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Practical aspects of the electronic system functioning in the field of medicine of the future (Pakistan)

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Abstract

This article focused on "Practical aspects of the electronic system functioning in the field of medicine of the future in Pakistan".

Aims: To explore the practical aspects of the electronic systems functioning in the field of medicine of the future, the challenges, and opportunities of implementing these systems, and the potential solutions for optimising and enhancing their impact on outcomes in Pakistan.

Methodology: A descriptive cross-sectional study design was used. A sample of 323 was selected through non-random convenient method. Data collected through interview. Chi square test was applied.

Results: The results on telemedicine showed, out of 323 participants who practiced telemedicine, 52% had 19-24 months of medical practice experience. Among the doctors, 19.3% used laptops, 22.7% used mobile phones to search information online, while 41.1% connected with their patients through WhatsApp and 16.9% through Facebook. 80% of the doctors agreed that telemedicine was beneficial for saving money, time, effort, and for the patients. Among the group with experience above 24 months, 59% were practicing EHR systems and 41% were not utilising them. When it came to CDS Systems, 64.2% of the more experienced group were using the system, while 35.8% were not. In addition, 71.2% of the more experienced group were practicing Digital Medical Imaging. During the COVID-19 pandemic, all medical institutes taught, assigned tasks, and evaluated students through online mechanisms. However, after the pandemic, 100% of the institutes returned to traditional teaching methods. Interestingly, 60% of the participants favoured online education, considering it an easier, more effective and efficient way of learning.

Scientific Novelty: Examines Pakistan's computerised healthcare system and its impacts.

Conclusion: Improved infrastructure, healthcare education, patient computer literacy, privacy and data security rules may have the largest impact on healthcare outcomes. An international help is needed to reach global electronic health care standards.

Note: Review paper may have different types of subsections.

Keywords: electronic system; medicine; future; Pakistan; practical aspects.

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Introduction

Information and communication technology has transformed the healthcare sector into e-Health. E-Health combines business, public health, IT, and medical informatics. Reengineering healthcare with health information technology has increased efficiency, but it needs new measuring tools. Medical procedures employ electronic

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technology for surgeries, treatments, and health issues. In today's world, when customers lack high-quality healthcare, medical electronics are crucial [1].

Digital healthcare technology is reshaping the healthcare. Healthcare professionals must use cutting-edge medical technologies to be relevant in the future. Digital health is "the field of knowledge and profession connected to the create and use of digital technology for health improvement, including telemedicine, eHealth, mobile health, and advanced computer sciences, including big data, artificial intelligence, and genomics," according to the 2020–2024 WHO global strategy. Digital health, a major instrument in sustainable development, is predicted to be worth $504.4 billion in the US by 2025. [2].

Japan introduced comprehensive electronic medical record hospital information systems around 20 years ago. Since then, big hospitals and small- and medium-sized clinics have embraced similar methods. Hospital information systems are currently a basic medical school topic. This examination seeks to identify barriers and opportunities to physicians adopting electronic medical records [3].

Medical facilities are using more electronic health records. This is a fantastic chance to enhance public health management, promotion, monitoring, and service delivery. By June 2013, most American office-based doctors used EHR. EHR system deployment and purchase require large financial commitments, but the strategy's success hinges on the medical community's readiness to adopt new technology [4]. The already conducted research showed various concerns related to its use as privacy and security concerns, high start-up cost, workflow changes, system complexity, lack of reliability, and interoperability amongst the frequently mentioned barriers [5]. Several industrialised countries use them to decrease difficulties and limitations, while developing nations like Pakistan have not made significant progress in adopting the new healthcare standards due to socioeconomic and technological constraints. Such a system would allow hospitals and clinicians to exchange patient data and develop an electronic health data library that can be used for many purposes keeping in view privacy and confidentiality [6, 7].

Telemedicine is essential in low-income nations like Pakistan, where 63% of the population is rural and 37% urban. Most rural residents should travel far for metropolitan hospitals. Online patient-provider partnerships meet these demands swiftly and effectively. It shortens travel distances, eliminates the need for patients to take a day off work, and may reduce congestion in understaffed healthcare institutions [8].

Clinical decision support systems use clinical knowledge, patient data, and other health data to enhance the healthcare delivery. When comparing patient characteristics to a computerised clinical knowledge base, a CDSS presents clinicians with patient-specific evaluations or recommendations. The programme immediately aids clinical decision-making. Nowadays, doctors utilise it at the point of treatment to supplement their expertise with CDSS information. 1970s saw the first computer-based CDSSs. Non-knowledge-based and knowledge-based. Both methods employ CDSS, although they vary. Clinical decision support software, which includes mobile apps, cloud-based software, and web-based software, supports clinical practise, patient management, and caregiving [9, 10].

Medical education is now computerised. Because of the COVID-19 pandemic, schools struggled to educate kids during the lockdown. Advanced technology allows e-learning and online medical education. Pakistan, like other low-income nations, doesn't work this way. Few medical colleges and universities offered online lectures and courses before the pandemic. Lack of infrastructure may make it difficult for medical educators to build or provide online learning. Most Pakistani medical schools teach by lecture. Knowledge is another issue. The lack of collaboration between the Higher Education Commission, Pakistan Medical and Dental College, College of Doctors and Surgeons, and Pakistan Medical College. No IT department is another issue. This sector lets colleges invest in IT departments, software, and technology for high-quality education [11, 12].

Medical imaging, like other digital diagnostic and therapeutic technologies, has pros and cons. The 1970s computed tomography scanner started the digital picture revolution in medical diagnostic imaging. Digital X-ray acquisition methods like computed radiography and digital radiography, developed in the 1990s and 1980s, followed. 1980s brought magnetic resonance imaging. Due to its prevalence, digital medical imaging is the preferred approach. Poor nations must address cultural, fiscal, economic, technological, and training difficulties to migrate from film processing and storage to digital capture and display. Technical longevity, inexpensive support, and training are additional issues [13–15].

Electronic medical systems helped the mother-child crises. It enhances maternal care by making patients content by offering more instructional and encouraging care, changing meeting hours, and reacting rapidly to emergencies when a healthcare practitioner is present [16,17]. Physicians lack the training to address such conditions. Pakistani physicians got three days of online training on digital health and telehealth consultations from Sehat Kahani Pakistan and Intelligent Project Automation System Pakistan to enhance electronics in medicine. These doctors may now provide post-abortion contraception and medicinal abortions remotely [18].

Many considerations support this study. First, medicine is evolving and technology is becoming increasingly important to healthcare. Pakistan too has a large population and an increasing disease burden. Effective and efficient healthcare services are needed, and electronic technology may help. Finally, electronic healthcare technologies have ethical, legal, and societal implications. Patient data privacy and security are challenges. Electronic healthcare technology research is needed for evidence-based policy and recommendations. This research may help Pakistan's healthcare system and evidence-based policy.

Research Problem

Since electronic systems have completely changed how healthcare is provided in Pakistan, this study focuses on EHRs, telemedicine, medical imaging, and CDSS to examine the potential and problems of integrating electronic systems into Pakistani healthcare practices.

1. How is telemedicine being used in Pakistani healthcare practices now, what are the potential and obstacles, and how can these problems be overcome to make the most of its utilisation going forward?

2. How are electronic health records now used in Pakistani healthcare practices, and what possibilities and problems exist in doing so? How may these issues be resolved to maximize their utilization going forward?

3. What are the existing methods, issues, and chances for using CDSS in Pakistani healthcare practices, and how may these issues be resolved to maximise its usage in the future?

4. What are the medical imaging implementation methods, issues, and opportunities now being used in Pakistani healthcare settings and how these issues are resolved in order to maximise their utilisation going forward?

5. What are the potential and constraints of employing electronic technology in this setting to enhance medical education and emergency situations in Pakistan?

Research Focus

The following items might be covered by the study on "Practical elements of the operation of electronic systems in the area of future medicine Pakistan:

1. Telemedicine
2. Electronic health/Medical record
3. CDSS
4. Medical Imaging
5. Digital Medical Education
6. Research and Development

Research Aim and Research Questions

Research Aim:

The aim of this research is to explore;

1. The practical aspects of the electronic systems functioning in the field of medicine of the future in Pakistan,
2. The challenges and opportunities of implementing these systems,
3. The potential solutions for optimising and enhancing their impact on outcomes.

Research Questions:

1. How are electronic technologies, such as EHRs, telemedicine, medical imaging, and CDSS, currently being used in Pakistani healthcare practices?

2. What are the challenges and opportunities of implementing electronic systems including EHRs, telemedicine, medical imaging, and CDSS, in healthcare practices in Pakistan? How can these challenges be addressed to optimise their use in the future?

3. How do electronic systems impact patient outcomes in different areas of healthcare in Pakistan, such as maternal and child health, chronic disease management, or infectious disease control?

4. What are the ethical and legal quality considerations of using electronic systems on outcome in medicine in Pakistan, and how can these be addressed to ensure the privacy and security of patient data?

5. How can electronic systems be used to improve medical education and training in Pakistan, and what are the challenges and opportunities of using these systems in this context?

Research Methodology

General Background

Technology is transforming the healthcare delivery. Electronic healthcare systems in Pakistan face usability, interoperability, data security, and cost issues. To understand the current status, challenges, opportunities, and potential solutions for maximising their use, it's important to study how electronic systems operate in Pakistan's future medical profession. The study setting was Faisalabad Pakistan. Study population included medical doctors working in private and public teaching institution. Sample size in this study 323 and a Nonprobability Convenient sampling technique was employed.

Data Analysis

Data analysis for the research on the practical aspects of the electronic systems functioning in the field of medicine of the future in Pakistan will involve both qualitative and quantitative data analysis methods. Chi Square test is applied to calculate p-value.

Research Results

Age wise frequency distribution of participants

The results of this study showed that the participants of study are distributed as age group 36–40 years of doctors accounted for 32.5% of the total population. Other age groups, from top to bottom, were as follows: 21.67% of those between the ages of 41 and 45, 19.20% belong to 31-35 years of age, 13.62% belong to 46 and above and 13% belong to the age group of 26-30 years as shown in table no.1.

Table 1. Age wise frequency distribution of physician.

Age Group	Male	Female
26-30	41	24
31-35	50	27
36-40	60	40
41-45	29	21
46 and above	20	11
Total	200	123

Telemedicine Practice

The result of the study showed that the out of 323 study participants; group having experience of medical practice of 6-12 months, were 14% who were practicing the telemedicine while those having 13-18 months of experience 17% were practicing, those having 19-24 months experience were having 52% were practicing while those having 25-29months experience, 11% were practicing and above 30 having 6% were practicing telemedicine or online medicine practice. Finally, the group having experience of 19-24 were 52 % who were practicing telemedicine as shown in table no. 2.

Table 2. Experience wise frequency distribution of physician.

Duration of experience in month	6-12	13-18	19-24	25-29	Above 30	P-Value
Telemedicine						
Yes	30(14%)	37(17%)	113(52%)	25(11%)	13(06%)	0.000
No	10(9.5%)	15(14.3%)	45(42.9%)	30(28.6%)	05(4.8%)	
Electronic Health / Medical Record						
Yes	45(23.1%)	35(17.9%)	60(30.8%)	30(15.4%)	25(12.8%)	0.000
No	20(15.6%)	15(11.7%)	45(35.2%)	25(19.5%)	23(18.0%)	
Clinical Decision Support Systems						
Yes	35(17.4%)	37(18.4%)	77(38.3%)	27(13.4%)	25(12.4%)	0.000
No	23(18.9%)	23(18.9%)	57(46.7%)	13(10.7%)	06(4.9%)	
Medical Imaging						
Yes	27(13.6%)	30(15.2%)	80(40.4%)	33(16.7%)	28(14.1%)	0.000

No	10(08%)	25(20%)	65(52%)	15(12%)	10(08%)

When dividing it into two groups having less than equal 24 months and above 24 months of experience in medical field, the result showed the group having experience above 24 months, 69 % were practicing telemedicine. The result may be concluded as out of 323 total participants, 67.5% of the participants were working in telemedicine.

The result also showed that 19.3% of the doctors were using laptops,22.7% using mobile phones to search for medical information online, while 41.1%% of them always connect with their patients through WhatsApp and 16.9 % through Facebook. As far as the legality is concerned 60 % of the doctors have no idea about the legal bindings while interacting with patients online while 40 % were knowing little bit. Furthermore, the importance of telemedicine usage for patients as a viable approach was agreed upon by 60 % of the participants. In this study, 80% of the doctors agreed to the usage of telemedicine for saving money, time, effort, and the beneficence of telemedicine for patients as shown in graph no 2.

Electronic Health / Medical Record

The result of the study showed that the out of 323 study participants; group having experience of medical practice of 6-12 months, were 23.1% who were utilising the electronic health record system as compared to paper record system while those who were having 13-18 months of experience 17.9% were utilising, those having19-24-month experience were 30.8% were utilising while those having 25-29 moths experience, 15.4% were utilising and above 30 moths having experience, 12.8 % were utilising. Finally, the group having experience 19-24 were 52 % who were utilising electronic health record system. When we divide it into two group having less than equal 24 months and above 24 months of experience in medical field result showed that the group having experience above 24 months,59 % were practicing electronic health record system and 41% were not utilizing. Result may be concluded as out of 323 total participants only 60.37% of the participants were having experience of working in electronic health record system as shown in table no. 2.

Clinical Decision Support Systems

The result of the study showed that the out of 323 study participants; group having experience of medical practice of 6-12 months, were 17.4% who were knowing and utilising the Clinical Decision Support Systems while who were having 13-18 months of experience 18.4% were utilising, those having19-24 months of experience, were 38.3% while those having 25-29 month experience 13.4% were utilising and above 30 months having experience 12.4 % were utilising. Finally, the group having experience 19-24months were 38.3 % were utilising Clinical Decision Support Systems. When dividing it into two groups having less than equal 24 months and above 24 months of experience in medical field result showed the group having experience above 24 months, 64.2 % were using Clinical Decision Support Systems system and 35.8% were not utilizing. Result may be concluded as out of 323 total participants only 62.23% of the participants were having experience of working in Clinical Decision Support Systems as shown in table no. 2.

Digital Medical Imaging

The result of the study showed that the out of 323 study participant group having experience of medical practice of 6-12 months, 13.6% were utilising Digital Medical Imaging while who were having 13-18 months of experience, 15.2% were utilising, those having 19-24 months experience, 40.4% were utilising while those having 25-29 months experience, 16.7% were utilising and having above 30 months experience were 14.1% who were utilising. Finally, the group having experience 19-24 months, 40.4 % were using Digital Medical Imaging. When dividing it into two groups having less than equal 24 months and above 24 months of experience in medical field result showed the group having experience above 24 months, 71.20 % were practicing Digital Medical Imaging. Result may be concluded as out of 323 total participants only 61.3% of the participants were having experience of working in Digital Medical Imaging as shown in table no. 2.

Digital education and training, research and development

The result of the study revealed that during covid 19 pandemic all medical institutes were teaching, assignments and evaluation 100 % through online mechanism but after pandemic there are 100% traditional methodology of teaching and learning. 60 % of the participants gave remarks in favour of online education considering it easier, more effective and efficient way as shown in graph no 3. The result of the study revealed that during covid 19 pandemic all medical institutes were teaching, assignments and evaluation 100 % through online mechanism but after pandemic there are 100% traditional methodology of teaching and learning. 60 % of the participants gave remarks in favour of online education considering it easier, more effective and efficient way as shown in figure no 1.

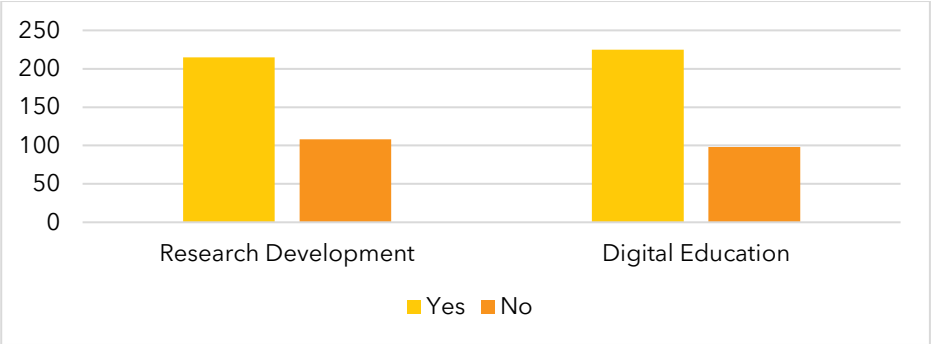

Figure 1. **Status of Opinion About Research Development and Digital Education**

Discussion

Telemedicine Practice

This study examined the usage of telemedicine. According to the research the telemedicine usage increased with the medical experience. 52% of the participants having 19–24 months of experience in medicine were practicing telemedicine. 41.1% of the physicians were using WhatsApp and 16.9% communicated with their patients on Facebook, while just 19.3% and 22.7% used laptops and mobile phones to search for medical information online respectively. 60% of doctors were ignorant of their legal duties while communicating with patients online. Telemedicine might save time, money, and effort, according to 80% of doctors. While another study found that the number of US telemedicine physicians increased from 20% in 2020 to 40% in 2021. After COVID-19 telehealth is spreading worldwide [19], and more than 50% of doctors used computers, mobile phones, and social media to engage with patients and stay updated on medical procedures literary assessments [20]. A Saudi Arabian study indicated that younger physicians utilise telemedicine more than those with 5–10 years of experience. As younger doctors are more technically elevated, they may practise more and use the internet to benefit patients [21].

Due to the advancement in information and communication technology the study's findings indicated that more than 50% of clinicians would be willing to practice telemedicine. These findings are corroborated by a research conducted in India, which revealed that more than 70% of doctors planned to continue utilising telemedicine at least periodically after the epidemic [22]. This is further supported by another study conducted in China that the physicians are most likely to have increased their telehealth use in the long term [23, 24]. Another study finding confirms that participants accepted telemedicine's advantages for a number of reasons, including its ability to save healthcare costs by reducing issues like needless emergency room visits, pharmaceutical abuse, and longer hospital stays [22, 25].

Other studies have found that up to 25% of patient-physician exchanges of information occur over the phone in settings like US internal medicine and UK primary care healthcare. This study agreed with the findings that phone consultations are the most common alternative to in-person consultations and may broaden access, convenience, and choice. Researches comparing the two methods of consultation show that patients were equally satisfied with both [26, 27]. Studies carried out in Brazil revealed that 18.5% of participants used telemedicine before to the pandemic but 63.6% of participants used telemedicine during the epidemic. Teleorientation and teleconsultation were the primary telemedicine techniques used throughout the epidemic [28, 29]. Less than a third of Polish healthcare providers utilised teleconsultations before to the epidemic, according to the same statistics. This is less than other studies have documented; for instance, in Saudi Arabia, more than half of the GPs utilised teleconsultation [30]. It can be stated that the COVID-19 pandemic has altered how telemedicine solutions are used in day-to-day healthcare work, raised interest in telemedicine, and compelled HCPs to quickly deploy teleconsultations [31].

Many studies found that Pakistan lacks a reliable telemedicine system. Medical students should learn about telemedicine so they can help implement it in the healthcare system. Telemedicine's usefulness and efficiency in diverse healthcare settings need additional investigation.

Electronic Health / Medical Record

This study revealed that 59% of individuals with more than 24 months of experience used EHR systems whereas 41% did not suggesting that clinical EHR system adoption and utilisation depend on exposure and familiarity. The research also stresses on the need of continued EHR system training especially for novices. In contrast a 10-year Indian study indicated that EMR use grew with time. Initially it was used for billing and inventories. EMRs improve patient tracking with time advancement. It is still difficult in transferring EMRs between medical institutions including pharmacies, labs, and specialists.

In 2018 Western Area a cross-sectional study showed the EMR's patient satisfaction rating was 3.7 which were significantly different from the PMR (p 0.001). Since 82.3% of patients believe doctors pay more attention to them during clinical consultations, they prefer the EMR system. According to respondent's consultations were lengthier in 80.4% of cases and tests and medications were better explained in 85.8% of cases. In presences of EHR, 84.0% of patients reported feeling better and ease in discussing their health with their doctor during professional appointments [34, 35]. This is also supported with research in Saudi Arabian that 81% of respondents claimed that their doctors treat them better when they have access to computerized health records. Also, it offers superior treatment (48%) easier scheduling (37%) and cheaper prices (50%). Moreover, Saudi consumers desire to digitally monitor and share their health information. This research brought attention to the value of digital health technologies, such as EHR, in providing Saudi citizens with high-quality healthcare [36, 37].

Overall, the study findings provide insightful information on the present level of healthcare professionals' use of EHR systems and point out areas for development in training and education to promote the uptake and use of these systems in clinical practice. There is a critical need for ongoing research to improve it.

Clinical Decision Support Systems

The research analysed clinical decision support systems that provide doctors with patient-specific diagnoses, treatment plans, and medication interactions. According to the study, 38.3% of 19 to 24-month-olds experience in clinical practice used CDSS. There might be several causes for this rise in CDSS use. Less seasoned medical professionals could be more open to using novel techniques and tools, like CDSS, to enhance patient care. Experienced physicians may not find CDSS useful since they have better knowledge and decision-making abilities. The fact that 64.2% of people with more than 24 months of experience utilised CDSS suggests that participant experience was not the main determinant of CDSS utilisation. This implies that CDSS use may be influenced by training, support, and familiarity with CDSS. The 62.23% CDSS usage rate within the participant group points to a discrepancy in CDSS adoption in the medical industry. Clinical decision-making, medical mistakes and patient outcomes may all be improved with CDSS systems. While Saudi Arabian researchers found many new factors that influence physicians' CDSS approval. They include accessibility, patient enjoyment, connection, communication, shared information, privacy, security, and perceived risks including functional performance risk and time risk. The study sheds new light on the many variables impacting doctors' CDSS adoption [38].

In primary care clinics managed by solo practitioners or physician groups, the utilization of Clinical Decision Support Systems (CDSS) varied from 68.5% to 100%, according to a US study. CDSS is utilized at 68% to 100% of primary care clinics that only use EMR/EHR systems especially for straightforward warnings about medication interactions and preventative reminders [39, 40]. While CDSS may improve patient outcomes and reduce healthcare costs, the study's findings have important ramifications for healthcare organizations and politicians. Nevertheless, the application of CDSS is hampered by insufficient training and device accessibility. To increase CDSS acceptance and utilisation, healthcare organisations should give physicians priority in their training and support. To use CDSS and improve patient care, policymakers must also regulate healthcare companies. Future research may assist in removing adoption hurdles by examining clinicians' CDSS adoption and usage [41, 42].

Digital Medical Imaging

Clinicians may take, preserve, and display X-rays, CT scans, and MRIs using the computer based DMI tool. By medical background, DMI usage varied. DMI was utilised by 13.6% of people with 6-12 months of experience, compared to 15.2% and 40.4%, respectively, for those with 13-18 and 19-24 months of experience. For individuals with 25–29 and more than 30 months of experience, the DMI utilisation fell to 16.7% and 14.1%, respectively. Further research found that DMI was utilised by 71.2% of people with over 24 months of expertise vs 28.8% of those without such experience. The survey discovered that 61.3% of participants utilised DMI, indicating a gap in acceptance in the medical sector.

Academic Radiology illustrated how radiologists' work-life balance has changed due to rising radiological imaging demand. Mayo Clinic imaging demand increased tenfolded from 9 million in 1999 to 94 million in 2010. Radiologists' workload has increased from 2.9 images per minute in 1999 to 16.1 in 2010. Radiologists review one photo every three to four seconds to meet demand. This highlights the increased use of digital medical technology [26]. Medical technology has improved patient outcomes. When healthcare providers and technology corporations combine to create and adopt new medical technologies, we may expect more advancement [43].

Given that DMI may boost diagnosis accuracy, improve patient outcomes, and lower healthcare costs, these results have significant policy and organisational implications for the healthcare industry. In order to improve the uptake and application of DMI, healthcare institutions should think about offering professionals training and support.

Digital education and training, research and development

This study suggests that all medical institutions used internet resources for education, homework, and evaluation during the COVID-19 pandemic. After the pandemic, all schools resumed traditional instruction. 60% of participants felt online education was easier, more effective, and more efficient. This study shows the benefits of online learning, especially given the pandemic's disruption of traditional teaching methods. Online learning allowed students to study without risking the virus and allowed institutions to employ technology to better education. As 60% of participants chose online education, colleges may want to consider adding it to their curriculum following the outbreak. This analysis was supported by a state-wide survey that indicated low adoption rates for online learning in higher education throughout normal academic years. During pandemics, 22.5% of medical schools and 26.9% of dental schools provide online learning, compared to 19.5% and 17.3% during academic years. These numbers show that few colleges offer online courses year-round [44].

Another study showed the usefulness of digital learning, also known as e-learning, web-based education, interactive learning, computer-assisted teaching, and internet-based learning. Web-based educational technology has grown due to a considerable drop in cost. Several colleges now see e-learning as essential to their educational system [45, 46]. These problems related to online education might have a negative impact on how well teachers present the lesson materials. However, a separate survey carried out in Bangladesh revealed that 94.9% of students used various e-learning tools, approaches, or platforms [47].

In impoverished nations, digital health may enhance surveillance, literature, education, knowledge, and research in addition to healthcare. While Kenya, Uganda, and India have adopted digital health policies, the desired results have not yet materialised. Digital health efforts in these nations are hampered by a lack of government support, funding, and stakeholder involvement. Non-governmental organizations with donor funding usually launch d-Health programs without research [48-49].

Technology improvements over the last ten years have significantly changed the healthcare industry. The delivery, documentation, and management of healthcare have been completely transformed by the combination of telemedicine, electronic health records, clinical decision support systems, digital medical imaging, and digital education and training. While these technologies provide a wealth of potential, they also present substantial obstacles that must be overcome in order for them to be successfully implemented. In order to guarantee the efficiency of these technologies, it is crucial to understand that their adoption must be customised to the particular requirements of each healthcare institution. The healthcare sector can continue to use technology to improve patient outcomes, expedite procedures, and raise the standard of care by investing in ongoing research and development.

Conclusions and Implications

The development of electronic medical systems has completely changed how healthcare is provided on a global scale. Yet, the adoption of such systems is still in its infancy in underdeveloped nations like Pakistan. This study sought to examine the practical elements of how electronic systems might operate in Pakistan's future medical profession, as well as the possibilities and problems associated with putting these systems in place and prospective solutions for improving and optimising their effects on results conclusion and implication are:

1. Electronic systems may significantly improve the quality and efficiency of healthcare services, improve patient outcomes, and diminish healthcare costs in the healthcare sector.

- Implication: In order to increase patient outcomes, diminished healthcare costs, and improve the quality of healthcare services, healthcare practitioners and policymakers should emphasise the adoption and deployment of electronic systems.

2. The adoption and implementation of electronic systems in healthcare practices in Pakistan are hindered by a number of factors, such as a lack of resources and infrastructure, restricted access to technology, a lack of technical experience, and opposition to change among healthcare professionals.

- Implication: In order to successfully implement electronic systems in healthcare practices in Pakistan, stakeholders must address the problems that have been identified, such as investing in infrastructure and resources, granting access to technology, helping healthcare professionals become technically proficient, and dealing with change-resistance.

3. To encourage the use and deployment of electronic technologies in healthcare practices in Pakistan, policy changes and investments are required.

- Implication: To encourage the adoption and deployment of electronic systems in healthcare practices in Pakistan, policymakers must prioritise investment in policy changes.

4. In Pakistan, there must be opportunities for ongoing growth of computerized health systems.

- Implication: To raise the standard of medical treatment and patient outcomes, Pakistan must constantly look for chances for the development of electronic health systems.

5. The sustainability of the adoption of electronic health systems in Pakistan depends on cross-sectoral cooperation.

- Implication: To guarantee the sustainability of electronic health systems in Pakistan, a cross-sectoral cooperation between healthcare professionals, decision-makers, and other stakeholders is essential.

6. For Pakistan's healthcare system to operate effectively, equity must be guaranteed in all areas.

- To ensure that all facets of the population have equal access to healthcare services and resources, equity must be a guiding concept in the development of electronic health systems in Pakistan.

7. For healthcare practitioners to become technically proficient and to encourage the adoption and deployment of electronic health systems in Pakistan, training and development programs are essential.

- To provide healthcare workers in Pakistan with the technical know-how they need to adopt and deploy electronic health systems, training and development programs are required.

Inadequate infrastructure, technical expertise, computer literacy, and healthcare professional resistance make these systems challenging to implement. The findings include improving infrastructure, educating healthcare workers, increasing patient computer literacy, and implementing privacy and data security regulations to maximise their impact on healthcare outcomes. There is a dire need for international support to achieve the global standard in electronic health care system.

Sample Size calculation

Population size (for finite population correction factor or fpc) (N):	2000
Hypothesized % frequency of outcome factor in the population (p):	50%+/-5
Confidence limits as % of 100(absolute +/- %) (d):	5%
Design effect (for cluster surveys-DEFF):	1

Sample Size (n) for Various Confidence Levels

Confidence Level (%)	Sample Size
95%	323

Results from OpenEpi, Version 3, open-source calculator [50]

Declarations

Author contributions

All authors have sufficiently contributed to the study and agreed with the results and conclusions.

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Ethical statement

This study does not require IRB approval as it does not involve human subjects/data.

Declaration of interest

No conflict of interest is declared by authors.

Data sharing statement

Data supporting the findings and conclusions are available upon request from the corresponding author.

Data Availability Statement

Data sharing not applicable: Data sharing is not applicable to this article.

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