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Effectiveness of Mobile Health (mHealth) Use in Monitoring Patients with Chronic Diseases: A SWOT Analysis

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ABSTRAK

Chronic diseases, such as diabetes mellitus, hypertension, heart failure and COPD, are the leading causes of morbidity and mortality in Indonesia, putting a strain on the health system and patients' quality of life. Continuous monitoring and effective management are essential, but are often constrained by limited access to healthcare services. Mobile-based health technology, or Mobile Health (mHealth), offers an innovative solution to improve monitoring of patients with chronic diseases, allowing patients to self-monitor their conditions and interact with medical personnel virtually. Despite its great potential, the implementation of mHealth faces challenges such as limited digital infrastructure, access gaps, as well as low digital literacy of patients, especially the elderly and those with low education. To address these challenges, a SWOT analysis was used to identify the strengths, weaknesses, opportunities and threats faced by this technology. The strengths of mHealth lie in real-time monitoring efficiency and accessibility, while the weaknesses lie in infrastructure dependency and potential inequality of access. Opportunities for mHealth development are promising, but face threats such as weak regulations and data misuse. The implementation of mHealth requires comprehensive policies, strict regulations, and continuous education to be effective in improving the quality of chronic disease monitoring in Indonesia.

Keywords: Chronic Disease Patient Monitoring; Mobile Health (mHealth); SWOT Analysis

INTRODUCTION

In recent decades, the prevalence of chronic diseases has increased significantly in various countries, including Indonesia. Diseases such as diabetes mellitus, hypertension, heart failure, and chronic obstructive pulmonary disease (COPD) are the main causes of morbidity and mortality (Ahmad, 2021). This condition not only burdens the national health system but also impacts the quality of life of patients and the economic productivity of society. Chronic disease management demands continuous monitoring, patient involvement in their own disease management, and good coordination between medical personnel and patients. However, in practice, many patients experience difficulties in accessing health services on a regular basis, either due to

geographical constraints, costs, or limited health worker resources. Therefore, innovations are needed to bridge the gap so that monitoring of patients with chronic diseases can be done more effectively and efficiently.

In the digital era, mobile-based health technology or Mobile Health (mHealth) emerges as a solution that can improve the effectiveness of monitoring patients with chronic diseases. The use of mHealth applications allows patients to independently monitor their conditions, record health progress, receive medication reminders, and consult with medical personnel without having to come directly to a health facility (Wahananingtyas et al., 2025). This technology also makes it easier for health workers to access real-time patient data, analyze health trends, and provide more timely interventions. In addition, the integration of mHealth with artificial intelligence (AI) and the Internet of Things (IoT) further improves the accuracy and personalization of healthcare services. However, despite its many potentials, the implementation of mHealth still faces various challenges, such as limited digital literacy, uneven internet access, and concerns regarding data privacy and security (Budiman et al., 2023). Therefore, it is necessary to conduct an in-depth analysis of the effectiveness and challenges of using mHealth in chronic disease monitoring, one of which is by using the SWOT Analysis method to identify strengths, weaknesses, opportunities and threats in the implementation of this technology.

Although Mobile Health (mHealth) offers an innovative solution in chronic disease monitoring, its effectiveness is still problematic and depends on infrastructure readiness, digital literacy of patients, and policies that support its widespread implementation. In the context of developing countries like Indonesia, the digital divide is not just a technical challenge, but also reflects deeper structural inequalities. Unequal internet access and limited technological devices not only hinder the maximum utilization of mHealth, but also widen the gap of inequality in health services (Febiarthy & Martha, 2023).

Furthermore, technological literacy among elderly patients and people with low education levels is not just an obstacle, but a reflection of systemic failures in equitable access to technology and digital health education. If not accompanied by strict intervention policies and sustainable education programs, mHealth adoption risks becoming a privilege for more tech-savvy groups, while vulnerable groups are increasingly marginalized from the digital-based healthcare ecosystem (Paul et al., 2023).

However, the challenges in mHealth implementation are not only limited to technical aspects and accessibility, but also relate to the readiness of the health system to integrate this technology effectively (Mulana, 2020). Many health institutions still rely on conventional methods of patient monitoring, with limitations in data interoperability between mHealth systems and existing electronic medical records. The lack of specific regulations related to usage standards, patient data protection, and control and evaluation mechanisms are also obstacles that have not been fully overcome (Makisurat et al., 2018). If the health system is unable to accommodate this technology properly, mHealth could

become an exclusive tool for certain groups of people and widen healthcare disparities (McCool et al., 2022).

Furthermore, the effectiveness of mHealth also needs to be evaluated from the perspective of patient compliance and interactions with medical personnel. While this technology can provide convenience in monitoring, not all patients have high discipline in utilizing the available features. Lack of motivation, unfamiliarity with the long-term benefits, and limited support from medical personnel may lead to suboptimal use of mHealth. In addition, there is a risk that technology dependency may replace the interpersonal relationship between patient and doctor, which in many cases plays an important role in building trust and ensuring continuity of care (Petrocchi et al., 2019). Therefore, before mHealth is widely adopted, there is a need for a holistic approach that not only highlights the advantages of the technology, but also considers the readiness of the healthcare ecosystem and patient behavior in utilizing this innovation.

A SWOT analysis approach in evaluating the effectiveness of mHealth is a crucial step to understand the extent to which this technology can be optimally integrated into the health system. In terms of strengths, mHealth offers efficiency in real-time patient health monitoring, wider accessibility, and ease in recording medical data. However, weaknesses cannot be ignored, especially in terms of dependency on digital infrastructure, limitations in patients' technological literacy, and potential gaps in access to services for underprivileged groups. If these weaknesses are not addressed, mHealth implementation risks failing to fulfill its purpose as an inclusive and sustainable health monitoring solution.

In addition, the opportunities aspect of mHealth development is also promising, especially with the increasing investment in health technology and the adoption of digital ecosystems in the medical system. However, these opportunities can be hampered by threats, such as weak regulations, potential misuse of health data, and resistance from medical personnel who are still accustomed to conventional methods. Without well-thought-out policies and effective integration between technology, health workers, and patients, mHealth may actually create new problems in healthcare, such as gaps in data accuracy or even inequality in service distribution. Therefore, the implementation of mHealth must be supported by comprehensive policies, strict regulations related to data protection, and continuous education for health workers and patients so that this technology can truly improve the effectiveness of chronic disease monitoring.

RESEARCH METHODS

A SWOT analysis approach in evaluating the effectiveness of mHealth is crucial to understanding the extent to which this technology can be optimally integrated into the health system. In terms of strengths, mHealth offers efficiency in real-time patient health monitoring, wider accessibility, and ease in recording medical data. However, weaknesses cannot be ignored, especially in terms of dependence on digital infrastructure, limitations in patients' technological literacy, and potential gaps in access to services for underprivileged groups. If

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Picture 1. SWOT Analysis of the Use of Mobile Health (mHealth) in Chronic Disease Monitoring

RESULTS AND DISCUSSION

SWOT Analysis of the Effectiveness of Using Mobile Health (mHealth) in Monitoring Patients with Chronic Diseases. The following are the results of the SWOT analysis compiled based on research findings.

1. Strengths

One of the main advantages of mHealth is its ability to provide real-time monitoring of patients' health conditions, which allows patients and medical personnel to access health data with a high level of accuracy and better speed than conventional methods. With this technology, healthcare professionals can immediately detect changes in a patient's condition, allowing for faster and more targeted medical interventions. In addition, mHealth also contributes to improving the accessibility of health services, especially for people who live in

remote areas or have limited mobility. Teleconsultation provided through the mHealth app allows patients to consult with doctors without having to visit a medical facility in person, which not only saves travel time and costs, but also speeds up the diagnosis and treatment process. Another advantage is efficiency in patient management, where the application of mHealth is able to reduce the administrative burden of health workers through the automation of patient data recording, medication reminders, and long-term tracking of patient condition progress. With an integrated system, medical personnel can easily access the patient's medical history, making medical decision-making more accurate and data-driven. In addition, this efficiency also has an impact on improving the overall quality of healthcare services, as medical personnel can focus more on patient care rather than administrative tasks**.**

2. Weaknesses

One of the major drawbacks in mHealth implementation is the reliance on digital infrastructure, where not all areas have adequate internet access to support optimal use of this health technology. In remote or low-connectivity areas, network limitations can cause disruptions in access to digital health services, preventing patients from properly utilizing real-time monitoring, teleconsultation or electronic medical records. This gap has the potential to widen healthcare disparities between urban and rural areas. In addition, patients' varying levels of digital literacy are another obstacle to mHealth implementation. Not all patients, especially the elderly and those unfamiliar with technology, have the ability to operate digital health applications. Difficulties in understanding the app interface, inputting health data, or following instructions can reduce the effectiveness of the services provided. Therefore, a comprehensive education and mentoring program is needed so that all levels of society can make optimal use of this technology. Another important challenge is the security and privacy of health data. The risk of data leakage and misuse is a serious threat, especially since some mHealth apps are not yet equipped with a strong encryption system to protect patients' personal information. If these security aspects are not properly addressed, public trust in mHealth services may decline, ultimately hindering the adoption of this technology in the wider health system. Therefore, strict regulations and the development of more sophisticated security technologies are urgent to ensure that patient data remains protected and can only be accessed by authorized parties.

3. Opportunities (Peluang)

Opportunities in the development of mHealth are increasingly wide open, driven by various factors that support each other. One of the main factors is the support of government regulations and policies that are increasingly progressive in encouraging the digitization of health services. Various initiatives have been launched to strengthen health technology infrastructure, including the integration of mHealth with the national electronic medical record system. This

will enable more efficient, integrated and accessible healthcare services for the public, especially in remote areas where it was previously difficult to obtain quality medical services. In addition, rapid advances in health technology are a key driver of mHealth transformation. The use of artificial intelligence (AI) in health data analysis enables faster and more accurate diagnosis, while the Internet of Things (IoT) facilitates real-time monitoring of patient conditions through wearable devices. Big data technology also plays an important role in collecting and processing patient data to produce more personalized and evidence-based treatment recommendations. With these innovations, patients can receive more proactive and predictive healthcare services, ultimately improving their quality of life. On the other hand, collaboration between mHealth app developers and various stakeholders in the healthcare industry creates great opportunities for service expansion and optimization. Cooperation with hospitals, clinics and medical personnel enables the integration of digital services with conventional medical practices, thus creating a more comprehensive health system. In addition, the involvement of pharmaceutical companies in mHealth can support digital prescription management and medication effectiveness monitoring. Last but not least, health insurance companies also have the potential to play a strategic role by developing digital technology-based protection schemes, which can improve service accessibility for the wider community. With the synergy between supportive regulations, technological advancements, and industry collaboration, mHealth has great potential to revolutionize the healthcare system, improve service efficiency, and provide more personalized and data-driven solutions for patients.

4. Threats

One of the major threats to mHealth implementation is weak and non-uniform regulations. Although the government has started to support the digitization of healthcare, the rules governing the use of mHealth are still fragmented and do not fully accommodate ethical and legal challenges, especially in the protection of patient data. This lack of regulatory clarity may pose a risk of data misuse and hamper public trust in digital health technology. In addition, resistance from medical personnel is also a challenge. Not all healthcare workers are ready to adopt mHealth technology in their practice, especially those who are used to conventional methods and feel that the use of this technology may reduce direct interaction with patients. This skepticism can slow down the widespread adoption of mHealth and limit its effectiveness in improving healthcare quality. Another threat is the inequality in access to technology, where not all patients have devices compatible with mHealth applications, and the significant difference in access between urban and rural communities. People living in areas with limited digital infrastructure or economic limitations may find it difficult to utilize mHealth services, thus exacerbating inequalities in healthcare access. If these challenges are not addressed, the benefits of mHealth could potentially only accrue to some groups

of people, while others continue to face difficulties in obtaining quality healthcare services.

Discussion

The results of the SWOT analysis show that mHealth has great potential in improving the effectiveness of monitoring patients with chronic diseases through real-time monitoring, improved access to health services, and data digitization that reduces the burden on medical personnel. This technology enables continuous monitoring of patient conditions, minimizing the risk of delayed medical intervention. In addition, mHealth also plays a role in improving patient adherence to medication, as supported by studies showing that digital health apps can provide automated medication reminders, provide interactive health education, and facilitate direct communication between patients and medical personnel (Deniz et al., 2023; Cao et al., 2024). Furthermore, the use of mHealth in the healthcare system has the potential to reduce long-term care costs by reducing unnecessary hospitalizations and improving the efficiency of chronic disease management (Kustiyanti, 2023). Digitizing patient data also allows medical personnel to access electronic medical records more quickly and accurately, allowing for more data-driven clinical decision-making (Fauzi et al., 2024).

However, despite its great potential, major challenges in mHealth implementation still need serious attention. Disparities in access to technology, especially in areas with limited digital infrastructure, may hinder the equitable adoption of mHealth (Ardiansyah & Rusfian, 2020). Uneven digital literacy is also an inhibiting factor, especially for vulnerable groups such as elderly patients and people with low education levels. A study by Khamaj & Ali (2024) showed that elderly patients have difficulty using mHealth apps, which poses a challenge in ensuring inclusivity of digital-based healthcare. In addition, concerns regarding privacy and security of health data are issues that must be taken seriously. Storing patient data in digital systems increases the risk of personal information leakage, which can be misused by irresponsible parties. Strict regulations on patient data protection and compliance with cybersecurity standards need to be implemented to ensure public trust in mHealth services.

Not only from the patient side, medical personnel also face obstacles in adopting this technology. The HIMSS (2023) report notes that 30% of medical personnel still show resistance to the use of digital technologies in their practices, citing reasons such as lack of training, increased administrative burden, and concerns over the effectiveness of new systems. Therefore, strategies that combine education, technical training, and incentives for medical personnel are needed to accelerate the adoption of mHealth in the healthcare system (Handayani, 2021). Overall, while mHealth offers significant benefits, its successful implementation relies heavily on improving digital infrastructure, increasing technological literacy, and strengthening data security regulations.

With the right approach, mHealth can be an innovative solution to increase the efficiency of healthcare services and improve the quality of life of patients with chronic diseases across all walks of life.

In addition, regulatory aspects and data security are major concerns in the implementation of mHealth. WHO (2023) highlights that healthcare digitization policies should include the protection of patient data from being misused by irresponsible parties. As the use of digital-based health applications increases, the risk of data breaches also increases, especially if the security system implemented is inadequate. A study by Andhani et al (2024) revealed that health applications that do not have strict security systems can increase the risk of personal information leakage, which in turn has an impact on decreasing patient trust in digital services. Therefore, strengthening regulations governing data security standards, encryption of medical information, as well as periodic audit mechanisms is crucial to ensure that patient health information remains safe and protected from misuse.

In the Indonesian context, digital transformation in healthcare is undergoing rapid development, especially as more mHealth platforms are introduced to improve access to medical services (Stoumpos et al., 2023). However, the implementation of these technologies still faces major challenges, including limited digital infrastructure in remote areas and technological disparities between different groups of people. Many hospitals and health facilities in urban areas have adopted digital systems, but in areas with limited internet access, mHealth utilization is still not optimal. In addition, the lack of digital literacy among patients, especially the elderly and people with low education levels, is also a barrier to effective utilization of health technology. Without adequate understanding of how to use health apps, many patients find it difficult to access mHealth services independently.

For mHealth to be effectively applied in the monitoring of patients with chronic diseases, a comprehensive mitigation strategy is needed. The first step is the improvement of digital infrastructure, including equitable internet access and the development of more user-friendly technology systems (Minutolo et al., 2017). In addition, technology literacy education for patients and medical personnel must be strengthened so that they can make the most of mHealth applications. The government and relevant stakeholders also need to strengthen health data security regulations, ensuring that every digital platform used meets strict security standards, including data encryption, dual authentication systems and regular cyber monitoring mechanisms. With a holistic approach, mHealth can be a reliable solution in improving the quality of healthcare services and the effectiveness of monitoring patients with chronic diseases in Indonesia.

CONCLUSION

The use of mHealth has great potential in improving the effectiveness of monitoring patients with chronic diseases, with its ability to provide real-time monitoring, speed up diagnosis, and improve accessibility of healthcare

services, especially in remote areas. It also helps to reduce the administrative burden on medical personnel and improve the efficiency of the health system. However, challenges such as limited digital infrastructure, inequality in access between urban and rural areas, and low digital literacy among patients, especially the elderly, need to be addressed to ensure inclusivity and effective use of mHealth. In addition, the importance of strengthening regulations to protect patient data and improving the security of mHealth applications are equally important aspects, so that public trust in this technology is maintained. With the right mitigation measures, including infrastructure equalization, education for patients and medical personnel, and the development of user-friendly systems, mHealth can be an innovative solution that can improve the quality of health services and chronic disease monitoring in Indonesial

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