

Effectiveness of Technology Application in Health Service System to Improve the Quality of Life of Elderly People with Chronic Disease

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Abstract

The rapid advancement of technology has significantly transformed healthcare services, particularly in improving the quality of life for elderly individuals with chronic diseases. However, the effectiveness of these technologies depends on the digital literacy of users, which remains low among the elderly. This study employed a qualitative case study approach to evaluate the effectiveness of technology applications at Keputih Community Health Center in Surabaya, Indonesia, and to analyze the digital literacy of elderly chronic disease patients. Data were collected through semi-structured interviews with six elderly informants, observations, and secondary health data from Electronic Health Records (EHR), Non-Communicable Disease Information System (SPTM), and ECLAIM Primary Care applications. The findings reveal two main results: first, elderly patients face significant barriers in digital skills (downloading apps, uploading files, searching for information) and digital safety (controlling privacy settings, identifying malware, creating secure passwords), requiring assistance from family members or health cadres. Second, despite these barriers, elderly hypertension patients demonstrated higher treatment adherence and better blood pressure control compared to productive-age patients. The implications suggest that while digital health applications benefit chronic disease management, they must be accompanied by tailored digital literacy training and family-based assistance to maximize their effectiveness for elderly populations. The study contributes to the literature on digital health equity and elderly care in low-resource settings.

INTRODUCTION

This study focuses on the effectiveness of technology applications at Keputih Community Health Center, Surabaya City, in addressing the healthcare needs of elderly patients with chronic conditions (Bofe & Adam, 2024; Nisa et al., 2023). Technologies such as electronic health records (EHR), telemedicine, mobile health applications, play a crucial role in improving accessibility, efficiency, and patient outcomes. By evaluating the impact of these innovations, this research aims to provide insights into optimizing digital healthcare strategies for sustainable and inclusive elderly care who have chronic disease (Chen & Xu, 2022; Polak et al., 2025; Purba et al., 2024).

The Relationship Between Mobile JKN and the Application is Mobile JKN and the Satu Sehat application have a complementary relationship in supporting the digital transformation of healthcare services in Indonesia (Fascia et al., 2023; Jasmine & Harmawan, 2025; Kurniasih et al., 2022; Maghfiroh, 2019). Mobile JKN is the official BPJS Kesehatan application,

focusing on simplifying access for National Health Insurance participants, such as checking their membership status, paying premiums, queuing online, and tracking their healthcare history. Meanwhile, the Satu Sehat application, developed by the Indonesian Ministry of Health, serves as a national health data integration platform, connecting patient medical records from various healthcare facilities in a standardized manner ((Kominfo), 2022; Hakim & Genep Sukendro, 2022; Sun et al., 2025; Theofilou, 2022).

The Relationship Between Mobile JKN, P-Care is Mobile JKN, P-Care, and E-Claim are three interconnected digital systems that support the National Health Insurance (JKN) service ecosystem. Mobile JKN serves as the gateway for participants, allowing them to access membership information, select healthcare facilities, and even queue for services online. When participants seek treatment at a primary healthcare facility (FKTP), all medical services received are recorded through the P-Care application, from examinations and procedures to referrals to hospitals if necessary (Apolinário-Hagen et al., 2017; Hou et al., 2016; Kebede et al., 2021; Marcolino et al., 2018).

If patients are referred to a secondary healthcare facility (FKRTL), data from P-Care serves as the basis for continued care. After the service is completed, the hospital submits a claim to BPJS Kesehatan (Social Security Administering Agency) through the E-Claim application. This process ensures that every service provided is digitally recorded, verified, and accountable (Milani et al., 2016; Paré et al., 2010; Ye et al., 2021).

With this flow, Mobile JKN facilitates access to service entitlements for participants, P-Care documents medical services at primary health care facilities (FKTP), and E-Claim ensures transparency and accountability in hospital claims. The three systems work together to create an integrated system, making healthcare services for JKN participants more efficient, transparent, and measurable.

The urgency of this research is underscored by the rapid digital transformation of Indonesia's healthcare system and the growing elderly population. The Mobile JKN application, launched in 2016 and updated regularly, is now mandatory for all BPJS Kesehatan participants to access services such as online queuing, referral tracking, and claims verification. However, if elderly patients cannot use the application independently, their access to essential healthcare services is compromised. Moreover, the Indonesian government recently launched the Free Health Check program in 2025, which is integrated with the Satu Sehat application, further accelerating the shift toward digital health services. Without evidence-based insights into the digital literacy barriers faced by the elderly, policies aimed at digital health inclusion may fail to reach the most vulnerable populations.

The novelty of this study lies in its mixed-method approach that combines: (1) an in-depth qualitative assessment of elderly digital literacy across 15 specific elements (8 digital skills and 7 digital safety aspects) based on the Kominfo, (2022) framework, (2) analysis of actual health outcome data (hypertension control rates) from electronic health records, and (3) a comparison between elderly and productive-age groups. Unlike previous studies that focused solely on user satisfaction or technology acceptance, this research examines both the process (ability to use technology) and the outcome (health status) of digital health application use. The study also contributes to the limited literature on digital health in Indonesian community health centers (*Puskesmas*), which serve as the primary care backbone for the majority of the population.

The relationship between the two lies in data and service integration. Mobile JKN serves as a gateway for participants to access BPJS Kesehatan membership benefits, while Satu Sehat ensures that patient medical data, including examination and treatment histories, is securely stored and accessible across healthcare facilities. With this synergy, participants not only benefit from administrative convenience through Mobile JKN but also receive higher-quality, integrated healthcare services through Satu Sehat.

The collaboration between these two applications is expected to accelerate the digital transformation of the national healthcare system, improve service efficiency, and provide a more comprehensive healthcare experience for the public.

The World Health Organization (WHO) classifies the elderly into several groups: middle-aged (45-59 years old), elderly (60-74 years old), old (75-90 years old), and very old (90 years and older). This study focused on the elderly group aged 60 years and over.

In addition to the elderly group, this study also conducted research on the productive age group as a comparison of the application of digital technology in the use of health services for both health service officers and recipients. Productive age is the age range during which a person is considered capable of producing goods and services and contributing to the economy. This age range generally ranges from 15 to 64, as defined by the Central Statistics Agency (BPS) and organizations such as the United Nations (UN) and the Indonesian Ministry of Health. This age range encompasses the physical, intellectual, and social capabilities necessary to actively participate in society and become a driver of development.

The Ministry of Communication and Informatics (Kominfo) initiated the concept of digital literacy, which encompasses four aspects: digital skills, digital ethics, digital security, and digital culture. More specifically, this study seeks to examine the digital literacy skills and safety of older adults, as well as the factors that influence these skills.

RESEARCH METHODS

Materials for this study used primary data: from interviews, E-Health Public Health Center Management Information System Application/SIMPUS, Non-Communicable Disease Information System Application/SPTM focused in hypertension as a sample, ECLAIM Primary Care linked with Mobile JKN Application from June to December 2024 and secondary data: from statistical data from the Central Statistics of Surabaya City Government, and policy on the use of digital technology for public health services and some related research journals. The methods used in this study are statistical analysis and qualitative approaches with in-depth interviews and observations to explore the experiences and perceptions of the quality of life of the elderly.

In this case, researchers are allowed to develop conclusions, abstractions, concepts, and hypotheses based on the data obtained from the data collection. Data collection was conducted through observation and semi-structured interviews with 6 informants from the elderly group. The researcher conducted observations and identified research informants through their participation as an elderly companion at an integrated family service post specifically for the elderly, operated by the Keputih Community Health Center. The subjects in this study were elderly residents within the Keputih Community Health Center's coverage area in Surabaya. The informants in this study were selected using a purposive sampling technique, where the researcher determined a number of criteria that informants must meet. This program involved

125 elderly people. The first criterion for informants in this study was those who were in the elderly group. The second criterion for selecting informants was that they actively use digital media, focusing on the Mobile JKN application. The six informants in this study can be said to represent the elderly population in the Keputih Community Health Center work area in Surabaya City. The interview process was conducted over a two-month period, from February to March 2025. Furthermore, the researcher also conducted data triangulation.

Triangulation is a technique that combines various data collection techniques and existing data sources. In this case, the researcher used data source triangulation, which involves exploring the truth of certain information through interviews with subjects the researcher believes have different perspectives. Here, the researcher will conduct an interview with an elderly companion from the Health Cadre Officer who manages the implementation of family *posyandu* activities for the elderly group on a regular basis. The goal is to examine the perspectives of seniors on digital literacy skills, which is an aspect of this research.

Table1: Digital literacy of the elderly and productive age groups in the aspects of digital skills and digital safety in the use of the Mobile JKN application

Initial Name	Age	Category	Gender	Occupation	History of Illness
SKJ	76	Old	Male	Retired Servant, Teacher Freelance	Civil Stroke, Hypertension
SFY	63	Elderly	Female	Housekeeping	Hypertension, Diabetes
TSR	73	Elderly	Female	Food Vendor	Hypertension, Diabetes
MYN	64	Elderly	Male	Technician Freelance	Hypertension
ZND	65	Elderly	Male	Pond Farmer	Hypertension, COPD
HDY	64	Elderly	Female	Couturier	Hypertension

RESULTS AND DISCUSSION

The use of digital technology in the form of applications at the Keputih Health Center varies depending on the function and purpose of obtaining the required health data. The following are several visualizations of health data related to the health service system, especially for the elderly with chronic diseases (Hypertension as an example) along with the monitoring results obtained from various digital applications that are used routinely at the Keputih Health Center.

Use Of the JKN Mobile Application for the Elderly And Productive Age Groups

Based on ECLAIM Primary Care data from Keputih Health Center (2022-2024) the JKN Mobile Application used by JKN (National Health Insurance) insurance participants at Keputih Health Center obtained from 2022 to 2024 at the Keputih Health Center above, it was found that the population of patients using the JKN Mobile Application at productive age was higher, while the elderly population was lower. However, the number of JKN mobile users at elderly ages tends to increase compared to the relatively stable productive age.

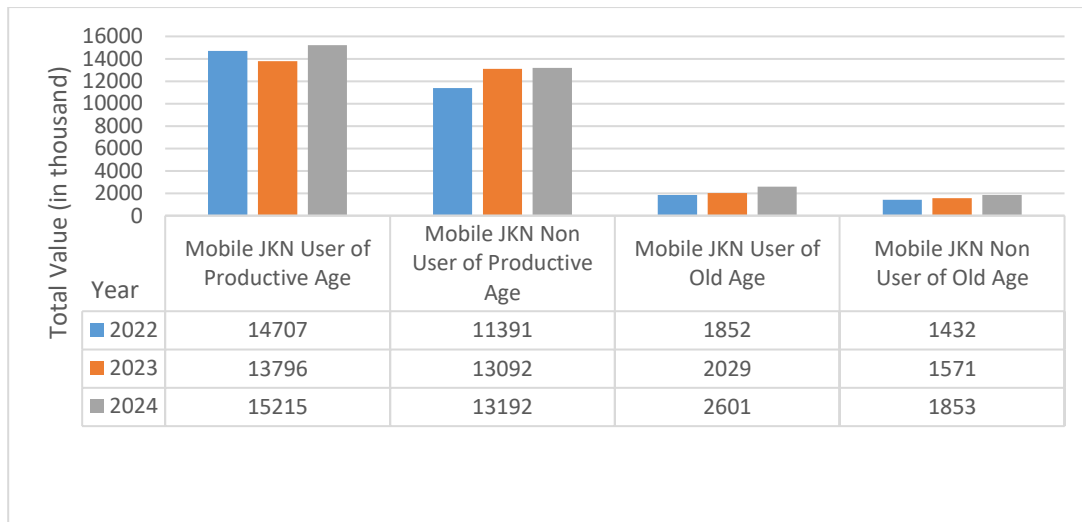


Figure 1: Population of Mobile JKN User and Non-User comparison between productive age and elderly at Keputih Community Health Center (2022-2024)

This is also in accordance with research conducted in elderly patients with chronic heart failure to use mobile health for health management in Shanghai and analyze influencing factors. Eighty-four patients (46.4%) expressed their willingness to use mobile health .

The Ability of the Elderly in Digital Skills Aspects

The low use of the Mobile JKN application as a means of providing and monitoring health services for health service recipients in the elderly group is due to varying levels of digital literacy. Following our research on the digital literacy of the elderly group in the Keputih Community Health Center work area, the following results were obtained.

Digital skill aspects, Kominfo (2022) has established eight elements. These aspects are connecting devices, downloading application files, uploading files, being able to search for and access information data and content in digital media, the habit of finding out the truth of information, being able to interact through various digital technology communication devices, being used to shopping through market places

The first element is the ability to connect to the internet, namely how someone can activate the internet on their device. All informants had the ability to connect their devices to the internet, only informant ZND had less understanding. The reason ZND lacked understanding was that his child had to top up the internet package, so he simply used it. He also didn't know how to turn the internet on and off on his device.

The second and third elements in this aspect are the ability to download and upload files/applications. In this element, only informants SKJ and MYN were able to download and upload applications. Meanwhile, other informants could not do so because their children helped them download and upload the application, so they just continued using it and if there was a problem while using the application, they also asked for help from their children or other people to fix it.

The fourth element of digital skills is the ability to search for and access data and information in digital media. In this element, only SKJ and MYN informants update or update the applications on their devices (in this case including the Mobile JKN application) in the

application. So only SKJ and MYN informants know what features are available or deleted in the Mobile JKN application. The reason informants do not update or update is because they do not know how to update, and they will only update after the application suddenly cannot be used and they ask for help from their children or other people who know how to update it.

The fifth and sixth elements of digital skills are most closely related to hoaxes: the habit of investigating whether information found on the internet is credible and comparing various sources of information to determine whether it is true. All informants understand what a hoax is, but they do not know how to find out whether the information is a hoax or not. On the topic of health information, they often find frightening information about the diseases they suffer from. This causes anxiety in them. However, they then find out by consulting health workers at health institutions.

The seventh indicator of digital skills is the ability to interact through various digital communication devices. All informants have mastered this skill. In this element, they rarely use this facility because they feel more comfortable if they can meet face to face with health workers rather than through the telemedicine facility available on the JKN mobile application.

The eighth element is getting used to shopping through marketplaces. In this JKN mobile application, this activity involves taking a queue number at the health facility you wish to go to. In this element, only informants SKJ and MYN took the online queue number on the Mobile JKN application independently, while other informants asked for help from their children or other people.

The Ability of the Elderly in Digital Safety Aspects

There are seven elements for digital safety. These elements are able to control who sees the timeline, know how to report social network abuse, able to disable the option to show geographical position, understanding of personal data, able to distinguish messages containing viruses/spam/malware, accustomed to creating secure passwords, always backing up data in several places

The first and second elements relate to the ability to control who can view a user's timeline on social media and how to report abuse on social networks. These two skills are lacking among almost all informants. In this element, only informant SKJ did it, while other informants occasionally or often asked for help from their children or other people to do it.

The third element of this aspect is the ability to disable the option to display geographic location. Four informants admitted to not understanding this feature. Only SKJ and MYN were able to adjust the location settings on their devices.

The fourth element is an understanding of personal data. According to the Ministry of Communication and Information (2020), personal data is divided into two categories: general personal data, such as full name, gender, nationality, religion, and/or personal data combined to identify an individual. Second, specific personal data, including health data and information, biometric data, genetic data, sexual orientation, political views, criminal records, children's data, personal financial data, and/or other data in accordance with statutory provisions. In this element, all informants understand that health data is private.

The fifth element is the ability to identify messages containing viruses, spam, or malware. All informants admitted to being unfamiliar with viruses, spam, or malware. They tend not to

look closely at what they receive in their inboxes. If they can open them, they will. However, if they can't open the message, they ask their children or someone else to fix it.

The sixth element of the habit of creating secure passwords. A secure password is a combination of numbers, letters, and punctuation. Most informants admitted they didn't really care about passwords. However, they often forgot the passwords they created. They also almost never change their passwords on any accounts. Most of them say they don't want the hassle of changing their passwords regularly.

The seventh element in this aspect is the ability to back up data. This capability is unique to SKJ and MYN. They routinely transfer data and delete unnecessary data from their devices. Other informants, however, asked their children or others for help with this task because their devices couldn't access the applications they needed, in this case the Mobile JKN app, due to their internal memory being full.

Categorization of the Capabilities of the Elderly in the Aspects of Digital Skills and Digital Safety

To assess the digital literacy skills of seniors in each element, researchers categorized them into three levels. They classified each element using the levels proposed by Gilster (1997): low, medium, and high. Low is defined as a person who has no technical understanding or ability in the element being assessed. Informants in this category still require assistance to perform various online activities. Medium is defined as a person who has knowledge of digital literacy aspects and can perform them independently. However, those in this category are unable to utilize the various features available on digital media to their full potential, but are limited to what they want and what they usually do. High is defined as a person who has in-depth knowledge of digital literacy aspects. In this category, a person can not only perform all digital literacy indicators independently but also has developed a habit of doing so. In this category, a person can already utilize all digital media features.

Then, after categorizing each element of digital literacy, the researchers again assigned digital literacy skills to three levels based on the majority of informants' responses. If a higher percentage of informants had low skills in one element, the researchers concluded that the overall skills of informants in that category were low. The opposite was also true. A high level was defined when the majority of informants had high skills in the element being assessed. A medium level was defined when the majority of informants had average skills in the element being assessed, and a high level was defined when the majority of informants had high skills in that element.

Categorization results of digital skill aspects. As follows : Connecting devices, (Medium); Downloading application files(Low); uploading files (Low); Being able to search for and access information data and content in digital media(Low);The habit of finding out the truth of information (High); the habit of comparing sources of information (High);Being able to interact through various digital technology communication devices(Medium); Being used to shopping through market places(Low).

Categorization results of digital safety aspects. As follows: Able to control who sees the timeline (Low); Know how to report social network abuse (Low); Able to disable the option to show geographical position, (Low); Understanding of personal data (High); Able to distinguish

messages containing viruses/spam/malware (Low); Accustomed to creating secure passwords (Low); Always backing up data in several places (Low).

Factors influencing low digital literacy in the elderly

Many factors contribute to the low digital media skills of older adults. The first is interest. In terms of digital skills, a person will be motivated to explore things that align with their interests and needs. Psychological factors is related to feelings of anxiety and a lack of confidence among older adults when surfing the digital world. They tend to be reluctant to engage in activities outside their personal interests, such as shopping online, reporting abuse on social networks, displaying their geographic location, and other activities that are not commonplace for them. Lack of digital education. The lack of digital education they receive often leads to them not engaging in digital activities effectively. Education and employment factors. Education and employment are also factors whose influence is most clearly visible. The informants with the lowest education were SFY and ZND. They were the informants with the lowest digital literacy skills compared to other informants. Those who work tend to have broader social circles and more diverse sources of information, which ultimately hones their ability to recognize information and protect themselves from various attacks.

Meanwhile, gender and age differences between the old and elderly had no impact whatsoever on their digital literacy skills. This is consistent with research conducted by Hakim & Sukendro (2021), which compared information literacy among Generation X and baby boomers, or seniors.

The results of this study showed no significant differences in information literacy between the two generations.

Compliance with control and treatment of hypertension patients of productive age and the elderly

Based on data Electronic Health Records of Keputih Health Center (2022-2024) mixed with Non-Communicable Disease Information System Application of Keputih Health Center obtained from 2022 to 2024 at the Keputih Health Center above it was found that the population of controlled productive-age hypertension patients was very low, while the population of elderly patients with controlled hypertension was higher.

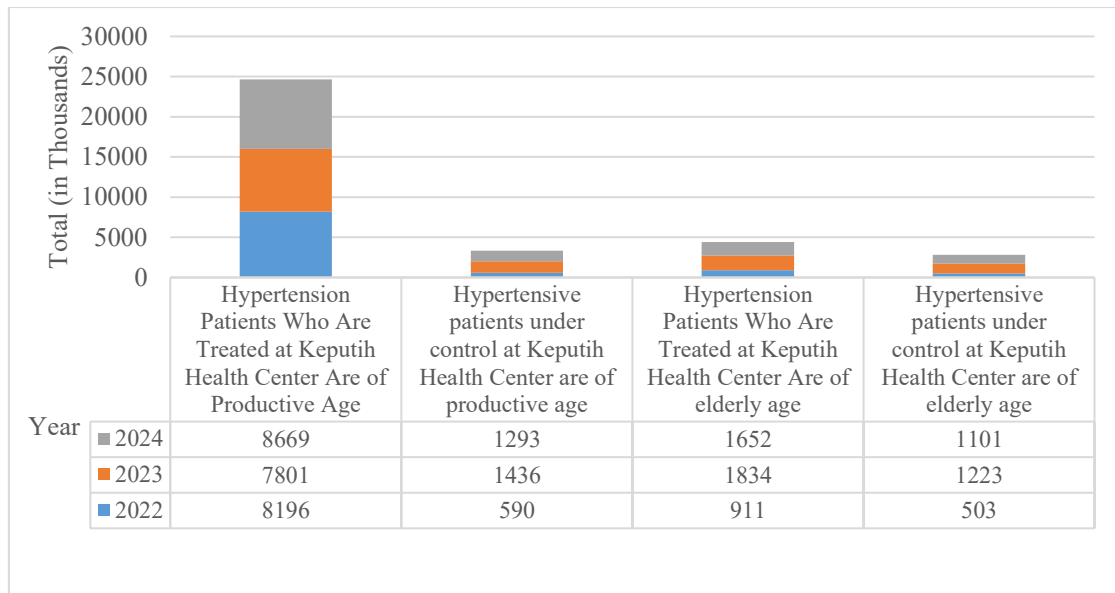


Figure 2: Population of hypertension patients who are treated and controlled comparison between productive age and elderly at Keputih Community Health Center (2022-2024)

Compliance of elderly patients with hypertension is influenced by several factors, including family support, availability of supporting facilities such as transportation, funds and health applications to monitor health history regularly. The level of compliance in the treatment of elderly people with hypertension with a sample selection that will be representative of the general population. In addition, research is needed that will record other possible factors that influence the level of compliance in the treatment of elderly people with hypertension. Such factors may be the level of social support of the elderly from their family/friends, the level of health literacy and the severity of depressive symptoms. Additionally, an important area of future research is to conduct an experimental study to identify those interventions that can change the behavior of the elderly with hypertension and increase their adherence to treatment.

CONCLUSION

The use of digital applications in the city of Surabaya, especially the Keputih Health Center, is very beneficial for health workers and the community as recipients of services. Patients with chronic diseases are also greatly helped by the existence of this digital application through the Mobile JKN (National Health Insurance) application and the Satu Sehat application, the launch of which has just started in 2025 related to the Free health check program initiated by the Indonesian Government for all Indonesian citizens. For elderly patients, there are still obstacles, namely in understanding the use of digital applications via mobile phones so that they require assistance from others. From the data at the Keputih Health Center, a phenomenon was found where the elderly with chronic diseases (in this case, for example hypertension) were more enthusiastic about checking themselves regularly and could achieve a stable condition than the productive age group. Meanwhile, patients with chronic diseases in this productive age have a better understanding of the use of digital technology applications than the elderly. Further research is needed to be done on this phenomenon.

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