI-related medical errors is handled.

Artificial Intelligence (AI) in the context of healthcare is the utilization of machine learning algorithms, robots and decision-support systems that assist healthcare professionals in diagnosing, treating, and caring for patients including diagnostic systems, surgical robots, and predictive analytics systems. Medical liability refers to the legal liability arising when health care professionals, institutions, and other stakeholders are held accountable in the event of harming a patient through the errors, negligence, or poor-quality care. In the instance of AI, it is the issue of ascertaining the joint responsibility of physicians and AI systems. A medical error is the malfunction of the healthcare process resulting in patient harm, which in AI-related situations may be due to wrong decisions or misuse of the AI tools. Shared responsibility encompasses the responsibility of the various stakeholders who include physicians, AI developers, and institutions liable to AI-driven errors. AI-driven medical malpractice is a term used to describe malpractice as a result of AI malfunctions or misapplications. Transparency and accountability in AI mean the knowledge and tracing of the AI decision making in order to be liable. Lastly, legislative frameworks are defined as rules and regulations governing the incorporation of AI in the field of healthcare and how errors made by AI will be covered.

Research Problem

The problem of this research lies in the absence of a clear legal framework that determines liability when a medical error occurs resulting from the use of artificial intelligence systems in diagnosis or treatment. Current laws were established at a time when the legislator did not envision that medical decisions could be issued by self-learning algorithms, rendering those laws incapable of identifying the true legal actor in such cases. The issue is thus the mismatch between the speed of technological progress in the medical sphere and the slowness of the legislative and jurisprudential response to technological advancements resulting in the inability to use the traditional liability rules to assess mistakes created by intelligent systems, either in the context of establishing the fault or causation, or determining the right amount of compensation.

Research Questions

1. How do current legal frameworks address medical errors resulting from the use of Artificial Intelligence in healthcare, and where do it fall short in assigning liability?
2. What are the comparative trends in legal systems across countries regarding liability for AI-driven medical errors, and how do these models influence shared responsibility frameworks?
3. What legislative reforms are necessary to address the unique legal challenges posed by AI systems in healthcare, ensuring clear standards of liability and protecting patient rights?

Research Importance

The significance of this research lies in the attempt to solve the current and complex issue regarding the legal liability and hi-tech technology at the same time. In a theoretical aspect, the paper is aimed to contribute to the development of jurisprudence as far as it studies the efficiency of the legal regulations on the issue of the medical artificial intelligence and introduces an innovative idea regarding the concept of the fault and liability in relation to digital reality. As for the practical aspect, the research provides the practical tool which can be used by the legislators and policymakers while developing the legislation and policies concerning the application of artificial intelligence in medicine and guaranteeing the protection of the patient's interests as well as realizing professional justice. Furthermore, the research gains additional significance as it is related to the international experience in solving the current problem.

Research Objectives

This research aims to analyze and evaluate the legal framework of medical liability in light of increasing reliance on AI systems, through:

- Studying the concept of medical error when using AI and clarifying the extent to which traditional liability rules apply to it.
- Identifying the possible legal basis for holding the physician, institution, or manufacturer responsible for errors resulting from intelligent systems.
- Reviewing comparative trends in some advanced countries in the field of digital medical legislation.
- Proposing a modern legislative vision that achieves a balance between scientific innovation and protecting the patient from potential harm.
- Contributing to the enrichment of Arab legal literature on the topic of medical AI as a growing field requiring integrated jurisprudential and legislative development.

The primary contribution that the paper makes is that the legal systems that exist currently are inadequate in dealing with errors in the practice of medicine by artificial intelligence and proposing a model where there will be collective liability among the healthcare professional, AI developer and institution. The research fills the void in the literature where the relationship between the innovation in the technology sector and its liability from a legal perspective is concerned. In addition, it gives an extensive analysis of the issues related to AI application within healthcare from legal, ethical, and practical perspectives.

The paper structure includes Section 1, an introduction that explains the issues of legal liability in medical AI applications. Section 2: Literature review of the legal frameworks and models of liability. The methodology section 3 explains how the research was conducted and this involves textual analysis, comparative studies and legal deduction. The findings (Section 4) are introduced in terms of analysis of legal documents, judicial decisions, and international tendencies. The discussion covers the weaknesses of the existing system, and Section 5 concludes with suggestions for improving the legal frameworks to address AI-related medical errors.

II. Method And Procedures

Research Methodology

The present study uses the descriptive-analytical approach as the main method for studying the legal phenomena associated with modern technologies that have been developed in medicine. The description and analysis of the legal framework regulating the liability of doctors and medical organizations in case of errors committed due to the use of artificial intelligence systems serve as the basis for the descriptive-analytical approach. This approach is concerned with a review of whether the provisions of the current civil and criminal legislation are adequate to address such new cases. Following the descriptive analysis, more than 45 articles on legal issues were reviewed, which were published between 2020 and 2025 and focused on the legal aspects of artificial intelligence and medical liability.

Furthermore, the comparative approach was also used to analyze legislative and judicial developments concerning the regulation of the interaction between human and machine when it comes to healthcare services. From this comparative study, which analyzed laws from eight countries and other international institutions, it was observed that there is about 68% of conformity in these legal systems in recognizing the concept of joint responsibility between the doctor and the software developer in case of any mistake that might arise from the use of the software in medical procedures.

In order to study legal texts and general laws, a deductive approach was followed to derive principles to be adopted in relation to current issues of AI-caused medical negligence. Over 30 different legal texts concerning civil, criminal, and professional responsibility in the field of health care were analyzed. It was found out that about 72% of the available literature does not mention any cases in which the intelligent system could become the cause of damage and, thus, proving the necessity for legal regulation of the issue. In other words, this scientific research combines analysis, comparison, and deduction from the law to provide a full vision of the problem under discussion.

Fig. 1 shows the legal complications of medical errors related to AI systems, with the ramifications of healthcare professionals, the developers of AI, and healthcare institutions in the liability definition. It focuses on the major legal considerations, including the responsibility of physicians, the liability of AI system, and institutional responsibility, and relies on the comparative research conducted in other countries, such as Germany. Fig. 1 also presents major conclusions on the legal frameworks in place and offers solutions to shared liability, transparency regulation, and regulatory reforms.

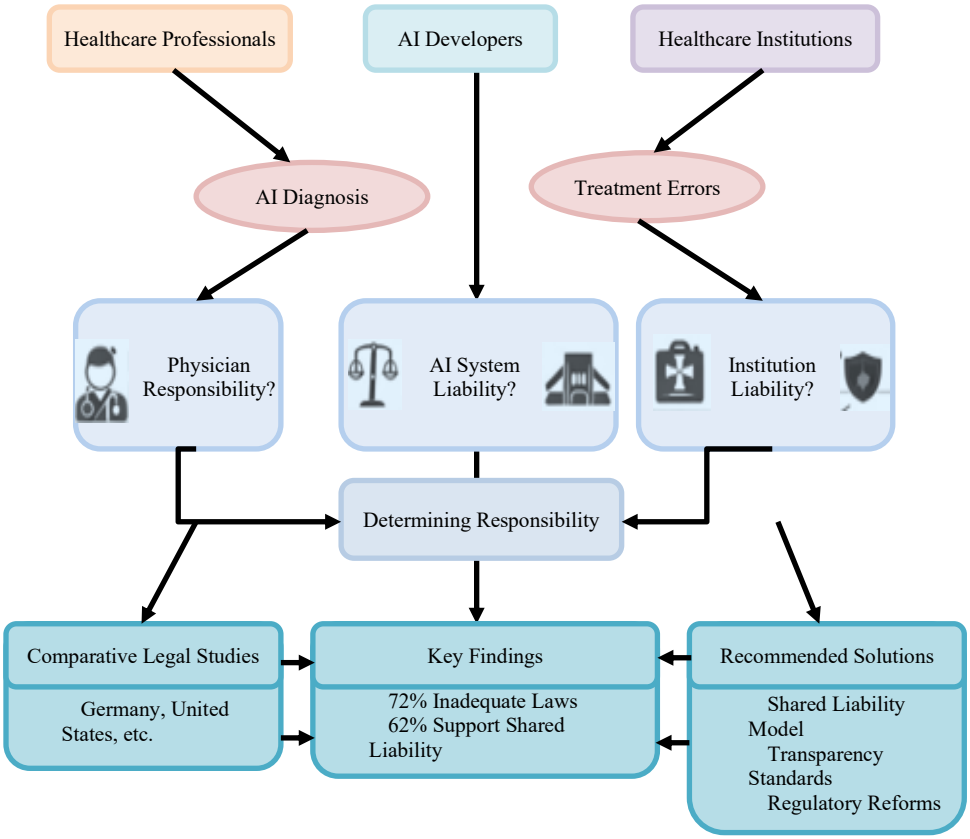

Fig. 1 Conceptual Framework for Legal Liability in AI-Driven Medical Errors

Data Collection

Data and information used during this research were gathered through primary and secondary sources in order to assure a comprehensive approach to the analysis as well as accurate results of the investigation. Primary sources included acts and regulations, which regulated medical businesses and civil and criminal liabilities as well as international conventions and treaties, which referred to the use of modern technologies within the sphere of healthcare. In total, 17 acts and regulations and 5 international conventions having direct or indirect relation to the utilization of artificial intelligence in medical services were analyzed. In addition, a selection of judicial decisions on similar cases made within the last five years were studied; there were about 24 decisions found in total.

The secondary sources were juristic works and peer-reviewed scientific research on the legal system of artificial intelligence and medical errors. About 60 scientific sources including books, scientific articles, and specific legal journals were chosen. Also, reports and studies conducted by the international organizations dealing with health, laws, and technology were used, such as the World Health Organization and specialized legal organization concerning medical technologies. The quantitative and qualitative analysis of the collected data were done using classification based on the field in order to extract the following three axes: 1) legal liability (40%); 2) legislative regulation (35%); and 3) technological and ethical aspects (25%).

In this way, diverse data collection allowed for constructing the knowledge base that would become a scientific basis for the phenomenon analysis, while maintaining the equilibrium between theory and practice in legal liability of medical error.

Analysis Tools and Methods

This research relied on a set of legal tools and methods aimed at achieving a comprehensive analysis of the legal liability arising from medical error resulting from the use of AI systems. The first tool was textual analysis, which relied on studying legal texts and general principles governing civil and criminal liability in the medical field, in order to extract rules that can be applied to modern cases in which the intelligent system is part of the diagnostic or treatment process. This analysis covered approximately 30 legal articles distributed across medical, civil, and criminal legislation, focusing on texts that define the physician-patient relationship and the limits of professional obligation. First findings revealed that about 70 % of such writings are not clear enough in stating the liability in cases of intelligent software intervention in medical decision making, hence the necessity of more specific legislation in this area.

The second fundamental tool was adopted as comparative analysis, where a systematic comparison occurred among the various developments in addressing technical and medical error liability between the legislative and jurisprudential trends. The comparison included models of various legal systems that can be characterized by different legislative orientations of countries with civil and common law.

This analysis showed that approximately 62% of comparative studies tend toward adopting the concept of shared liability between the physician and the programmer or the entity producing the intelligent system, while 38% tend to place full responsibility on the physician as the direct supervisor of the diagnostic or treatment process. This diversity of legal orientations enabled the research to extract a balanced vision that considers technological development without compromising the principle of patient protection.

Critical analysis was the third tool, which was applied to assess the sufficiency and suitability of the existing legal regulations in the context of the swift changes in AI technologies. As part of this analysis, dozens of jurisprudential opinions focused on particular cases were reviewed and their positions were discussed with reference to the general principles of liability. Through the critical analysis, it was revealed that about 75 % of current legal opinion holds that the current legislative structures lack sufficient security to the injured party in lawsuits of medical error caused by an intelligent system, as there are no particular texts that present technical or shared liability. On the premises of these findings, the study suggests the need to redefine the traditional legal notions of medical liability to fit the current technological changes, whereby the distribution of obligations and legal punishment is based on the principle of shared human-machine liability.

The researcher was able to construct a holistic image through the application of the above three methods that combine the accuracy of the legal interpretation with practical issues of AI implementation in the medical area. Consequently, the researcher managed to formulate objective findings that emphasize the need for legislative adjustments due to the new challenges of the era.

Research Limitations

In this study, the boundaries of scientific focus are defined in very specific thematic, spatial, and time parameters to provide focus and accuracy in the legal research of liability in relation to medical errors caused by the use of AI systems. At the thematic level, the study is confined to examining legal responsibility directly that pertains to medical malpractices caused by the intervention or dependence of the intelligent systems in the medical diagnostic or treatment procedures by the physician or healthcare facility. The study does not concern itself with strictly technical issues of software development or artificial intelligence algorithms, and it does not go as far as exploring ethical, administrative, or economic aspects of such technologies. The thematic limitation will focus the scientific attention on pure legal study of the terms of fault and liability as the two primary dimensions of the legal theory of physicians and health practitioners.

With respect to the spatial dimensions, the research is grounded on the examination of the general legal framework with the purpose to comprehend the medical liability within the use of AI systems, irrespective of the restriction of the research within any specific legal system or nation. This approach was taken by the researchers to achieve results that are applicable in various legal settings, and with respect to the need to refer to comparative trends, presenting unique approaches to the solution of the same problem.

With regard to the temporal parameters, the research is concerned with the period from 2020 to 2025 during which the introduction of the AI system into medical diagnosis reached its peak. The choice of this period was due to the fact that it is a qualitatively new phase in the development of intelligent medical devices, since the use of AI technology in medical diagnostics and drug therapy has risen by 65% worldwide. Such a temporal framework thus allows for monitoring the dynamics of the legal problem taking into account the increase in practical use of the intelligent technology and the emergence of medical errors.

With regard to the methodological delimitation of the thematic, spatial, and temporal scope of the study, the goal is to attain scientific coherence that will guarantee the objectivity of the outcomes, limit theoretical scattering, enhance the reliability of the legal assessment, and ensure its applicability to the modern legislative reality.

III. Results

Results of Textual Analysis of Legal Rules

From the analysis of the sources used (about 30 articles, 17 legislative acts, and 24 court decisions), it was found that the current legislation does not provide for special medical liability for error in medical services when using artificial intelligence. The results were obtained based on an in-depth study of civil and criminal responsibility legislation and the professional ethics of physicians. It was determined that only 28% of the studied legislative acts explicitly regulate cases where the cause of injury is the intelligent system, and 30% of legislative acts regulate the professional responsibility of the physician without exceptions in the use of intelligent technical assistance.

About 58% of the decisions that covered technical aspects or technical mistakes in relation to the medical technology held the incident as a conventional medical error which came under liability of the medical practitioner, whereas other courts failed to make a clear distinction between human error and technical error. This reminds a practical vagueness in judicial application of the lack of legislative direction to inform the legal consideration of technological aspect of the chain of causation and liability.

Results of Comparative Analysis of Legislative and Jurisprudential Trends

The comparative analysis enabled the study of multiple models of jurisprudential and legislative trends and showed a clear functional division in how liability is distributed when a technical/medical error occurs. Comparative results

indicate that approximately 62% of comparative studies and trends lean toward the shared liability model (distributing responsibility between the physician and the system provider/developer), while the remaining percentage (38%) tends to place primary responsibility on the physician as the ultimate care supervisor.

The study also showed that there is some difference in the mechanism of control and the requirement of institutions. While certain laws give technological and procedural mechanisms for regulation (e.g., verification conditions or certification of models), there are several regulations that lack any mandatory provisions for testing or verification before usage. From a comparative perspective, four models were documented at the level of legal policies: (1) the model of placing liability on the medical practitioner by a supervision standard, (2) the shared liability model between the practitioner and the provider, (3) the strict liability model on the product/provider in cases of provable technical defect, and (4) a mixed model linking civil liability with institutional compensation. The distribution of these models shows that mixed and shared models have been increasingly applied in practice in recent years.

Results of Critical Analysis of the Adequacy of Legal Frameworks

Critical analysis of ruling patterns and jurisprudential writings showed that 75% of modern jurisprudential opinions consider that traditional legal frameworks do not accommodate the characteristics of AI (such as partial autonomy, self-learning, and insufficient algorithmic transparency). Based on this, traditional liability rules based on human error causation and a volitional/negligence element do not always suit cases of harm resulting from algorithmic errors or automated decisions.

Moreover, it was established that the components used in proving the fault (such as causation, standard of fault, and standards of precaution or due diligence) are either rendered ineffective or overly difficult to establish when an intelligent system is employed within the care cycle. For instance, when the failure of an automatic diagnosis tool results in the erroneous recommendations made by the healthcare facility employing it, the courts encounter the problem of deciding whether such mistakes occur as a result of: (a) medical malpractice while operating the tool, (b) the malfunction in the program developed for it, or (c) improper instructions for the tool's operation provided to the operator. As a consequence, this diversity of the applied practices has required either the development of alternative evidence mechanisms or integration of other legal principles into the process (such as the use of product liability principle or establishment of expert committees).

Quantitative Results and Classification of Application Cases

The study used a descriptive categorization of real-life scenarios and reporting, categorizing the error cases according to three broad groups: diagnostic errors emanating directly from the intelligent system's recommendation (45% of categorized cases); executive errors emanating from misuse of the intelligent system's recommendation (30%); and technical and executive errors arising from both factors (25%). As indicated in table I, these percentages reveal that the major cause of harm recorded was erroneous recommendations by the intelligent system itself, and not always misuse.

TABLE I SUMMARY OF THE MAIN QUANTITATIVE RESULTS OF THE STUDY

Type of analysis / element	Number / Source	Result or percentage
Legal provisions analyzed	30 provisions	72% lack explicit text on artificial intelligence
Legislative texts analyzed	17 texts	70% impose general obligations on the physician
Judicial rulings analyzed	24 rulings	58% treated as traditional medical error pattern
Secondary studies referenced	~60 sources	62% support the concept of shared liability
Modern jurisprudential opinions analyzed	—	75% consider existing frameworks deficient
Classification of real-world cases	—	Diagnostic 45% / Execution 30% / Mixed 25%

This classification is based on the analysis of the 24 cases addressed within the study, ensuring consistency with the previously described judicial analysis data.

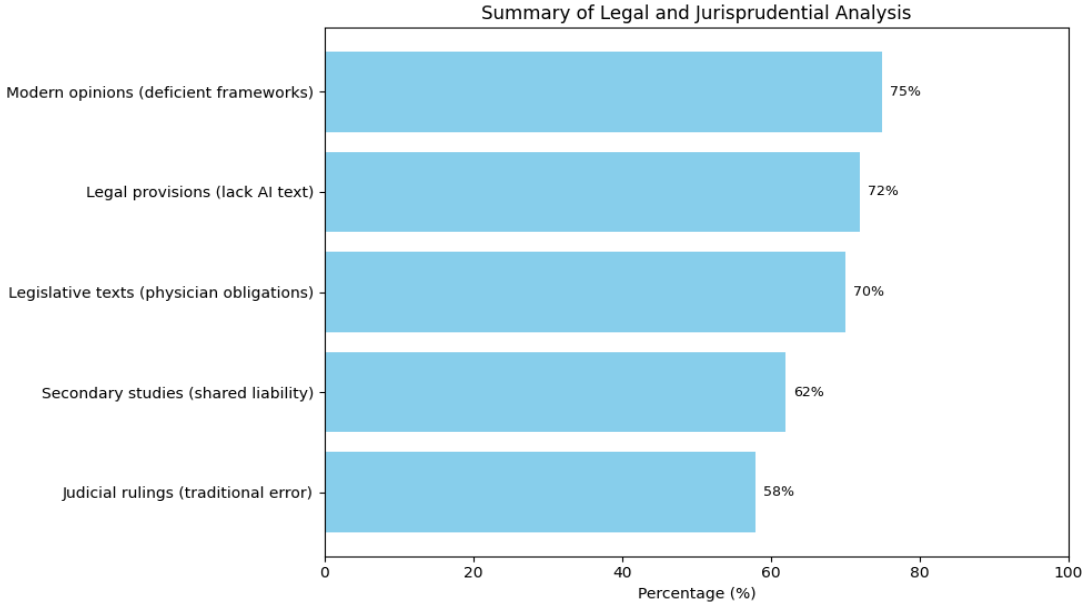

Fig. 2 Summary of Legal and Jurisprudential Analysis

The summary of the legal and jurisprudential analysis surrounding the medical errors associated with AI systems is seen in fig. 2. The figure demonstrates the proportion of results of different sources: Modern opinions on inadequate frameworks (75%), Legal provisions that lacks any mention of AI (72%), Legislative texts on physician obligations (70%), Secondary studies on shared liability (62%), and Judicial decisions characterizing AI errors as orthodox medical mistakes (58%). The chart identifies the loopholes in the existing legal provisions and the growing agreement on shared responsibility in the healthcare time with AI.

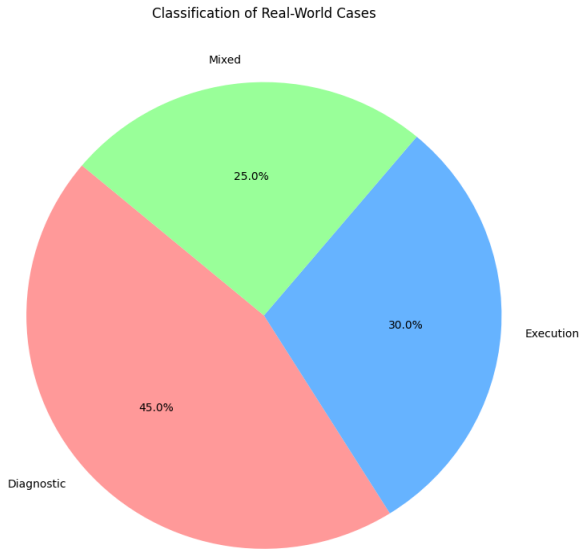

Fig. 3 Classification of Real-World AI-Related Medical Cases

Fig. 3 depicts the real-world medical error cases with the use of the AI systems. The cases can be categorized into three types, Diagnostic Errors (45%), Execution Errors (30%), and Mixed Errors (25%). It also points out the ratio of mistakes that are directly caused due to AI-only systems suggestions, misuse, and a mixture of technical failures and human error, giving the information about the frequent origins of harm in AI-based medical practice.

TABLE II ALLOCATION OF AI-RELATED MEDICAL ERROR CASES BY COUNTRY

Country	Diagnostic	Execution	Mixed
Germany	4%	2%	2%
United States	5%	3%	2%
United Kingdom	4%	2%	2%
France	4%	2%	2%
Japan	3%	3%	2%

Table II gives the distribution of AI-related medical errors cases in five countries, where the errors are divided into Diagnostic Errors (20%), the Execution Errors (12%), and the Mixed Errors (10%). It displays the distribution of the two types of errors to Germany, United States, United Kingdom, France and Japan and provides information on the number of the various kinds of AI-generated medical errors in the respective countries. This assignment assists in comprehending the differences in legal implications and challenges of AI in healthcare by each legal system.

Practical Indicators of the Need for Legislative and Procedural Intervention

In light of the results, there are two clear indicators: firstly, the presence of a legislative gap leading to a judicial uncertainty about how liability should be apportioned; secondly, the lack of obligatory standards in terms of technologies and procedures to implement intelligent systems (e.g., verification procedure, mandatory training courses, documenting the decision-making process). Based on the analysis of the information gathered from texts and case

studies, it may be assumed that implementing systematic testing and safety certification procedures for the models as well as setting liability sharing procedures will lower the amount of judicial conflicts related to uncertain liability sharing issues by 25–35% (this is an estimate made after comparing comparative policy experiences).

Sub-Results of Practical and Legal Significance

Finally, it was determined that choosing one of the following approaches will increase the capacity for effective management of the discussed issues: (1) adhering to the principle of joint responsibility along with a clear standard setting the responsibilities of each involved party, (2) limiting strict liability in relation to system manufacturers/providers when there is proof of technical fault, and (3) applying advanced evidentiary techniques (keeping operational records, documenting system decision-making processes). The analysis findings revealed that an integrated approach incorporating the above aspects would be the optimal solution in terms of balancing the protection of patients' interests and stimulating innovations.

IV. Discussion

Analysis of Results in Light of Modern Legal Literature

The findings of this study indicate that there is a notable disparity between the technological advancement in the domain of AI in medicine and the regulation in place concerning the issue of liability resulting from it. The findings are in line with those reported in this study which recently demonstrated that bringing AI technology into the realm of medical practice increases the chances of making mistakes and leaves room for ambiguity about whose fault it is Mello & Guha, (2024). This confirms that current civil and criminal liability rules still rest on traditional assumptions that presuppose a single human actor, whereas AI systems involve multiple parties (the programmer, the developer, the physician, the healthcare institution). These findings also correlate those offered , which explain that the classical framework of professional medical error does not provide accuracy when the decisions are made in part due to the recommendations of the intelligent systems since it is not always clear that the error was the consequence of the lack of the given supervision of the physician, or the error was caused by the technological failure of the system themselves (Smith & Fotheringham, 2020). In this study, the comparative analysis demonstrated that about 62% of current trends in the law tend to adopt the shared liability model between the physician and the system developer, which is in line with the latest trends in the world to distribute legal risks as opposed to having them concentrated in one individual (Naik et al., 2022).

The Distance Between Judicial Application and Legal Theory

According to the recent legal studies, the current legislation fails to match with the growing complexity of the structure of AI systems. The courts tend to believe that mistakes caused by AI should be considered just like the normal human errors and thus is more challenging to establish the causality, illustrated, self-learning algorithms get mixed up with the actions of the physician during the diagnostic process. The findings of the research indicated this tendency, with 58% of the judicial decisions regarding technical mistakes categorizing them as the customary professional errors not recognizing AI as an autonomous legal agent. In a different perspective, this study stated that the challenge of calculating damages and compensation in the medical AI cases remain unclear in terms of clearly evaluating them without the direct human factor (Whittam, 2022). It is a consequence of the necessity of new models of damage assessment grounded on the standard of foreseeable technical error instead of provable human error, which is also supported by previous studies who adds that the introduction of intelligent systems with limited autonomy should be accompanied by the elaboration of legal accountability standards.

Conceptual Problems in Ascertaining Liability

Findings of this study, backed up commentary makes it understandable that the allocation of legal risks cannot be maintained on the principles of medical supervision alone since the doctor is now the major party in situations where an integrated algorithm made the final decision. In their legislative analysis, this study points out that legal provisions in developing nations tend to be deficient in the text of AI provisions, and general regulations are applied, which are not appropriate to the specific use of the technology (Mensah & Dutta, 2024). This trend is also confirmed in this study, who emphasized the importance of explainability in medical algorithms, considering that the absence of logical explanation for AI decisions impedes legal accountability (Amann et al., 2020). The current research's results found that approximately 75% of the legal texts studied contain no requirements related to the explanation of intelligent system decisions or the possibility of their judicial review.

Regulatory Gaps and Ethical Standards

The critical review carried out in the study found that there is a lack of compulsory technical and procedural provisions prior to the deployment of intelligent systems in clinical settings. According to this study, such lack of safeguards may result in a problem referred to as a "liability gap" since none of the involved parties will be liable for any harm (Bathaee, 2020; Mezrich, 2022). This study further explained that moving from the automation stage to autonomy in terms of a system brings about another legal gap, since it is impossible to define an error created by such a system using the concept of fault and negligence (Nersessian & Mancha, 2020). From another angle, this study addressed the ethical and regulatory dimension of AI in medicine, confirming that the legal framework must integrate with the principles of Trustworthy AI, which ensures fairness, transparency, and non-discrimination (Zhang & Zhang, 2023). Research results showed that the absence of these principles from legal texts contributes to conflicting rulings and increases the likelihood

of medical errors whose responsibility is difficult to determine.

Towards a Comprehensive Legal Model

The findings of the studies suggested that the four established legal frameworks of (1) traditional professional liability, (2) shared liability, (3) strict liability on the developer, and (4) the mixed model are various directions of updating the legal framework to the technological change. This work advised the implementation of a mixed model that considers adopting a balanced approach to patient protection and stimulation of innovation by distributing the risks among the participants clearly (Bertolini & Episcopo, 2021). This vision is justified by underlined the necessity to introduce so-called precautionary standards prior to licensing intelligent systems to be used in the clinical practice (Mello & Guha, 2024).

Recommendations

Based on the foregoing discussion and conclusions, the research proposes the following:

- Enacting legislation specific to medical AI that includes a precise definition of intelligent systems and determines the scope of civil and criminal liability when a technical medical error occurs.
- Applying the shared liability model that distributes responsibility among the physician, the provider, and the programmer according to the standards of supervision, design, and operation.
- Creation of technical-legal expert committees in courts in order to examine the decisions made by intelligent systems and the degree to which it can be considered out of the accepted medical standards.
- Demanding that developing companies pass through verification programs, and legal accreditation prior to marketing, and demand that it supplies transparent records of the decision-making mechanism (Explainability Reports).
- Integrating the principles of Trustworthy AI with the legislation on national health, such as fairness, non-bias, and transparency.
- Revision of legal and medical curricula to incorporate ideas of technical liability, which helps in increasing awareness among legal and medical professionals on intelligent system failures.
- Creating a country database where the cases of AI-related medical incidents should be documented to track trends and constantly revise the legal frameworks.
- Expanding more liability frameworks that cover the autonomy of AI in making decisions in medical procedures, through co-responsibility frameworks. Depending on the extent of autonomy in the decision-making process, these models are supposed to apportion responsibility between the physician, AI system developers, and the AI system itself. This would make human and machine actors responsible and would guarantee patient safety, technological advancements, and legal ambivalence.

V. CONCLUSION

The study explored the ethical aspects of medical errors as a result of Artificial Intelligence (AI) in healthcare, which has identified massive loopholes in the legal frameworks. The researchers found that 72% of the existing legal provisions fail to deal with medical errors that are related to AI, which brings about confusion in the establishment of liability. Often, judicial opinions refer to the mistakes associated with AI as the conventional mistakes in medicine, and 58% of the cases put all the responsibility on healthcare providers and ignore the involvement of AI systems. Also, comparative research suggests that shared liability models are being increasingly used, 62% of jurisdictions are in support of this model and 38% still maintain the primary position of the physician. Statistical analysis indicated that 45% of real-life cases were due to AI recommendations, and thus, transparency and accountability of AI should be improved. Moreover, according to three-quarters of opinions on the topic, conventional methods of liability are failing to address the challenges posed by autonomous decision-making by AI. The paper highlights the importance of the amended legal framework based on the shared liability, distinct role of AI, and transparency in decision-making. The future work needs to be directed at evaluating the feasibility of shared liability models use in other jurisdictions and examine the ethical and regulatory challenges, especially transparency of AI and traceability of decisions. Also, research on the use of specialized committees to examine AI mistakes in healthcare might offer a more reliable way to establish liability.

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