

The application of Artificial Intelligence (AI) in Mobile Learning (M-learning)

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The application of Artificial Intelligence (AI) in Mobile Learning (M-learning)

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Abstract— This paper studies the application of artificial intelligence (AI) in mobile learning (m-learning). In this report study, we discuss the meaning of Artificial intelligence AI and Mobile Learning Materials, make them clear to people and students. Then, explain the significance of the application of Artificial Intelligence in mobile learning materials. The use of “artificial intelligence” in mobile learning Materials a opportunity to breakdown the traditional borders of learning in the classroom to make students-instructors regarding teaching classes fixed to the future m-learning market. This research introduces five problems in mobile learning. These problems make it necessary to apply artificial Intelligence in mobile learning materials. Furthermore, the development of mobile learning materials as part of ubiquitous learning in Open Learning Universities. Furthermore, how are students utilising Mobile Learning for open learning? Smartphone devices have evolved from a means of communication to tools for M-learning, open learning, work, socialisation, and entertainment as smart mobile technology has advanced and their affordability has increased. Mobile learning Materials are the most important thing for open-learning students to make learning as simple as possible. Additionally, the impact of applying Artificial Intelligence to mobile learning materials in open learning faculty and students was investigated. Finally, the study discusses the possibility of creating Mobile-learning Materials for use in open learning. The data were gathered through an E-survey administered by faculty, as well as interviews with students and a sample of each study group. The findings indicate that college students' perceptions of using mobile Learning Materials are improving, and they are willing to use mobile learning.

Keywords— Artificial Intelligence (AI), Mobile Learning Materials (MLM), Mobile learning (ML)

I. INTRODUCTION

Over the last few decades, artificial intelligence (AI) has been extensively researched around the world. The use of AI in Mobile learning (ML) to improve the effectiveness of teaching and learning in precision education is a particularly hot topic (Tang, Hwang, 2021).

The field of artificial Intelligence in mobile learning has been in existence for about 40 years and has operated under various other names, the most common of which is intelligent tutoring systems (ITSs). The field was initially brought to wider attention by papers in a special issue of the International Journal of Man-Machine Studies,[1] According to a new report from "The International

Telecommunication Union" (ITU), there are 7 billion mobile device subscriptions worldwide (August 2015). In fact, “total mobile” subscriptions by 2020 will actually number 9.2 billion. When you take into account the internet and came Things services, M2M, mobile broadband and some of the major phones of the remaining, there will be 26 billion devices connected in five years. Devices are specific about the terms of interest of researchers to investigate its ability to provide all of the songs Place and mobile learning (Looi, Sun, Wu, Seow chia, Wong, & Norris, 2014) given that the learners in university-level positive towards mobile devices, and implemented them in their daily lives, and expected to be used in learning (Joe, Kim & Kim, 2016) Additionally, mobile devices or small computing devices Smartphones, tablets, IPads, and wireless touch screen e-readers will be significantly more affordable and accessible in 2030. By the year 2016, "A total of 1.75 billion smartphone users worldwide will be in 2014, as mobile devices become more financially manageable, 1X, 3G data, and 4G and 5G data networks advance." Smartphone adoption is expected to continue at a rapid pace through 2020, according to mobile device technology.

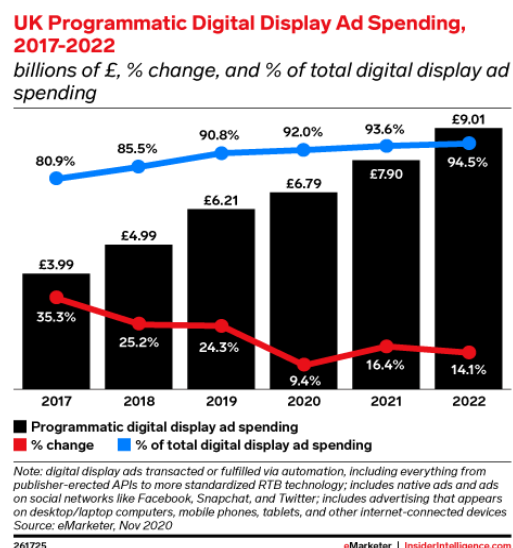


Figure 1. Mobile Phone Users Worldwide 2017-2022

Cost of mobile devices as well as lower data transfer rate in the network and lower m-learning resources, mobile devices are not widely deployed (Li, 2010).

According to the 2012 New Media Consortium (NMC) Horizon mobile learning Report (Johnson et al., 2012), mobile learning is a "technology to watch" in higher education institutions (HEIs). It has become common to use higher education institutions mobile devices to provide m-learning across campus. Since 2009, To facilitate the learn self-study system, Open Learning Universities adopted the printed textbooks system for students in m-learning, Printed books, as well as the knowledge that has been supporting open learning in the universities as an important resource in m-learning inside and outside the classroom (Fletcher & Reese, 2005). As a result of the spread and development of smartphones in the technological era, as well as applications that enable the deployment of e-books for students. As a result, Mobile Learning Materials (MLM) are an excellent way to introduce students to m-learning lessons. Over the last decade, technological advancements for mobile devices have provided an opportunity to provide open learning and e-learning to students anywhere, at any time. Hwang, Tsai & Yang (2008) further definition of open learning and e-learning process which employs the use of mobile devices and telecommunications technologies and remote to enable students to learn in a real environment with the possibilities of access to m-learning materials source context-aware ubiquitous learning (u-learning).

II. MOBILE LEARNING MATERIALS:

Utilizing (MLM) Mobile Learning Materials in Open learning Universities allows learners to detract their materials while securing data through cell phone devices. Moreover, educators could redesign variants about materials. Through those transformations for portable learning, learners might associate for contexts through portable materials (Word, Pictures, Graphics, forms, constantly on Gave Eventually Tom's perusing the portable mechanisms). (Chu, Hwang, & Tsai, 2010);

The advantages of digital healthcare include improved service quality, lower costs, increased accessibility, and decreased service delivery inefficiencies. Notably, the challenges that the global healthcare sector is currently experiencing may have an unavoidable and workable answer in digital healthcare. For instance, the number of people with chronic diseases and the price of current treatments has increased along with the improvement in life expectancy [35].

With the rapid development of AI, it is now possible to create strong models from aggregated healthcare data that can automate diagnosis and enable a more precise approach to medicine by customizing therapies and directing resources with maximum efficiency in a timely and dynamic way [23].

AI technologies can help optimize daily tasks for healthcare professionals like (1) risk factor analysis, (2) disease prediction, (3) infection prediction, (4) population health monitoring, (5) prediction of adverse effects, (6) prediction of outcome or likelihood of survival, and (7) analysis of electronic health records. The potential of AI technologies, including AI-Health solutions, can benefit several people at once by scaling, diagnosing, or forecasting results [27].

As digital technologies are swiftly integrating into the healthcare system and expanding the prominence of AI solutions, various challenges relating to safety, explainability, and fairness have evolved into ethical concerns within the digital health domain [17].

A strong governance structure is needed to integrate AI technologies into clinical practice and protect people from harm, particularly from unethical activity [27].

Various works of literature have identified several ethical issues surrounding digital health; however Islamic perspective regarding digital health or implementing AI in the medical field has not been discussed. This paper will discuss the relationship between ethics in digital health and Islamic Medical ethics. Islamic medical ethics derives from Shari'ah (Islamic Law), extracted from 2 foundations, namely, the Qur'an (the holy book of all Muslims, and the Sunna (Traditions of Prophet Muhammad). Otherwise, Ijtihad (reasoning from experts in Islamic law) or Qiyas (judgment based on analogy) will be sought if there is no clear text from the Qur'an or Sunna [41].

This paper looks into digital health ethics and relates them to Islamic medical ethics. The four principles of medical ethics (beneficence, non-maleficence, justice and autonomy) are firmly embedded in the Islamic worldview, which can be applied in digital healthcare. Artificial intelligence has great potential within digital healthcare. However, it requires a careful approach when integrating it into medicine as various concerns may arise, including patient safety, patient justice, data privacy, and doctor-patient relationship.

III. THE OBJECTIVES OF THE PAPER

While implementing digital technologies into medicine, the principles of Islamic Medical ethics must be revised and understand the objectives of the medical field as Al Izz ibn Abdul Salam stated in his book "Qawaeed Al-Ahkam": "The aim of medicine is to preserve health, restore it when it is lost; remove ailment or reduce its effect. To reach that goal it may be essential to accept the lesser harm, in order to ward off a greater harm, or lose a certain benefit to procure a greater one."

The objectives of this paper are outlined in the following points:

1. To list the benefits and risks of digital health
2. To discuss ethical issues regarding digital health
3. To understand digital health ethics from an Islamic perspective.

IV. ISLAMIC MEDICAL ETHICS

The emergence of advanced medical technologies, such as life support for terminal patients, radiology imaging, and, most recently, the introduction of smart technologies, such as artificial intelligence, has raised some new ethical issues for Muslim doctors and patients. All medical practitioners should be aware of the ethics of digital health in the context of Islamic principles for decent and proper practice, and this knowledge should be incorporated into their programs [20].

Before understanding the ethics of digital healthcare from an Islamic perspective, it is crucial to grasp the broader Islamic worldview to comprehend the fundamentals of Islamic medical ethics. Islam is viewed as a comprehensive way of life by its believers; sickness and health are only one aspect of the believer's journey through life. The Qur'an refers to Abraham, who is a role model for the Muslims, saying: "*And when I am ill, it is God who cures me*" (Surah Ash-Shu'ara, Verse 80), which in perspective shows that the role of a physician in the treating patients is consequently mostly one of the intermediaries. In addition, according to the Islamic worldview, the laws and principles that Muslims follow, are to govern themselves ultimately arise from a divine source and are solidified in the law. As a result, morality and ethics are absolute principles that cannot be separated from the law and should not be subjected to geographical or chronological variations. Therefore, one must first comprehend the way Muslim jurists strive to accurately interpret the fundamental texts of the Shari'ah in accordance with the divine will, a subject known as the

principles of jurisprudence (usul al fiqh), to truly appreciate the topic of Islamic medical ethics [29].

Islamic medical ethics is a system for analyzing and resolving ethical problems in healthcare practice or research founded on Islamic moral and legal sources (mainly the Quran and Sunna) and attempts to uphold Islamic moral principles [41].

Islamic medical ethics is an outgrowth of Shari'ah or Islamic law, in which the Shari'ah is built on two pillars: the Qur'an, the holy book of all Muslims, and the Sunna (The Prophet Muhammad's tradition, which includes his words, deeds, and approvals). "Ijtihad" or "Qiyas" is considered when the Quran or Sunna do not include a clear guideline [11].

Given the breadth of ethical precepts in Islam, the Islamic ethical tradition pays special attention to medical practice to ensure that it corresponds to Islamic Shari'ah. The objectives of the Shari'ah include preserving faith, life, mind (intellect, reason), progeny, honor and property. [41] The first fundamental premise of Islamic medicine is the Qur'anic emphasis on the importance of human life. "*If anyone saved a life, it would be as if he saved the life of all mankind*" (Surah Al-Ma'idah, verse 32). In this verse, Chamshi-Pasha & Albar [12] explain that a person who saves a life and continues to do so is a characteristic that is essential to the survival of mankind.

Along with supporting "the four principles" of biomedical ethics put forward by Beauchamp and Childress, Islamic medical ethics similarly adheres to them. The four guiding principles of biomedical ethics, following this perspective, are (1) respect for autonomy, (2) beneficence, (3) non-maleficence, and (4) justice. However, the emphasis on individual principles differs from Western Bioethics' traditional interpretation [41].

Western ethics has evolved into a philosophical science that greatly emphasizes human experience and reason in determining right and wrong. Whereas Islamic ethics embraces diverse intellectual traditions, retaining a religious worldview and taking its primary resources from religious texts. Islamic bioethics is founded on duties and obligations (such as protecting life and seeking treatment) and should align with the rights (of God, the community, and the individual). In contrast, Western bioethics emphasizes a rights-based principle that includes individual rights [11].

The first known framework on ethics in Islamic medicine was described in "Akhlaq Al-Tabib", written by Abu Bakr Al-Razi. Al-Razi believed the doctor needed to be a role model and an expert in his area. In addition, views on medical ethics are separated into three categories: the doctor's responsibility to patients, to self and the patient's responsibility to doctors [10].

Al-Razi wrote two divisions of medicine that studied two concepts involving physical and physiological illnesses and the weaknesses of morality, a concept that can be traced back to Plato. Al-Razi explained that the self has the upper hand compared to the body, as the virtue of the self will determine the nature of the body. This approach is conceptualized in one of Al-Razi's written works, which expanded across society in the following years, explaining the flaws of the self, their origins, and how to address them. In this way, the practice of balancing morality and medicine is advanced, creating a new view of medicine separate from Plato's [22].

V. ETHICAL CHALLENGES IN DIGITAL HEALTH

There is a lack of research on the ethics of digital health, and it is understandable given that the application of digital systems and technologies in healthcare is still in its earliest stages of development and that the ethical issues raised by the rise of digital healthcare are complicated and multifaceted [35].

The public's perception of digital healthcare and how it affects their life can be influenced by understanding the implications of digitalizing healthcare. Public perception can be achieved by thoroughly understanding and comprehending the prospective paths society may want to take in the future by posing critical questions about the extensive consequences of digital health [36].

Several opinions on the connection between AI and the implementation of human rights have been released by the Office of the High Commissioner for Human Rights. The office stated that these technologies could undermine older people's autonomy and independence and offer serious privacy hazards. Numerous academic works have also emphasized the many ethical challenges that must be overcome. Among the most important ones are inadequate information, interference with patient-physician communication, murky and inaccurate reports, the security of electronic personal information, patient safety, undivided responsibility, inequality and bias, and patient autonomy [3], [35].

All said issues go against the basic tenets of medical ethics: beneficence, non-maleficence, justice, and human autonomy, which are intended to safeguard vulnerable patients in the face of societal hierarchy and uncertainty [6]. Currently, there are increasingly more proposals and policies addressing the subject of ethical AI to help tackle the said issues. For example, the United States Food and Drug Administration selectively certifies organizations that create and manage AI. The European Commission has put up legislation with standardized artificial intelligence guidelines that outline an organizational accountability principle for privacy and data

comparable to the European General Data Protection Regulation [28].

VI. DISCUSSION ON ETHICAL ISSUES OF DIGITAL HEALTH FROM AN ISLAMIC PERSPECTIVE

A. Patient Safety

Artificial intelligence (AI) is used to predict risks, gather a range of data, including both new and prepared data, and improve patient safety, both within and outside the hospital. AI, for instance, can improve decision-making by identifying high-risk patients while in the hospital and directing early intervention and preventative initiatives. In addition to its contributions to the fields of drug discovery, customized medicine, and patient care monitoring, AI offers the potential to help physicians make better diagnoses than before. In order to recognize, evaluate, and reduce risks to patient safety, AI has also been integrated into electronic health record systems [16].

Rapid technological improvements raise safety issues as medicine evolves from traditional clinical-based patient care to more digitalized healthcare. There is frequently a lack of high-quality, evidence-based studies showing the linked health advantages of the most recent technologies. Additionally, proving that emerging technologies and approaches are efficient has many difficulties [17].

Patients and society could be impacted by digital health in general if patient safety standards are disregarded at various levels. Misdiagnosis is a serious risk that can occur individually in several ways. Medical technologies like wearable devices can have bugs or are incorrectly calibrated for their purpose and can present inaccurate results. A healthcare professional who relies on these technologies or software that provides clinical decision support may make an incorrect diagnosis or treatment because they tend to accept the recommendations of automated systems without questioning them. While a physician might diagnose anyone incorrectly and later give a proper diagnosis and treatment to one person, a flawed algorithm based on erroneous or incomplete evidence could simultaneously diagnose hundreds or thousands of individuals [27].

Overreliance on technology can become a major issue within digital healthcare as the simplicity and effectiveness of automated technologies may persuade users to rely too heavily on technology. In the short term, overreliance can lead to deskilling among healthcare professionals (HCP). This process hinders doctors' capacity to make competent conclusions based on observable signs, symptoms, and available data. Once an

event of a technological failure or breakdown happens, disruption of performance or inefficiencies among physicians can be worrying and ultimately affect patient safety [8].

As the algorithm in this scenario would be considered a diagnostic support tool, just like a blood test, with no decision-making capacity, several laws will imply that the healthcare provider would be at fault, and therefore liable, for an adverse event. The HCP has to act appropriately based on the information provided [21].

While AI has previously excelled at several health-based detection tasks, improving explainability is challenging. This problem occurs because many of these results were obtained by "black-box" methods that are uninterpretable. In other words, data is supplied into the system, which produces a predictive output. However, the system does not mention how it arrived at the anticipated value or draw any conclusions from it, which reduces its trustworthiness. This problem poses challenges for physicians as it is crucial to grasp the fundamental inner workings of their devices. This problem is made more evident by the growing use of deep learning systems in the digital health industry. Deep learning models feature millions of internal connections [17].

A similar question might be posed regarding the role of commissioners or retailers of the gadget containing the algorithm. Some may suggest that authorities or regulators (for example, MHRA in the UK, the FDA in the US, or the CFDA in China) should share some of the blame or responsibility for the product's introduction to the market without thorough evaluation. The problem's source can be traced back to erroneous coding or poor training data quality. In conclusion, there is an apparent lack of distributed accountability, a problem made worse by a lack of transparency. Therefore, holding specific individuals or groups responsible for unsatisfactory results is difficult, creating a severe ethical risk [27].

Digital health does not necessarily affect hospitals but plays a significant role in public health. Health resources are allocated based on policy judgments supported by facts and evidence. However, policies based on unreliable data can deplete public resources (by promoting vaccination campaigns in areas where vaccination is not required) and disrupt local economies (by frightening off tourists), which would lower the amount of money available for public spending. As a result, less effective public healthcare is provided, leading to poorer health outcomes for society [15].

For the next generation of AI technologies to be used in healthcare, they must be transparent, understandable, comprehensible, and fair. Clinicians and patients will gain more confidence from transparency in AI systems. However, the enhanced system should be more accurate overall and generalizable with better knowledge and understanding of internal processes and decisions [17]. There are specific scenarios where AI-Health solutions might not be in line with existing standard practices but are necessary to handle cases of large uncertainty and can only be entirely handled by physicians. Therefore, physicians should participate in the decision-making process with AI health technologies [27].

Prophet Muhammad said, "There should be neither harming nor reciprocating harm." Islam forbids us from being destructive or malevolent to others. Islam advocates against taking revenge on those who have hurt you, even if they have harmed you [11]. Inflicting harm against another human being is being looked down as Prophet Muhammad said: "By Allah, he does not believe – thrice – the one whose neighbor is not secure from his harm." (Sahih al-Bukhâri) In this hadith, the Prophet repeated thrice that he is not a believer if one harms his neighbor and, therefore, should not enter Jannah (paradise) [37].

Non-maleficence is one of the four principles of medical ethics (autonomy, justice, beneficence, and non-maleficence) and is a fundamental principle of morality and bioethics. It is desirable to avoid causing harm if an action has both positive and undesirable outcomes. Additionally, the action can be permitted and performed if a situation's benefits outweigh its drawbacks [41].

Al Izz ibn Abdul Salam stated in his book "Qawa'id Al Ahkam" that the purpose of medicine is to maintain health and, when necessary, to give a cure. In order to achieve this aim, lesser harm occasionally needs to be tolerated in order to avert larger harm. The ultimate objective of the treatment is for the patient to gain from it. As a result, restricted treatment may be allowed when necessary and when there are no other options.

Islam places such a high value on preventing harm that, as was already established, there is a specific legal maxim to that effect. According to the al-darar-yuzal principle, the injury must be avoided at all costs and has precedence over actions that might produce an equivalent benefit. According to another Islamic belief, "no damage shall be inflicted or reciprocated." This principle is one of the most significant

traditions in Islamic social ethics that is directly attributed to the Prophet and is accepted by scholars from every branch of Islamic jurisprudence [29]. AI should be created to be harmless; it should, first and foremost, do no harm. It is important to consider what results it ought to produce. "Should the emphasis when applying machine learning to healthcare be on maximizing saving lives over profit, and who does it save?" The saying was derived from a hadith in which the Prophet advised the companions to prevent any harm that might come to them. Healthcare professionals should perform their duties as Allah's servants by carrying out a preventive strategy to safeguard lives [40].

B. Justice and Equal Rights among Patients

Equal access to digital technology in health care, equity in treatment access, non-discrimination and non-stigmatization in treatment, equity in data ownership, and empowerment are the characteristics of justice [35].

The adage "Rubbish in, garbage out" describes how poor input data or instructions may result in undesirable outputs. This adage is particularly true for machine learning, as the data sets used to train and evaluate machine learning models are crucial for assuring the moral application of prediction algorithms. Machine learning-trained algorithms may become skewed if the training data sets are not sufficiently representative. An algorithm was developed using a data set with an underrepresented demographic in the population, especially when an algorithm is trained mostly on data from older males. Such an algorithm would produce subpar recommendations for younger Black women. Health disparities may worsen if algorithms developed on data sets with these features are used in healthcare [39].

Unintentional injustice to people has grown in importance as a problem for AI. The choice of training datasets is a significant source of bias because AI techniques are data-driven [6]. The accuracy, completeness, and diversity of AI data should be maintained by AI developers, especially for training purposes. If a certain racial or ethnic minority group is underrepresented in a dataset, oversampling that group relative to its population size may be required to ensure that an AI technology obtains the same findings in that population as in better-represented groups.

The implications of AI technology use must be monitored and examined, particularly unequal effects on specific groups of people affected by existing bias and discrimination. Special measures must be taken to ensure the rights and well-being of the vulnerable population are

protected once discrimination and bias emerge in machine learning models [42].

Excluding specific characteristics, like age or gender, from the training of AI models is one method for preventing biases that have already been identified. It is important to note that excluding certain parameters will introduce new biases and may come at a cost, such as a significant decline in model performance and, consequently, its usability. Conflicts between the many levels of justice could eventually trample on the respect for the autonomy of patients [6].

The goal of the concept of justice is to uphold all parties' legal rights in any given situation, ensuring fairness and equity. Gillon has outlined three main applications of this principle in healthcare ethics: distributive justice (where limited resources are divided fairly), rights-based justice (ensuring individual rights are respected), and legal justice. In Islam, Justice is a central principle that should be applied in all aspects of life, including spiritually, legally, politically, or financially. The Holy Qur'an emphasizes justice very strongly, as it is mentioned at least in 16 verses and these verses state that one of the main purposes of the prophets in this is to establish justice [29], [41]. In the Qur'an, it is said: "Indeed We have sent Our Messengers with clear proofs and revealed with them the Scripture and the Balance (justice) that mankind may keep up justice" (Surah Al-Hadid, verse 25).

Prophet Muhammad strongly emphasized in his last sermon the importance of justice as every person from all backgrounds of life should be respected as said: "All mankind is from Adam and Eve, an Arab has no superiority over a non-Arab nor a non-Arab has any superiority over an Arab; also a White has no superiority over a Black nor a Black has any superiority over a White except by piety and good action". [41]

Historically, Al-Razi ensures his duty as a physician to practice medical justice by treating all his patients equally regardless of their background. He believes that physicians should be more eager to treat people who are disadvantaged and should not focus on having monetary gain after the treatment [10]. According to Athar [4], the principle of medical justice is to fairly distribute the benefits and burdens by ensuring people receive what they are entitled to and deserve. These principles include deciding where to allocate health resources and so as technology advances, Muslim physicians should implement medical justice into digital health. The goal of digital health should focus on reshaping

the healthcare system by broadening the coverage of healthcare access and the spread of health information and literacy [7]. As it is known by now, justice is one of the main four principles of medical ethics and as said in the Qur'an: "God commands justice (principle of Justice), doing of good (principle of beneficence), and giving to kith and kin, and forbids all indecent deeds, and evil (principle of non-maleficence) and rebellion: He instructs you that may receive admonition" (Surah An-Nahl, verse 90).

C. Data Privacy and Security

Healthcare organizations will require big data to be stored, managed, and utilized to ensure an efficient healthcare system. As big data are stored and processed online, there is an increased risk of data breaches that can lead to a breach of patient privacy. In digital healthcare, the privacy of patient medical data is probably one of the most important markers of ethical concerns. Every patient has the right to privacy, and only non-personal information be disclosed to certain parties subject to permission being given [1], [35].

Since ensuring the patient's private and sensitive information has become more challenging, data security will require more attention, especially when most personal information can be viewed in healthcare data and large volumes of patient data are shared between departments, increasing the risk of unauthorized access to the data at any point [35].

Protected Health Information disclosed that there had been an increasing number of cyber-attacks in healthcare organizations. The number had risen 320% in 2016, recording at least 16,612,985 individual patient records being compromised. This alarming issue displays an urgent need for healthcare providers to take a more proactive and comprehensive strategy to protect information assets and counter the growing threat of future cyber-attacks [1].

Users' private data are also continuously generated outside the healthcare organizations, and these data are harvested through various forms, such as social media and wearable technologies. Various studies have raised ethical issues regarding regularizing such technologies. This issue cannot be kept up as rapid technological advancements exacerbate it in healthcare solutions. A report from the Federal Trade Commission reported that some companies had not complied with regulations in collecting private data from individuals, and some of these data had been sold for commercial profits. Sharing data without the customers' permission goes against the customers' privacy and human rights. Strict regulations

must be enforced to prevent any similar incidents in the future [14].

According to the divine principles of Islam, it is forbidden to enter another person's property without that person's consent, and it is also forbidden to pry into and reveal another person's privacy [32]. Allah S.W.T. disapproves of this unethical conduct, and He warned, "O believers! Avoid immoderate suspicion, for in some cases suspicion is a sin, Do not spy on one another" (Al-Hujurat, verse 12). Looking at another verse in the Qur'an, Allah S.W.T. stresses the importance of every individual's right to privacy as He has protected the heavens from Jinn or Satan eavesdropping on any information being shared [33]. Allah S.W.T. stated in the Qur'an, "Indeed, We have adorned the nearest heaven with an adornment of stars; and as protection against every rebellious devil. (So) they may not listen to the exalted assembly (of angels) and are pelted from every side. Repelled; and for them is a constant punishment. Except one who snatches (some words) by theft, but they are pursued by a burning flame, piercing (in brightness)" (Surah As-Saffat, verses 6–10).

Prophet Muhammad also stressed the importance of privacy among each other and according to him, "O people, who have professed belief verbally, but faith has not yet entered your hearts: Do not pry into the affairs of the Muslims, for he who will pry into the affairs of the Muslims, Allah will pry into his affairs, and he whom Allah follows inquisitively, is disgraced by Him in his own house" [32].

With advancements in healthcare, such as telemedicine, and electronic medical records, there are increasing chances of data privacy breaches [38]. Technology advancement illustrates the priceless sanctity associated with information confidentiality, which can only be kept when people's privacy is respected, particularly in this era of widespread ICTs. Shari'ah places strict measures against any form of spying, including eavesdropping and with the current technology, accessing and sharing personal data without consent goes against one's right to privacy [33].

Autonomy is one of the four Islamic Medical ethics, which is maintained by keeping the information of the patient secret, respecting the patient's privacy, and ensuring only the truth is explained to the patient without deception.[38] Failure to comply betrays the patient's rights to autonomy and can deteriorate the patient's trust in their physician, leading to a lack of effective communication and treatment [2].

5.4 Maintaining a Proper Doctor-Patient Relationship

Healthcare professionals are overworked, and physician burnout is becoming a universal dilemma. There is a significantly increasing demand for healthcare services, and doctors will have to see many patients, leading to longer waiting hours [34]. Given these constraints, finding efficient strategies to provide the best healthcare for all patients should be a priority. The latest technologies, such as telemedicine implemented in hospitals and clinics, can help reduce waiting hours and prevent patients from unnecessary travel to the hospitals.

With the rise of medical technology and medical data, telemedicine has become an important tool in digital health. Telemedicine has the potential to revolutionize patient-centered care and remote clinical care. Doctors may now communicate with patients through various new technological platforms, such as messaging text, email, and mobile device applications. Telemedicine enables disadvantaged communities without competent clinical care, such as in distant areas, to obtain medical care from healthcare specialists and support from all disciplines, such as medical, nursing, or psychological [25].

Telemedicine can help optimize patient care and management with remote monitoring, including automated interactions and reminders to continuously engage with patients with ease from their homes [25]. According to Luz [24], some studies showed that telemedicine help improves the quality of life and medical conditions such as diabetes mellitus, hypertension, and hyperlipidemia. Telemedicine improves the effectiveness of the healthcare system. It is also useful in reassessing and monitoring known patients, adjusting medications, responding to straightforward inquiries, gauging adherence, or sharing information on additional tests, particularly when they are normal. The patient does not need to visit the doctor to confirm that everything is normal. However, it is important to note that the first consultation with the doctor must be in person, as the doctor will have to perform a physical examination to confirm the patient's diagnosis. Menage [26] highlights that physical examination plays an important role in diagnosing a patient, and she emphasizes that technology like telemedicine undermines human dignity by treating individuals as impersonal objects. Empathic touch creates a clinical relationship of intersubjectivity and affirms the ethically significant differences between individuals and objects, such as value and dignity.

Several legal and ethical issues can arise in telemedicine. Some patients may have difficulty getting used to new devices and software; therefore, some might prefer to consult with their doctors in their offices. Different demographics and socioeconomic groups might also not have access to such technologies, which may lead to unequal healthcare access. Telemedicine can be effective for certain users or scenarios [25]. Doctors should maintain proper manners when seeing the patient in the office to maintain proper doctor-patient relationships, as both diagnosis and treatment are effective when the patient and doctor have a good relationship and trust [12]. As legal, statutory clauses regarding telemedicine are not standardized, the responsibility for caring for patients in telemedicine might be taken for granted, and the risk of misdiagnosis increases; therefore, standardizing laws for telemedicine will increase acceptance of telemedicine globally [31].

Every management outlined by the physicians should have some degree of explainability; however, most machine learning models have so-called "black-box algorithms" which are noninterpretable even for the developers of the machine learning model, and these can raise ethical and legal issues as disclosing medical treatment to the patients in detail is one of the important principles of medical ethics. Patients will only trust and accept machine learning models if they are explained regarding implementing machine learning in their care [39].

The practice of medicine is firmly dependent on the relationship between the doctor and his or her patient, and medical technology should not be permitted to dehumanize medicine further. A doctor who consults patients over telemedicine should be compassionate in the office and not over-test or over-treat their patients. The doctor-patient relationship is successful when physicians treat patients with decency and respect [12].

Doctors are expected by the patients to be treated with a high level of care and compassion as they see doctors should possess good *khuluq* (Manners) such as mercy, patience, tolerance, kindness, and honesty while avoiding anger, prejudice and selfishness as taught by the Qur'an and Sunna [13]. Good Muslim doctors must look further into the patient's interest and avoid taking advantage of or misleading the patients as the Prophet said: "Those who have a perfect faith are those who have the best character". The Quran describes the ideal character of a Muslim, saying: "Indeed, Allah orders justice and good conduct"... and "forbids immorality and bad conduct and oppression". (Surah An-

Nahl, verse 90) The two primary sources of Islamic law help guide Muslim physicians to have the essential manners of a good physician, which is an important component of having a good doctor-patient relationship [12].

To establish a healthy relationship, Islam listed three important points: to have justice among the patients, Ihsan, which could roughly translate as being sympathetic, forgiving, and cooperative and lastly, to give proper treatment to the patient's relatives. Akhlaq Al-Tabib is one of the first books written on medical ethics written by Al-Razi over a thousand years ago. Al-Razi explained that doctors should be soft-spoken, communicate with compassion and kindness and be modest with patients. Even those patients who have lost all hope of recovery should be encouraged by the doctor to be more positive [22].

Medical technologies are advancing, and there are increasing means of obtaining investigation results to help understand the patient's condition. As digital health also involves using telemedicine, doctors can be reached through computers and phones, and the communication between the doctor and patient is lessened. The doctor-patient relationship will then become distanced, and there is a loss of empathy as physicians will see patients as diseases to be treated rather than as humans. Empathy enables doctors to understand the patient more subjectively and can be the key to covering the patients' religious and spiritual aspects of health [13].

Ensuring information obtained during a consultation should be kept private as it is important to maintain trust between doctors and patients. Trust plays an important component in effective communication and relationship between doctor and patient [22].

VII. CONCLUSION

Islam asserts that, in general, it has supported the application of science, medicine, and technology as remedies for human suffering. The Qur'anic verses regularly refer to the pursuit of knowledge, particularly in science, and urge us to investigate and seek the truth. As stated in the Al-Qur'an: "Allah will raise in rank those of you who have faith and those who have been given knowledge" (Sūrat al-Mujādilah, verse 11). According to this verse, having faith in Allah SWT is one of a believer's core characteristics, and possessing knowledge is one of their most admirable qualities.

Digital health is the implementation of technology into the healthcare system. The complexity of digital health has led to improvements in the healthcare system even as the digital

health revolution draws closer to individualized and preventative approaches; at the same time, the lack of legislative constraints or uniform standards in the health ecosystem integrating with new and quickly developing technology leads to a rise of new stakeholders, large amounts of data, unique computational and analytical approaches, and these factors together, create ethical difficulties, especially in the Muslim communities [30].

Before introducing new digital health tools into clinical practice, it is critical to consider their ethical consequences. Within Muslim nations, 'fatwas' (authoritative Islamic opinions) issued by Islamic religious authorities can encourage the use of new medical technologies while restricting certain aspects of the technology that can be seen as unethical, especially for Muslim communities [11].

With the availability of new medical technologies, Muslim doctors should be permitted to use them under Islamic law-derived ethics. Muslim nations should support the integration of digital healthcare because it advances knowledge and expands the doctor's role in digital healthcare to achieve more efficient and better patient care.

VIII. REFERENCES

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