



Enhancing legal and medical responsibilities in the healthcare sector with artificial intelligence: The moderating impact of professional training

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Abstract

Artificial intelligence is increasingly integrated into healthcare, offering improvements in efficiency, diagnostics, and patient care. Despite these benefits, its adoption raises ethical and legal challenges. This qualitative study explores healthcare practitioners' perceptions of AI adoption, accountability, and the role of professional training. The study was conducted in two hospitals in the Balqa and Jarash Governorates in Jordan. A purposive sample of 20 participants, including physicians, nurses, clinical technicians, and hospital administrators, participated in in-depth, semi-structured interviews. The findings indicate that AI is largely received positively and is believed to support clinical decision-making and improve efficiency. However, there are apprehensions regarding the ethical and legal accountability that come with AI use, as there is a lack of firm rule guidelines and training. Participants believed that professional training should be customized to the intended outcome in the given context, and should provide relevant, practical skillsets. The Jordanian healthcare context in which the study was carried out is relevant, as it gives policy and ethical suggestion related to AI implementation. The hospitals having the discussions about the legal complexities forecasting the adoption of the technologies, these, alongside professional complexities, cover all the dimensions that these hospitals can face while responsibly integrating the innovations.

Keywords: Artificial intelligence, healthcare sector, legal responsibility, professional training, medical responsibility

Introduction

The application of artificial intelligence (AI) into healthcare has been adopted rapidly, which has transformed practices of medicine globally. Clinical decision-making accuracy has improved across diagnosis, treatment recommendations, patient analytics, and other fields due to the efficiency brought to analytics and patient management systems (Shaheen, 2021) [24]. Outcomes of medicine have improved, and hospital operations have been streamlined; however, concerning the ethics the legal accountability and professional questions of responsibility have arisen. The boundaries of legal and medical responsibility have always been considered separate, but, with the advancement over AI in medicine, the degree of blur has increased. The issue of medical AI systems making medical decisions and the potential consequences that could arise, create loopholes in accountability (Cestonaro, Delicati, Marcante, Caenazzo, & Tozzo, 2023) [18].

The AI systems decision-making ought to be parameterized; otherwise, the physician that could be considered the main liability would be left uninformed (Amann, Blasimme, Vayena, Frey, Madai, & Consortium, 2020) [6]. The responsibility however would then be extended towards the developers of the AI systems, data practitioners, and healthcare systems. The absence of responsibility in this case, would be the concern that the legal systems would have to deal with in case the AI systems were used in an autonomous manner, which were designed to be under supervision (Price, Gerke, & Cohen, 2020) [12, 18]. The trust of the AI systems in relation to the public would be unfair. Hence, accountability in this case ensures that the rights of the people and the patients are legally and ethically maintained.

An important component in this changing landscape is the education of health practitioners; the absence of comprehensive training risks reliance on AI, which could result in faulty conclusions, violation of ethical standards, or litigation. In contrast, the scope of trained professionals is more reliable, legal, and medical. Using AI trained professionals Tailored and focused AI compliance adheres to ethical standards of medical practice. Responsibility training and medical training at the borders of AI and its ethical uses related to shields primary AI ethics issues. The devices to ethics that center on the human practitioners and collaborate A systems approach of AI devices and adoption. The devices may be used Substitute to human center approach specialists (Schuur, Rezazade Mehrizi, & Ranschaert, 2021) [23]. The marriage of Artificial Intelligence, medical ethics and liability, and the role of training is new and lacking within research of the healthcare field, particularly in developing countries, like. Jordan and the rest of the Arab world. The examination rest of the world the breaches and s study of the integration of AI medicine focus more on the ethics and liability issues associated with AI. Therefore, the purpose of this research is AI influence on more the legal and medical responsibility AI in healthcare and professional training on the her. The purpose of the research is to understand the ethical and regulatory approach of the relationship to integration and the responsibility technological advancement and advocacy of professional ethics and accountability at the same time (Ali, Alshinwan, Khashan, Hijjawi, Altawil, Al-Na'amneh, Abu-Adaiq *et al.*, 2025; Amann *et al.*, 2020) [4, 6].

Aim Of The Study

This study intends to examine the integrations of Artificial Intelligence (AI) for improving legal and medical

responsibilities in the healthcare sector and the moderating influence of professional training on this relationship. More specifically, the study aims to find out the impact of the adoption of AI on the accountability, ethics, and legal liabilities of the practitioners in the healthcare sector and the role of training programs in promoting accountability in the use of AI in healthcare practice.

Literature Review

1. Artificial Intelligence in Healthcare

Artificial Intelligence enhances and optimizes current and future diagnostic systems and patient monitoring tools along with the predictive analytics and treatment recommendation systems of healthcare. Moreover, the various branches of AI such as machine learning, imaging, natural language processing, and clinical decision support systems have become crucial parts of the electronic health records systems (Nasef, Nasef, Sawiris, Weinstein, Garcia, & Toma, 2025) ^[15]. These systems substantially improve the efficiency and patient outcomes, and accuracy, while decreasing the percentage of human errors. Resource allocation overall improves as well (Amann *et al.*, 2020) ^[6]. Despite the improvements in decision support systems, the potential of human error in the healthcare system remains, along with the explainability and trustworthiness of clinical AI. Ethically and legally sensitive issues can arise from algorithmic malpractice outcomes such as biased and unrepresentative, improper, and unreasonably applied data sets, and improper application of the healthcare system algorithms by the managers and the healthcare team (Gerke, Minssen, & Cohen, 2020; Nasef *et al.*, 2025) ^[12, 15].

2. Legal and Medical Responsibility in Healthcare

Medical responsibility encompasses ethical, professional, and legal obligations that healthcare professionals must adhere to in providing care. Legal responsibility includes civil liability (compensation for harm), criminal liability (punishment for negligence), and disciplinary measures within professional codes of conduct (Price, Gerke, & Cohen, 2019) ^[17]. The adoption of AI challenges traditional responsibility frameworks, because clinical decisions increasingly involve algorithmic inputs. Diffusion of responsibility occurs when errors arise from AI-assisted decisions, making it unclear whether the physician, institution, or AI developer is liable (Price, Gerke, & Cohen, 2021) ^[19]. In Jordan, the Medical Liability Law No. 25 regulates physicians' accountability, but it does not explicitly address AI-related errors, highlighting a regulatory gap.

3. AI and Responsibility: Ethical and Legal Challenges

AI's integration in healthcare raises several ethical and legal challenges. One key concern is accountability, it can be difficult to determine who is responsible for AI-assisted errors the physician, the hospital, or the AI developer. This ambiguity complicates both clinical practice and legal proceedings. Another challenge is transparency and explainability. Many AI algorithms operate as "black boxes," meaning their decision-making processes are not easily understandable. This limits clinicians' ability to justify or explain clinical decisions, which is critical for maintaining trust and professional accountability (Alawamreh, Almhasneh, Alammri, Ramadneh, Al-Shaar, & Zahran, 2023; Watts, Amann, Arnell, Ayeb-Karlsson, Beagley,

Belesova, Boykoff *et al.*, 2021) ^[2, 29]. Patient safety and consent also require careful consideration. Patients need to understand how AI contributes to their care and what risks may be involved. Without proper communication and informed consent, the use of AI could compromise ethical standards in patient care. Finally, there are significant regulatory gaps. Current legal frameworks may not adequately cover liability arising from AI-driven decisions, necessitating updates to laws and policies to ensure accountability and protection for patients and providers alike (Corfmat, Martineau, & Régis, 2025) ^[9]. The literature emphasizes the importance of governance mechanisms that clearly define AI liability while integrating ethical principles with legal frameworks.

4. Training as a Moderator

The AI's effectiveness in augmenting the medical and legal responsibility largely depends on training healthcare professionals. Training enables clinicians to adjudicate AI outputs and make decisions that are aligned with AI suggestions (Corfmat *et al.*, 2025) ^[9]. Training also fosters the recognition of the limits and risks of AI, helping healthcare professionals to identify contexts in which AI may be ineffectual, inappropriate, and unreliable. Moreover, training ensures adherence to ethical and legal regulations to make certain that AI is applied within the professional and legal limits of responsibility. Most importantly, training fosters human oversight of AI-assisted decisions to avoid dependency on AI and ensure that the clinician maintains his or her role during the pivotal phases of decision-making (Dwivedi, Hughes, Ismagilova, Aarts, Coombs, Crick, Duan *et al.*, 2021) ^[11]. Without sufficient training, the integration of AI is likely to yield a greater number of errors, as well as legal challenges. In contrast, trained professionals can use AI to enhance legal responsibility and accountability while safeguarding the interests of the patient.

5. Research Gaps

While interest in AI in healthcare continues to grow, there is a paucity of studies examining the intersection of AI adoption, professional training, and the concomitant legal and medical responsibilities (Gerke *et al.*, 2020) ^[12]. Most studies attempt to address the discrete phenomena of AI training or its implementation. The interactions among these phenomena are left to further research. Moreover, a few studies address the regional context of Jordan or the Arab world more broadly and the legal context of AI in healthcare, which remains underdeveloped, this understanding is critical in the context of the local regulation and sociocultural determinants of professional AI accountability and practice, there is a lack of qualitative studies examining healthcare professionals' perceptions of AI, responsibility, and training as a moderating variable. These perceptions are fundamental to the development of training practice, the responsible implementation of AI, and AI policy formation that is responsive to the realities of clinical practice (Nasef *et al.*, 2025; Qawaqneh, Ahmad, & Alawamreh, 2023) ^[2, 15, 20].

Methodology

1. Research Design

The research utilizes qualitative research methodology to capture the perceptions and experiences of health care professionals on AI adoption, the medical and legal liability,

and the professional training intervention. Utilizing a qualitative research approach helps to capture the complexities of the participants' viewpoints which could be lost in a quantitative assessment.

2. Sample and Participants

The research focuses on the professionals in different areas of the healthcare sector within the confines of two selected hospitals (Al-Husen Hospital) in the Balqa Governorate and Jashash Hospital of Jordan. These hospitals have been selected so as to provide insights pertaining to the use of AI in healthcare settings. It is planned that 20 participants will be recruited, 10 participants from each hospital, and to be recruited through purposive sampling to ascertain that the participants have direct experience through pertaining to the AI systems in healthcare. Such sampling is crucial as it will provide the study with focus data. The study will include healthcare professionals, with administrative, nursing, clinical technician, or even physician roles who have spent 12 months within the confines of a hospital with AI systems in use, the exclusion criteria include healthcare administrative staff, or clinicians who have not AI systems within their hospital settings.

3. Procedure

The relevant Ethics Boards from the collaborating hospitals will be approached for the required ethical approvals. Participants allowed to join freely and will be required to provide a signed endorsement, depending on the convenience and choice of the participants, interviews held face-to-face or on a secure video platform (Hussain, Ahmad, & Yahaya, 2009; Silverman, 2021) ^[14, 27]. Each Interview is projected to take 30 to 45 minutes and if willing, participants will be audiotaped. Data collection is likely to take 2 to 3 weeks, and transcribing and thematic analysis will be conducted as per the accepted requirements of qualitative methodology.

4. Justification of the Methodology

The qualitative approach using purposive sampling techniques fits the study because it emphasizes depth, capturing the intricacies of the lived experiences of the AI technology impacted healthcare workers. Studying two hospitals in Balqa Governorate offers geographic context while ensuring participants possess direct and pertinent exposure to AI technology in the healthcare sector (ALJAWARNEH, Kader ALOMARI, ALOMARI, TAHA, & OBEIDAT, 2022; Creswell & Poth, 2016) ^[5, 10].

Finding

This section outlines the most important results obtained from the thematic analysis of conducted interviews with twenty professionals from the healthcare field within two hospitals situated in Balqa Governorate, Jordan. The analysis identified five key themes concerning the adoption of AI, the adoption of professional training, and both the impact and indirection of professional training. Appropriate to each theme, direct speech from interviewees is used, while maintaining the anonymity of the respondents and their contributions through the coding system P1–P20.

1. AI Adoption: Perceived Benefits and Integration

Respondents were positive with AI's application within the healthcare setting, considering it a powerful technology that

could streamline, enhance, and expedite diagnostic processes, as well as improve patient monitoring. Particularly, physicians focused on the diagnostic capabilities of AI as supportive tools, while nurses emphasized the AI's capabilities in patient monitoring. However, the depth of AI integration and the level of confidence in it AI's capabilities varied.

"AI is mainly for diagnostic support. It helps, but I always cross-reference its suggestions with my clinical judgment." (P1, Physician, 7 years' experience).

"AI patient monitoring systems lessen the nurses' workload, but I fear that reliance on these systems may compromise patient safety." (P12, Nurse, 6 years' experience).

The potential of AI was not lost on the administrators, but they emphasized the fact that it was underused and attributed this to a lack of confidence amongst the staff.

"We need structured training programs to build confidence to address the issue of AI underutilization." (P5, Administrator, 8 years' experience).

2. Ethical and Legal Responsibility: The Accountability Gap

All participant groups expressed concern about the ethical and legal accountability gaps for the negligent acts of AI. This 'accountability gap' issue came up repeatedly, and a lot of them wondered who is legally accountable in case of an AI-powered mistake.

"Who makes the mistake? Am I the one? The hospital? The AI creators? This is concerning to me and is one of the reasons why I don't trust the technology. There is a lack of trust." (P4, Physician, 10 years' experience)

"Without recall procedures and accountability, we are swimming in a legal grey zone." (P14, Physician, 12 years' experience).

3. Training Effectiveness: A Critical Moderator

The moderating role of professional training was a central theme. The consensus was that the current training is insufficient, often being too theoretical and lacking practical, hands-on components. This inadequacy was seen as a major barrier to the effective and safe use of AI.

"The training was brief and didn't really explain the limitations of the AI. We need more than a one-hour seminar." (P1, Physician, 7 years' experience)

"Training was largely theoretical. We need practical exercises and simulations to understand how to use these systems in real-world scenarios." (P2, Nurse, 5 years' experience)

Participants frequently called for more structured and role-specific training programs.

"We need regular workshops and simulation-based training to build confidence and ensure we are using the technology correctly." (P12, Nurse, 6 years' experience).

4. The Importance of Human Oversight

The barriers created by the absence of accompanying professional training were dominant. The prevailing view was that such training, in most cases, is largely theoretical while lacking practical training. This was thought to be the most basic threshold to the effective and safe use of AI tools.

"The training was brief and within that the limitations of the AI were not covered in detail. We cannot survive on a one-hour seminar." (P1, Physician, note that current experience is 7 years)

“Training was primarily in the realm of theoretical. Instructional strategies such as practical exercises and real world simulations need to be incorporated to bridge the gap in the use of these systems.” (P2, Nurse, 5 years’ experience)

The demands voiced by participants were predominantly hierarchical and aimed through the lens of specialization.

“We need systematic workshops and simulation training to build a safety net to ensure proper use of the technology.” (P12, Nurse, 6 years’ experience).

5. System Integration and Technical Challenges

To conclude, the members delineated the technical issues associated with the integration of AI systems into hospital infrastructure. The issues along with inconsistent adoption across departments were described as pragmatic hindrances in harnessing the true value of AI.

“Integrating AI with existing systems presents some technical challenges. Integration is not always smooth.” (P3, Clinical Technician, 6 years’ experience)

“AI use is, to my observation, not uniform across departments. Such disparity remains a barrier in defining a standard of care.” (P15, Administrator, 7 years’ experience)

Discussion

This research highlights a balanced perspective on the implementation of AI technology in the Jordanian healthcare system, especially in the context of healthcare professionals’ responsibilities and their training (Amann *et al.*, 2020) ^[6]. The data points indicate that healthcare professionals tend to recognize the importance of AI technology in improving productivity and accuracy in diagnosis. The hesitance to embrace AI technology, on the other hand, is in tandem with the global discourse on the transformative power of AI in medicine (Topol, 2019) ^[28] and points toward a lack of belief in the technology. This polarity reveals the conflict between excitement toward a change and apprehensions around the ability to deploy the technology. AI is perceived to be underutilized, and it is the lack of training policies and procedures that predominately explain the absence of such policies that impedes the achievement of the anticipated value (Abu Huson, Aljawarneh, Obeidat, & Alqudah, 2024; Topol, 2019) ^[1, 28]. The emerging theme from the study is on accountability. Participants mentioned what they call an “accountability gap” due to the lack of legal and ethical frameworks in Jordan to ascribe AI-related errors. This corresponds with earlier literature on how the regulation of AI is often lagging and faster integration leads to the absence of clarity in the clinical context (Amann *et al.*, 2020; Gerke *et al.*, 2020) ^[6, 12]. In Jordan, this is particularly troublesome because it creates a gap of inaction since practitioners hesitate to act because of the assumed legal implications. This is the gap the study aims to address. AI technology in healthcare needs responsible legal and ethical use, and it is this gap that policymakers need to fulfill, in order to protect both practitioners and patients. One other interesting finding is the role of professional training as the foundational element of integrating AI responsibly. Participants indicated training is lacking and underscored the desire for ongoing, contextual, and pragmatic forms of adult education. This is consistent with other work that argues effective AI education must extend beyond technical training to center on user trust and confidence (Shortliffe & Sepúlveda, 2018)

^[26]. With respect to the Jordanian healthcare system, training seems to be the bridge between technological readiness, ethical practice, and user confidence. Purposeful training programs can enable healthcare professionals to work seamlessly with AI, thereby improving their proficiency and responsibility in practice (Dwivedi *et al.*, 2021) ^[11]. Furthermore, the research still confirms the dominant role of humans with regard to AI-assisted decision making. Participants have remained consistent that AI should be used to assist and never take the place of a person. This position is consistent with the “human-in-the-loop” model, which posits that the best results come as a result of the blending of human skill and machine intelligence (Shaheen, 2021) ^[24]. This model strengthens the assertion that the ultimate accountability in a clinical setting continues to be the responsibility of a person as the systems become more advanced. The lack of people in the system means that ethics, compassion, and contextualization which an AI system would be devoid of becomes the dominant mechanisms in the provision of healthcare (ALHATMI, EISHEH, & ALRHABA, 2024; Reddy, Fox, & Purohit, 2019) ^[3, 22]. In the case of the AI focus of the study, the unfulfilled promises of AI integration have resulted in barriers to its use in practice, focusing on the workflows of the participants. Participants noted that the AI components of the systems in use do not integrate well with the rest of the hospital infrastructure, which is the same issue that is noted in other studies, this is an issue of efficient workflows and systems interoperability and usability accessibility in the setup. In Jordan, these technical barriers have to meet with the coordination of hospital managers, IT and clinical staff to make sure that the AI systems support, and do not counter, the clinical workflows (Zhang, Shi, Hu, & Zhang, 2025) ^[30]. In the case of Jordan, the discussion suggests that the barriers to the acceptability of AI in workflows for healthcare stem from the internal systems of governance that are interlinked with the training, trust, and accountability framework, the case study provided illustrates in more in depth detail that without the integration in governance frameworks, the sophisticated technologies on their own will be unable to improve the clinical workflows in the AI focus of the study. In the specific case of AI, the funding that is earmarked has to be channeled for integration in system frameworks, legal structures, and governance that will enable space for the AI to improve on the already existing structures for component of the workflows that are designed for system efficiency and accuracy along with ethical bases (Hmamouchi & Ziadé, 2022) ^[13].

Limitations

This study does shed light onto the challenges faced by profession, yet it’s challenges must also be recognized. To start, purpose pragmatic sample include just twenty candidates attending two quite close hospitals. Margin of short sample with short distance between visits, alongside the inquiries planned, totally explain individual all thoughts (Bouncken, Czakon, & Schmitt, 2025) ^[7]. The sample with purpose had direct contacts with AI; while having the direct contact, the sample size does suffer with self-bias, and social bias, alongside the self-experience, lowers the claimed self-objectivity (Bouncken *et al.*, 2025; Perez, 2024) ^[7, 16]. Focus also seems rather rigid, especially as the integration of AI systems seems rather advanced or dumb

witted, the inability of precision accounts of surrounded integration, leads to loss of precision. Furthermore, data capturing along with other factors leads to the limitations of assessing the interval of the training set, whilst the other intermittent frames stand utterly unchanged. Most likely, the specific cultural, regulatory, and organizational structures in place in Balqa Governorate affected how participants understood the concepts of responsibility and training, which serves as one of the several possible reasons the results of the study can be generalized to different settings (Rawash, Alawamreh, Obeidat, & Nawafleh, 2023; Shokrollahi, 2025) [2, 21, 25].

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