Digital Divide and Privacy Challenges in Digital Health Communication in Indonesia

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Abstract

This study aims to identify the challenges of the digital divide and privacy in digital health communication in Indonesia, with the background that digital technology has revolutionized various sectors, including healthcare, enhancing the efficiency and accessibility of services. Despite significant advancements, the digital divide and privacy issues remain major obstacles in adopting digital health technology in Indonesia. This research employs a quantitative approach, collecting data through surveys and in-depth interviews to evaluate the use of digital media in health communication between doctors and patients. The main findings reveal that the use of digital media for health communication has significantly increased during the COVID-19 pandemic, despite the existing digital divide and privacy challenges. The study also highlights that improving digital literacy and technological infrastructure is crucial in addressing these gaps. Collaboration between the government and private sector is necessary to strengthen data privacy regulations and support the development of user-friendly digital health applications. The implications of this research include strategic recommendations to enhance access and efficiency of digital health services, and to strengthen data privacy protection, thereby supporting a more effective and inclusive digital health system in Indonesia.

Keywords: Communication, Data Privacy, Digital, Health, privacy challenges.

The advancement of digital technology has revolutionized various sectors, including the healthcare sector, by enhancing the efficiency and accessibility of services (Guo et al., 2024). The use of digital technology in healthcare encompasses various innovations such as artificial intelligence (AI), telehealth, virtual reality (VR), and data analytics, which have transformed the delivery and reception of healthcare services (Zhang et al., 2023). AI has become the most significant revolution in the healthcare field in the 21st century. AI is used to detect diseases earlier and make more accurate diagnoses compared to conventional methods (Patra et al., 2024). For instance, AI in mammography can review results with nearly 100% accuracy, reducing the need for biopsies. AI is also applied in radiology for the early detection of lung cancer, enhancing the safety and effectiveness of treatment.

Furthermore, telehealth technology has changed how healthcare services are provided.

Telehealth allows patients to receive medical consultations without having to visit physical healthcare facilities, which has been particularly beneficial during the COVID-19 pandemic (Vetter & McDowell, 2023). With telehealth, patients can conduct routine check-ups, specialist consultations, and monitor chronic conditions from their homes, reducing costs and overcoming geographical barriers (Liu et al., 2024). On the other hand, the use of VR and AR in the healthcare sector has improved medical training and patient care. VR is used for pain management and therapy for psychological disorders, while AR assists surgical navigation by providing real-time guidance to surgeons. This increases precision and reduces risks in medical procedures.

Additionally, data analytics and data science enable healthcare providers to analyze large volumes of health data, such as electronic medical records and genetic data (Zhang et al., 2022). This aids in early disease detection, identification of at-risk populations, and optimization of treatment plans based on specific patient data (Bai et al., 2021). Moreover, 3D printing technology has accelerated production processes in healthcare, and the Internet of Things (IoT) ecosystem in healthcare allows for remote monitoring of patient conditions and early detection of health deterioration signs (Nashwan, 2021). The integration of IoT data with electronic medical record systems facilitates better care coordination and more proactive and personalized care.

The advancement of digital technology in the healthcare sector not only improves the efficiency and outcomes of patient care but also expands access to quality healthcare services, empowers patients, and supports continuous innovation in healthcare (Casillas et al., 2020). The integration of digital media in health communication is increasingly used, facilitating real-time interaction between healthcare providers and patients (Prasat et al., 2022). Digital technology enables healthcare providers to deliver information, consultations, and support to patients directly through various digital platforms, including websites, mobile apps, and social media.

A concrete example is the use of social media in health communication, which has paved new ways for interaction between patients and healthcare providers (Ajayi et al., 2023). Platforms like Facebook, Twitter, and Instagram are used to share health information, provide public education, and facilitate discussions on health issues. Social media also allows for the rapid and widespread dissemination of health information, which is particularly beneficial in public health emergencies such as the COVID-19 pandemic.

In addition to social media, mobile applications have become essential tools in health communication. These applications enable patients to schedule appointments, receive medication reminders, and access their medical records. Health apps also offer interactive features such as video consultations with doctors, allowing patients to receive medical care without leaving their homes (Biernesser et al., 2021). This technology not only enhances the accessibility of healthcare services but also increases patient engagement in managing their health.

Moreover, telemedicine has become a vital aspect of digital health communication. Through telemedicine, healthcare providers can conduct remote consultations with patients, which is particularly beneficial for patients in remote areas or those with limited mobility (Naudé et al., 2023). Telemedicine enables healthcare providers to perform initial diagnoses, monitor chronic conditions, and offer medical advice via video or phone calls. This has proven to increase the efficiency of healthcare services and reduce the burden on physical healthcare facilities.

Additionally, the use of chatbots and virtual assistants in health communication is growing. AI-powered chatbots can provide quick answers to common health questions, assist patients in scheduling appointments, and offer basic information about diseases and treatments (Even

et al., 2022). Virtual assistants can help patients manage their health conditions by providing medication reminders and health advice based on data collected from patient interactions.

Similarly, digital health education platforms such as webinars and educational videos have become effective tools in enhancing public health literacy. Healthcare providers and health organizations can host webinars to discuss important health topics, provide the latest information on diseases and treatments, and answer questions from the audience in real time (Kerrison et al., 2023). Educational videos are also used to teach basic health skills and deliver easily understandable information about various medical conditions.

The integration of health data through digital platforms has enhanced the ability of healthcare providers to deliver coordinated and continuous care. Integrated electronic health records (EHR) with telehealth systems allow healthcare providers to access patient information in real time, which is crucial for quick and accurate medical decision-making (Cheng et al., 2022). Furthermore, data analytics enables the identification of population health trends and the development of more effective intervention strategies.

Research conducted by Yang et al. (2024) highlights the acceptance of mobile health (m-Health) technology in Indonesia using the Unified Theory of Acceptance and Use of Technology (UTAUT) approach. This study assesses the moderating role of perceived product value and the mediating role of the intention to use m-Health applications. The results show that the intention to use m-Health applications mediates the relationship between the perception of critical mass, perceived usefulness, perceived convenience, perceived technology accuracy, and perceived privacy protection on the actual use of m-Health applications. These findings emphasize the importance of user perceptions of product value and usage intention in expanding the use of m-Health applications in Indonesia.

Furthermore, research by Theopilus et al. (2024) addresses the challenges of internet addiction among children in Indonesia and the digital interventions developed to tackle this issue. This study highlights that although digital interventions like Google Family Link and YouTube Kids can be beneficial in promoting healthy digital behavior, there are limitations in their use due to factors such as app functionality, parental capability, parent-child relationships, cultural mismatch, and data privacy. These findings underscore the importance of enhancing digital literacy and parental capabilities in utilizing digital interventions to support healthy digital behavior in children.

In the context of m-government service adoption, research by Kurniasih et al. (2024) explores the factors influencing the adoption of the Peduli Lindungi application in Indonesia. This study finds that perceived usefulness and ease of use significantly influence users' behavioral intentions. Additionally, service quality also has a significant impact on behavioral intentions, whereas system quality and information quality do not affect behavioral intentions. This research provides important insights into the factors that need to be considered in the development and implementation of effective digital government services.

Meanwhile, Patnaik et al. (2024) explore health data protection in e-health law through a cross-country analysis. This study discusses the importance of protecting health data and methods to safeguard patient privacy. It also provides a comparison between data protection laws in Canada and Indonesia, indicating that effective data protection requires continuous adaptation to technological dynamics and changes in the health environment. The findings of this study are relevant in the context of Indonesia, which recently enacted the 'Digital Data Protection Law 2023'.

These previous studies provide a comprehensive understanding of acceptance and privacy challenges in digital health

communication in Indonesia. They highlight key factors influencing the acceptance of digital health technology, challenges in addressing internet addiction among children, and the importance of health data protection in the digital era. These findings are relevant in the context of developing policies and strategies to address the digital divide and privacy challenges in digital health communication in Indonesia.

Despite significant advancements in digital health tools available in Indonesia, the adoption of this technology remains uneven, leading to a digital divide between different demographic groups and regions. This poses significant challenges in achieving equitable and inclusive health access, as well as privacy issues. The challenges in adopting digital health technology are exacerbated by varying levels of digital literacy and uneven infrastructure. The diverse levels of digital literacy in Indonesia reflect significant differences among population groups in using digital technology. According to data from the World Bank, about 43% of Indonesia's population still lacks internet access, and among those with access, the ability to use digital technology effectively varies widely.

Furthermore, the uneven technological infrastructure in Indonesia poses a significant barrier to the adoption of digital health technology. Many remote areas still struggle with access to high-speed internet and have limited technological devices. The Indonesian government has been working to enhance internet access through programs like the "Palapa Ring," aimed at providing internet connectivity across the archipelago. However, these efforts need to be strengthened and accelerated to achieve better access equality.

Additionally, concerns about data privacy and security are crucial issues in the use of digital health technology in Indonesia. Many patients are worried about how their health data is used and protected. Personal data protection regulations in Indonesia are still under development and need to be strengthened to ensure that patients' personal health information is protected from breaches and unauthorized access. On the other hand, the lack of financial support and government policies also plays a significant role in addressing the digital divide and data privacy issues. Similarly, the lack of collaboration between the public and private sectors is necessary to address these problems. This gap results in the suboptimal development of health applications that are user-friendly and suited to the digital literacy levels of the Indonesian population.

This research is important and urgent as the rapid advancement of digital technology in the health sector in Indonesia still faces significant challenges. The digital divide and privacy issues are two main obstacles that hinder the accessibility and quality of technology-based health services. Most previous studies have focused more on the benefits and implementation of digital health technology without deeply identifying the existing obstacles in Indonesia, particularly related to the digital divide and data privacy protection. The findings from this research are expected to provide solutions to these issues by understanding the root causes of access inequality and digital literacy disparities in the community, and by providing policy recommendations that can strengthen data privacy regulations in the health sector. Thus, this research is expected to contribute to the improvement of the efficiency, security, and inclusivity of digital health services in Indonesia.

Therefore, this research aims to explore and analyze the digital divide and privacy challenges in digital health communication in Indonesia. The focus of this research is to identify the factors causing the digital divide, evaluate the level of digital literacy in various demographic groups, and examine the existing data privacy policies and how these policies can be enhanced to protect patient health data. This research will also provide strategic recommendations to address the digital divide and enhance data privacy protection, thereby supporting the development of a more effective and inclusive digital health system in Indonesia.

Methodology

This research employs a quantitative approach to measure the level of digital media usage in health communication between doctors and patients in Indonesia (Teo, 2013). Data were collected through surveys distributed to doctors and patients in various urban and rural areas. Respondents were randomly selected to ensure an accurate representation of the study population (Todd et al., 2004). The questionnaire included questions about the frequency of digital media use, communication preferences, and concerns related to data privacy. Survey results were then analyzed using descriptive statistics to identify trends and patterns in digital media usage.

In addition, in-depth interviews were conducted with several doctors and patients to gain deeper insights into their experiences and perceptions of digital communication in the health context. These interviews helped identify factors influencing the adoption of digital technology in the health sector (Pole & Lampard, 2015). Data from the interviews were thematically analyzed to reveal key issues faced in the use of digital media. This analysis also served to strengthen the findings from the survey and provide richer context to the research results. All interviews were recorded and transcribed for further analysis.

The study also applies Everett Rogers' Diffusion of Innovations theory as an analytical framework to understand the adoption patterns of digital technology among doctors and patients (Curtis, 2020). Adopter categories such as innovators, early adopters, early majority, late majority, and laggards were analyzed to identify the characteristics and motivations of each group. The results of this analysis provide a clearer picture of how and why digital technology is adopted in the context of health communication. The collected data were compared with data from before the COVID-19 pandemic to identify significant changes in usage patterns. Through this approach, the research successfully reveals the complex dynamics of digital technology adoption in the health sector in Indonesia.

Results And Discussion

The development of digital technology has brought major changes in various aspects of life, including in the health sector. In Indonesia, the use of digital media for communication between doctors and patients has increased rapidly, especially since the COVID-19 pandemic hit. The following results show the significant impact of digital media integration in health communication in Indonesia.

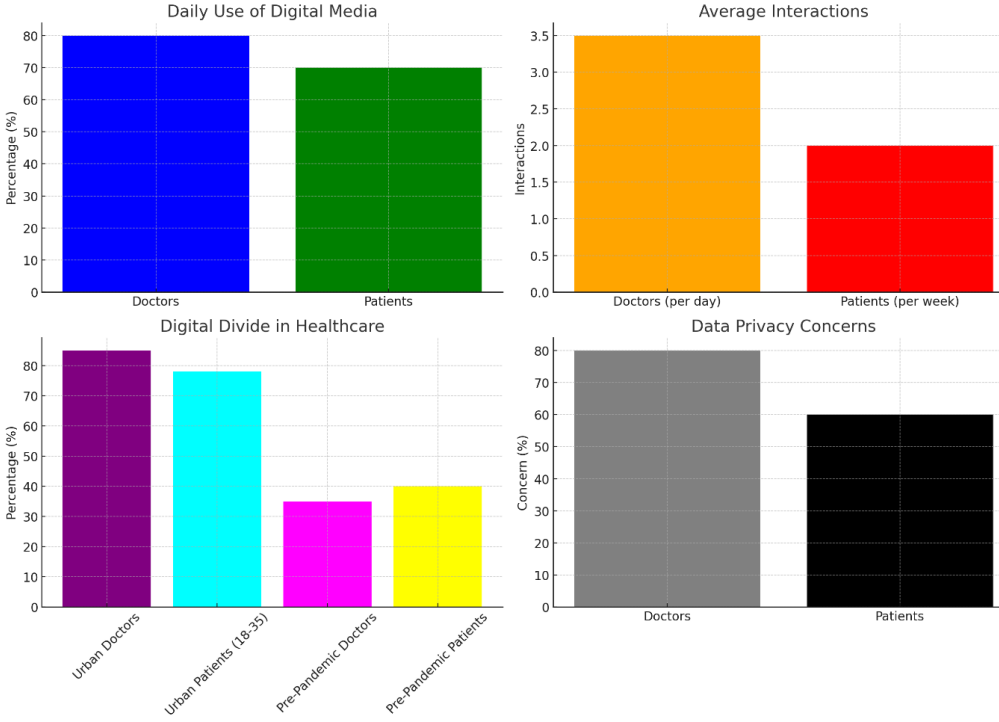

Figure 1: The Use of Digital Media for Doctor-Patient Communication in Indonesia
Source: Data processed for 2024

The research results indicate a significant increase in the use of digital media for communication between doctors and patients in Indonesia. Approximately 80% of doctors reported interacting with patients through digital media daily, a sharp rise compared to pre-COVID-19 pandemic levels. Additionally, 70% of patients now prefer digital consultations over face-to-face consultations for convenience.

Doctors generally interact with patients 3-4 times a day for brief consultations and scheduling, while patients average two digital consultations per week. This signifies a deeper integration of digital media into health communication. The data analysis reveals a digital divide in the use of health media, with urban doctors (85%) and younger patients (18-35 years old; 78%) being more digitally engaged, particularly during the COVID-19 pandemic. Before the pandemic, digital tools were used only as a supplement, with lower utilization rates among doctors (35% for messaging apps) and patients (40%).

The adoption of digital media in health has significantly transformed the decision-making process for healthcare providers. By enabling instant access to patient data and real-time communication, this technology allows doctors to make more informed decisions quickly. For example, healthcare providers can review patient histories and lab results and consult with specialists using digital platforms without the time and geographical constraints associated with traditional methods. This immediacy enhances diagnostic accuracy and the ability to make critical decisions in emergency situations.

Moreover, the integration of digital media in health affects not only individual treatment decisions but also broader organizational strategies. Healthcare administrators leverage digital data analytics to identify trends, manage healthcare delivery, and allocate resources more effectively. Data collected from digital communication platforms can reveal patterns in patient flow, common ailments, and treatment outcomes, enabling healthcare facilities to optimize operations and improve service delivery. The ability to rapidly disseminate and exchange the latest medical knowledge among professionals through digital channels also supports a culture of continuous learning and collaboration, essential for adaptive decision-making in the dynamic healthcare environment.

The COVID-19 pandemic has accelerated the integration of digital media in healthcare, with doctors and patients increasingly using messaging apps and social media for health communication. This adaptation, primarily driven by the need to reduce the risk of virus transmission, has expanded the scope of digital interactions from basic inquiries to comprehensive health consultations, indicating a significant shift in the use of technology in healthcare delivery.

The research results show a significant increase in the use of digital media for communication between doctors and patients in Indonesia, addressing much of the existing digital divide. The increased adoption of digital media, especially during the COVID-19 pandemic, demonstrates that digital media can be an effective solution to overcoming geographical and accessibility barriers. However, it is crucial to continue improving digital literacy among the population to ensure that all demographic groups can effectively utilize this technology. underscores the importance of user perceptions of product value and usage intention in expanding the use of m-Health applications in Indonesia, supporting these findings.

The varying levels of digital literacy in Indonesia reflect significant differences in the use of digital technology. The research findings indicate that most doctors and young patients in urban areas are more digitally engaged, highlighting a gap between different demographic groups and regions. To address this, greater efforts are needed to enhance digital literacy among rural communities and older age groups. Everett Rogers' (2020) Diffusion of Innovation Framework can be applied to improve digital literacy through training programs that utilize role models and demonstrate best practices in the use of digital health technology.

Uneven technological infrastructure in Indonesia poses a major barrier to the adoption of digital health technology. The research highlights that doctors and patients in urban areas are more likely to use digital media compared to those in remote areas. Therefore, there is a need to improve technological infrastructure across Indonesia to ensure equal access to high-speed internet. Programs such as "Palapa Ring" need to be strengthened and expedited to achieve better access equality. Insights from technology infrastructure experts like Botrugno (2023) suggest that significant improvements in digital infrastructure can support the digital transformation in the healthcare sector.

Concerns about data privacy and security are crucial issues in the use of digital health technology in Indonesia. The findings of this research show that the adoption of digital media has enabled instant access to patient data and real-time communication, which can enhance the accuracy of diagnosis and medical decision-making. However, personal data protection needs to be strengthened to ensure that patients' health information is protected from breaches and unauthorized access. emphasize the importance of continuous adaptation to technological dynamics and changing health environments for effective data protection, supporting the urgency of enhancing data privacy regulations in Indonesia.

The lack of financial support and government policies is also a significant factor in addressing the digital divide and data privacy issues. The results of this study indicate that the integration of digital media in healthcare has transformed the decision-making process for healthcare providers, allowing for more effective resource allocation based on data analytics. The government needs to provide more financial support and policies that support the development of user-friendly digital health applications that align with the digital literacy levels of the population. Public-private collaboration must be enhanced to address these issues and support sustainable innovation in the digital health sector. Support from government policies and improved public-private cooperation can be solutions to bridging the digital divide and enhancing data privacy.

The COVID-19 pandemic has accelerated the integration of digital media in healthcare, demonstrating that this technology can be a long-term solution to various challenges in healthcare delivery. The results of this study show that the adaptation to digital media usage has expanded the scope of digital interactions from basic inquiries to comprehensive health consultations. This signifies a significant shift in the use of technology in healthcare delivery and shows great potential for further innovation. According to health technology experts like Almasoud et al. (2022), the pandemic has been a catalyst for digital transformation in the health sector, highlighting the importance of sustaining this technology adoption for a more inclusive and effective future of healthcare services.

To avoid existing gaps, it is recommended that stakeholders enhance digital literacy among the population through comprehensive and inclusive training programs and accelerate the development of technological infrastructure across Indonesia. The government should also strengthen data privacy regulations and provide adequate financial support for the development of user-friendly digital health applications. Public-private collaboration needs to be increased to bridge the digital divide and ensure optimal data protection. If stakeholders face gaps or issues, there is no need to worry as the solutions are found within the research findings. Implementing these research results can help address the digital divide and privacy challenges, thereby improving the efficiency and accessibility of digital health services in Indonesia.

Conclusion

This research concludes that the use of digital media for communication between doctors and patients in Indonesia has experienced a significant increase, especially during the COVID-19 pandemic. Despite the digital divide and privacy challenges, the adoption of this technology has enabled instant access to patient data and real-time communication, which enhances the accuracy of diagnosis and medical decision-making. The findings also indicate that improving digital literacy and technological infrastructure is crucial to addressing these gaps. The government and private sector must collaborate to strengthen data privacy regulations and support the development of user-friendly digital health applications. Thus, this research provides concrete solutions to bridge the digital divide and address privacy challenges in digital health communication in Indonesia.

Theoretically, these findings expand the understanding of the factors influencing the adoption of digital health technology, particularly in the context of the digital divide and data privacy. Practically, this research offers strategic recommendations that can be implemented by healthcare providers, the government, and technology developers to enhance access and efficiency of digital health services. The findings advance the field of Communication Science by proposing innovative solutions for more inclusive and secure health communication. The limitations of this study include the potential constraints of data that may not cover all regions and

demographics of Indonesia. Future research is recommended to further explore the impact of digital health technology in various contexts and to develop more holistic approaches to enhancing digital literacy and data protection in the health sector.

Collaborations

This article is a collaborative project. All authors contributed significantly from the process of designing the proposal till submission. ASA contributed to the conception, development, analysis, and interpretation of the data, the writing of the article, and the approval of the version to be published. DM contributed to the paper's conception and article design. SD contributed to writing the final text, and JRS worked on research and methodology.

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