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Evaluation of the Lack of Digital Interaction in Healthcare Services and Development of Recommendations

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ABSTRACT

The lack of digital interaction refers to the insufficiency or complete absence of direct or real-time engagement on digital platforms. In the context of healthcare services, the absence of digital interaction presents various challenges in the delivery of care. These challenges include trust issues, difficulties in comprehending information, reduced communication between patients and healthcare professionals, misunderstandings resulting from inadequate information, decision-making difficulties, and a lack of empathy. To mitigate the adverse effects of insufficient digital interaction, healthcare providers must develop and implement innovative strategies aimed at enhancing digital engagement and improving the accessibility and usability of digital health services. This study presents recommendations aimed at addressing the lack of digital interaction in healthcare services, serving as a foundation for the development of new strategies. It has been conducted as a systematic review based on a comprehensive literature analysis. The findings indicate that the fundamental step in improving digital interaction in healthcare is enhancing digital health literacy. By providing digital health literacy education, individuals can be supported in effectively utilizing digital health information. Healthcare institutions should develop new strategies that take into account patients' levels of health literacy and focus on improving their access to and ability to use digital health information. To promote digital health literacy, digital education programs should be offered to individuals, and user-friendly digital health tools should be designed by healthcare providers.

1. INTRODUCTION

Digital interaction encompasses the processes that enable individuals to exchange information, establish social connections, and gain experiences through various digital tools. These processes exert influence across a broad spectrum, ranging from education and healthcare services to business and daily life practices. Digital interaction has implications such as fostering a conscious approach to screen time usage and the adverse effects of excessive usage on mental health. Moreover, it is emphasized that individuals' social relationships are also affected by digital interaction [1]. Research in the field of Human-Computer Interaction (HCI) has demonstrated how digital twin technologies drive transformation in industrial production. Digital interaction has been enhanced through big data visualization tools, thereby facilitating the management of production processes [2]. In the context of language education, integrating digital interaction with gaming has been found to enhance language learning. Online multiplayer games promote language use by providing students with opportunities to practice speaking and writing [3].

The lack of digital interaction is defined as individuals' inability to effectively engage with digital environments or tools. This deficiency can stem from various factors, including lack of access to technology, insufficient digital skills, or challenges in user interface design [4]. The lack of technological access, deficiencies in digital literacy, and barriers in user interface design contribute to lower participation in the digital world. Digital interaction is a concept that defines how individuals engage with digital media and technologies. It has been suggested that individuals with low technological experience are less likely to successfully use a new digital interface, which can lead to a lack of digital interaction [5]. In order to prevent digital communication deficiency, digital

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literacy training should be widely implemented, user-friendly technologies should be developed, and digital solutions should be designed with consideration of social inequalities. Ensuring equitable access to digital tools and enhancing individuals' ability to navigate digital platforms are essential steps in fostering inclusive digital participation.

The use of digital technologies in the healthcare sector is essential for improving patient care and increasing access to health services. However, limited access to these systems or deficiencies in their use may hinder individuals from utilizing healthcare services. The lack of digital interaction in healthcare negatively impacts the effectiveness of patient care and accessibility to health services. The failure to adopt digital health solutions can lead to weakened doctor-patient relationships, inequalities in healthcare services, and legal risks. Enhancing digital interaction in the healthcare sector is critically important for improving patient care, expanding access to health services, and reducing the workload of healthcare professionals.

2. LACK OF DIGITAL INTERACTION

The lack of digital communication is defined as the insufficiency or complete absence of direct or real-time interactions on digital platforms [6]. In the context of healthcare services, this deficiency leads to a reduction in interaction between patients and healthcare professionals, limited access to health information, and difficulties in patients' informed decision-making processes [7]. Furthermore, the lack of digital communication can result in negative outcomes in healthcare services, such as trust issues, misunderstandings, and a lack of empathy [8]. Therefore, strengthening digital communication plays a critical role in enhancing patient satisfaction and improving the efficiency of healthcare services.

In today's world, where dependence on digital communication is increasing, individuals with limited participation in digital platforms may experience loneliness, reduced life satisfaction, and cognitive difficulties. Furthermore, it significantly affects mental health and overall well-being [9]. The impact of digital interaction on loneliness has been found to be small but positive. While passive digital communication (e.g., browsing the internet) negatively affects individuals' well-being, active digital communication (e.g., chatting) has been associated with increased social support [10]. Digital interaction also shapes individuals' behavioral, cognitive, and physiological characteristics. It has been noted that individuals with limited participation in digital environments face greater challenges in adapting to modern communication methods [11].

Lack of digital interaction is defined as individuals' inability to sufficiently engage with digital tools or environments, resulting in difficulties in accessing information or developing digital skills [12]. This deficiency has significant effects on individuals' mental health, social well-being, and cognitive development. Lack of digital interaction may prevent individuals from adequately benefiting from mental health services. Studies in Human-Computer Interaction (HCI) have shown that digital platforms can improve mental health services through AI-supported therapies. However, limited access to these services remains a significant issue [13]. The impact of emotional expression in digital communication varies by gender. Research indicates that women derive greater emotional benefits from digital interaction, whereas men tend to find support in more neutral digital interactions [14]. The lack of digital interaction can lead to various negative effects, such as increased loneliness, cognitive difficulties, and social exclusion. To mitigate the negative consequences of digital interaction deficiency, promoting digital literacy through targeted initiatives is of critical importance.

2.1. Lack of Digital Interaction in Healthcare Services

Digital health systems facilitate patient access to healthcare services and support healthcare professionals in service delivery. However, the incomplete adoption of digital health services and deficiencies in the use of these systems may limit individuals' access to healthcare. One of the barriers to access is the lack of sufficient digital health literacy among individuals. A study conducted in the state of Alabama found that cancer patients and community health workers faced significant challenges in understanding and utilizing digital health services. It has been reported that elderly individuals and patients from low-income groups experience restrictions in accessing healthcare services due to unfamiliarity with technology, difficulty reading small screens, and reluctance to use online services [15].

The effective implementation of digital health technologies is closely related to the digital skills of healthcare professionals. A study revealed that a significant portion of healthcare professionals lacked adequate training in using digital health solutions. The use of digital tools was found to be particularly low among nurses [16]. Communication issues between patients and healthcare professionals in the digital age directly

impact treatment effectiveness, patient satisfaction, and prescription adherence. The insufficient adoption of digital health services may also be attributed to the transformation of traditional communication models between patients and doctors [17].

A study conducted in Germany highlighted that slow progress in the digitalization of the healthcare system and lack of interaction were primarily due to regulatory and policy barriers. Successful implementation of digital health systems requires infrastructure investments and harmonization of legal regulations [18]. The trust factor plays a critical role in the adoption of digital healthcare technologies. A study conducted in China and the United States found that the lack of collaboration between academia and industry in healthcare digitalization decreased trust in digital solutions. Users tend to avoid digital healthcare services due to concerns about data security and system accuracy [19]. Economic barriers play a significant role in the use of digital health services. A study in Australia identified that individuals in socioeconomically disadvantaged areas faced difficulties accessing digital health services due to issues such as lack of internet access and necessary devices, severely limiting healthcare accessibility [20].

Human-computer interaction studies have shown that low engagement with digital tools negatively impacts user experience. Inaccessible digital platforms or complex user interfaces make it difficult for individuals to effectively utilize digital tools [21]. The absence of digital health solutions can disrupt doctor-patient relationships. The failure to integrate digital technologies into healthcare services results in patients taking a more passive role in managing their health, thereby reducing accessibility to healthcare [22]. Furthermore, the lack of digital health solutions leads to legal concerns regarding patient rights and data security. In healthcare systems with inadequate digitalization, patients face restrictions in accessing medical records, increasing legal risks [23]. Patients without access to digital health systems may develop distrust towards modern healthcare solutions. Due to the insufficiency of digital health technologies, patients may become less informed and active in managing their health [24]. Additionally, the absence of digital health solutions can increase healthcare costs, particularly in managing chronic diseases, where lack of digital applications restricts early diagnosis and treatment access, ultimately raising healthcare expenditures [25]. The lack of digital health applications hinders patients from accessing their medical records and making informed healthcare decisions [26].

Digital health technologies have the potential to improve healthcare access, enhance patient care, and reduce costs. However, lack of access to digital health systems may prevent individuals from fully benefiting from healthcare services [23]. Inequalities in access to digital health services are particularly evident among the elderly, low-income groups, and individuals living in rural areas. A study indicates that these groups are less likely to utilize digital healthcare services [27]. A study evaluating the use of digital health platforms by elderly individuals found that computer anxiety and fear of making errors hindered the adoption of digital health services. Additionally, some users found interfaces complex and emphasized the importance of human [28].

During the COVID-19 pandemic, a study conducted across 10 Latin American countries analyzed the adoption rates of digital health applications in the region. According to the study, the initial utilization rate of existing health applications in these countries was only 2% at the beginning of the pandemic. However, as the pandemic progressed, there was an increasing tendency toward personal data sharing [29]. The adoption rates of electronic health records (EHR), health information exchange (HIE), and digital patient communication in Germany, Austria, and Switzerland have been compared. The study found that the EHR adoption rate was 52% in Austria, 78% in Switzerland, and 50% in Germany [30]. The adoption rate of Electronic Health Records (EHR) in Chinese hospitals increased from 18.6% in 2007 to 85.3% in 2018. In contrast, the adoption rate in the United States rose from 9.4% in 2008 to 96% in 2017. The average annual EHR adoption rate was calculated as 6.1% in China and 9.6% in the United States [31]. It was found that only 21.6% of primary healthcare providers in Jordan utilized Electronic Health Records (EHR), while the remaining 78.4% still relied on paper-based systems [32].

Liu et al. [31], examined factors limiting elderly individuals' use of digital health services, identifying physical limitations, lack of training, insufficient technological equipment, and mistrust in online services as major barriers. Gupta [32], found that factors influencing patients' adoption of digital health services included health beliefs, ease of use, and service perception. However, privacy and data security concerns negatively affected adoption. Ekenstam & Eklund [33], indicated that while digital health services could improve primary healthcare access, their effectiveness compared to traditional methods such as telephone consultations remains uncertain.

A study conducted in Germany found that the slow progress of digitalization in healthcare

increased healthcare workers' workload and reduced service efficiency. Delays in adopting digital health solutions decrease healthcare system effectiveness [34]. Increasing access to digital health solutions can contribute to a more efficient and equitable healthcare system. Further research and policy development efforts are crucial to addressing these challenges.

3. Recommendations

Suggestions for enhancing digital interaction in healthcare services are categorized under five main themes. The first theme emphasizes the role of expanding training on digital platforms within healthcare services to foster greater digital interaction. The second theme focuses on recommendations related to improving digital accessibility and interaction. The third theme highlights the enhancement of telemedicine and mobile applications, along with strategies to optimize their usability, as a means to strengthen digital interaction. The fourth theme explores the integration of artificial intelligence and big data processing in healthcare services to further facilitate digital engagement. Lastly, the fifth theme addresses the importance of advancing digital interaction through the development of applications centered on data privacy and patient safety.

3.1. Education-Based Recommendations for İncreasing Digital Engagement in Healthcare

Organizing training programs on mobile health applications, online appointment systems, and patient portals.

Providing education on effective utilization of electronic health records (EHR), telemedicine platforms, and AI-supported diagnostic systems.

Encouraging elderly individuals to use digital health services through specialized training programs, simplified video tutorials, and instructional guides.

Implementing gamification techniques in mobile health applications to make patient education more engaging.

Educating patients about data security and equipping them with fundamental knowledge to manage their health data securely.

Encouraging local governments, universities, and NGOs to organize community-based digital health education programs.

Assigning digital health consultants in community centers to provide guidance to individuals.

Updating digital health policies to ensure broader access to digital health services and encouraging health insurance models that promote digital health literacy.

Considering recommendations from international organizations such as the World Health Organization (WHO) and the European Union (EU) on digital health literacy.

3.2. Recommendations for Enhancing Digital Interaction and Accessibility in Healthcare

Patient portals, mobile applications, and telemedicine platforms should be designed to be accessible and user-friendly.

Voice command systems, chatbots, and AI-powered health assistants should be made more accessible, particularly for elderly individuals and those with low digital literacy.

Mobile applications should enable users to schedule appointments and communicate with healthcare providers with a single click.

Rapid support services should be provided to resolve technical issues encountered by users.

Free or low-cost digital health solutions should be developed for low-income groups.

Healthcare facilities in rural areas should be supported with internet connectivity and digital health systems.

Voice assistants and screen readers should be integrated into digital health platforms to facilitate access for visually impaired patients.

AI-powered sign language translation systems should be implemented to improve healthcare accessibility for individuals with hearing impairments.

Larger buttons and intuitive designs should be incorporated to enhance interface accessibility for individuals with mobility impairments.

3.3. Recommendations for Enhancing Telemedicine and Mobile Applications in Healthcare

The availability of video conference-based consultations should be expanded, integrating patients more effectively into remote diagnosis and treatment processes.

Mobile health applications should be utilized to support the management of chronic diseases such as diabetes and hypertension.

Telemedicine platforms should incorporate multilingual support to overcome language barriers.

In addition to video consultations, instant messaging and AI-powered chatbot services should be integrated.

Digital health education programs should be developed to enable physicians, nurses, and other healthcare professionals to effectively utilize digital sağlık systems. These training programs should

cover topics such as AI-assisted diagnosis systems, electronic health records (EHR), and remote patient monitoring.

Government-supported free digital health services should be offered to low-income and disadvantaged groups.

Mobile health clinics and remote diagnostic centers should be established in rural areas.

Patients should be provided with clear information regarding how their data is processed when using digital health services.

3.4. Recommendations for Enhancing Digital Interaction in Healthcare Through AI And Big Data Analytics

AI-powered diagnostic systems can be utilized for early disease detection. AI algorithms should identify abnormal health data and send early warnings to patients and doctors.

Wearable devices and IoT-enabled sensors can facilitate real-time transmission of patient health data to physicians.

Big data analytics can be employed to assess patient data for improving public health policies. Preventive healthcare services can be enhanced through big data analysis.

Insights derived from patient data analytics can increase the efficiency of healthcare services.

AI can assist doctors in providing personalized health recommendations. AI-driven genetic analysis can enable personalized treatment plans based on individual health data.

The utilization of AI algorithms in radiology and pathology imaging systems should be expanded. AI-assisted cancer diagnostic systems can help radiologists achieve faster and more accurate results.

Clinical decision support systems can improve diagnostic accuracy for healthcare professionals.

Machine learning algorithms should analyze patients' medical histories to determine the most suitable treatment methods.

1.1. *Recommendations to Increase Digital Engagement with Data Security and Patient Privacy*

Patients should be informed about the security of digital health platforms, ensuring transparency regarding how their data is utilized.

Patients should have increased control over their health data, allowing them to determine who can access their information.

Blockchain technology should be employed to encrypt and secure patient records. Blockchain-based digital identity verification can ensure that only authorized healthcare professionals access patient data.

Two-factor authentication (2FA) should be implemented to protect both patient and doctor accounts.

End-to-end encryption (E2EE) should be used during data transmission to securely transfer sensitive health information.

Anonymization and synthetic data generation techniques should be applied to enable secure AI-driven data analysis.

AI-powered threat detection systems should be developed to counter cyberattacks. Hospitals and healthcare institutions should undergo regular cybersecurity assessments.

4. Conclusion

Future research on improving digital interaction should focus on developing adaptive and inclusive digital platforms, enhancing digital literacy interventions, and exploring the role of emerging technologies such as artificial intelligence and virtual reality in fostering engagement. Studies should investigate how personalized digital health tools can bridge the gap for individuals with limited technological experience and how social and economic inequalities impact digital participation. Additionally, interdisciplinary research combining human-computer interaction, behavioral sciences, and public health can provide deeper insights into effective strategies for increasing digital engagement across diverse populations.

Conflict of Interest

No conflict of interest is declared by teheauthors. In addition, no financial support was received.

Author Contributions

Conception and design of the study: DK; Data collection: DK; Data analysis: DK; Data Interpretation: DK; Drafting the article and/or its critical revision: DK; All authors have read and agreed to the published version of the manuscript.

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