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iJIM International Journal of Interactive Mobile Technologies

iJIM | eISSN: 1865-7923 | Vol. 18 No. 23 (2024) | OPEN ACCESS

https://doi.org/10.3991/ijim.v18i23.51311

PAPER

Evaluating the Effectiveness of Remote Mobile Health Services for the Elderly: Standards and Best Practices

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ABSTRACT

The innovative application of emerging mobile and wearable health information and sensing technologies (mHealth) holds great promise for lowering healthcare costs and enhancing well-being in various ways. Numerous fields are seeing the development of these applications. Still, to fully understand the opportunities and difficulties associated with using mobile technologies to enhance health outcomes, more thorough research is required. There is currently little data supporting the effectiveness of mHealth. Even though these technologies seem harmless and enticing, more research is required to determine the best times, locations, and users for mHealth methods, applications, and devices. As a result, a remote medical hub waitperson is essential to sustainably providing high-quality telemedicine services. This paper offers a thorough analysis of the delivery of medical services through telemedicine applications, with a focus on medical center servers. It also draws attention to the problems and obstacles that still need to be resolved to deliver health services via telehealth in the medical center. These ideas are used in this work to define a high standard for the developing field of mHealth research, explore potential future directions, and describe existing assessment standards.

KEYWORDS

mobile health (mHealth), remote medical center, health record, effectiveness, connected health (CH)

1 INTRODUCTION

Physical or mental disorders including high blood pressure, diabetes, heart disease, obesity, stroke, etc., are examples of chronic diseases. Over two-thirds of all deaths globally are caused by these illnesses, which make up the majority of health concerns for humans [1]. The prevalence of chronic illness has grown in tandem with population expansion, and hospitals can no longer hold the number of patients they need. In addition, specific home care is needed for chronic illnesses in order to meet patients' demands and carry out treatment plans. Additionally, the majority of families and caregivers lack the necessary time or expertise, which puts the patients'

Wang, B., Yang, P., Zhang, L., Zhang, Y., Li, X. (2024). Evaluating the Effectiveness of Remote Mobile Health Services for the Elderly: Standards and Best Practices. *International Journal of Interactive Mobile Technologies (iJIM)*, 18(23), pp. 125–137. https://doi.org/10.3991/ijim.v18i23.51311

Article submitted 2024-07-23. Revision uploaded 2024-09-06. Final acceptance 2024-09-10.

standard of living at constant risk. There is a growing demand for the development of e-health systems, such as electronic medical records, mobile health (mHealth), telemedicine, e-visits, e-consultations, and remote patient monitoring. These systems are employed in therapy, diagnosis, prediction, and ongoing monitoring. As a result, they lower healthcare expenses and let patients go about their regular lives with constant monitoring of their vital signs.

The novel coronavirus disease (COVID-19) was caused by a cluster of a genus of the Coronaviridae family, which was formally reported from Wuhan, Hubei Province, China, on December 31, 2019. Primary evidence showed that the elderly and people with underlying medical conditions (such as diabetes, cancer, high blood pressure, and heart illnesses) are more vulnerable to the illness in its most severe form. This infection quickly spread to other parts of the globe [2]. It is stressed that seniors should be protected by social distancing or, if required, social exclusion, as they have a significantly higher risk of fatality during the COVID-19 pandemic than younger individuals. Many issues, including depression, intellectual disability, heart disease, and an increased risk of death for older persons, can be brought on by loneliness and social isolation. The COVID-19 epidemic that is now raging has brought attention to the necessity of portable technology to reduce the chance of cross-contamination via intimate contact. For older persons who are restricted, smart technology—such as mobile-based technology—has proven crucial for self-care, guidance, and discovering life's purpose.

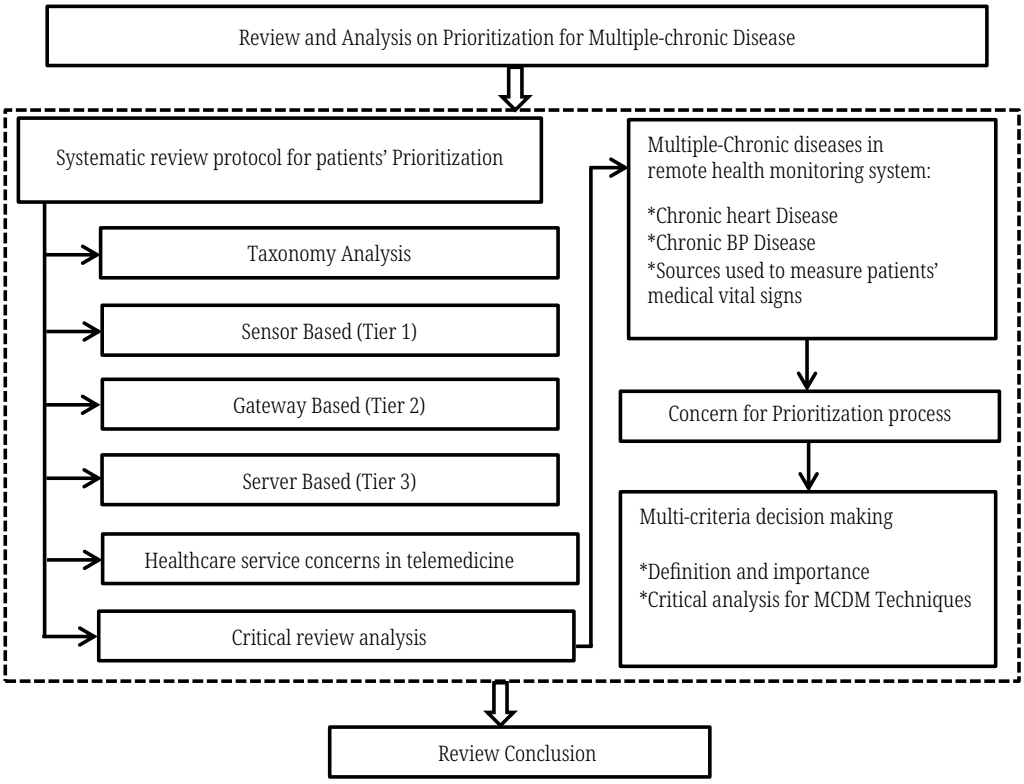

Fig. 1. Evaluation and structure analysis

To emphasize and examine the process of patient prioritizing with MCDs in telehealth uses, a thorough and in-depth analysis of the literature is necessary. Additional research is necessary to address unresolved problems with telemedicine applications and difficulties in patient prioritizing (see Figure 1).

Because it provides a number of advantages, including patient health information and distant medical services [3], telemedicine is being employed in the healthcare industry more and more. A remote medical profession known as telehealth allows various healthcare professionals to collaborate and allow them to do so when diagnosing or treating a patient. Patients in remote areas and remote communities may benefit from remote medical services if they receive expert care from doctors or other experts who make the trip to see them.

This is the format for the remainder of the paper. This work's purpose, scope, systematic review, and meta-analysis methodology are presented in Section 2. In Section 3, illustration, along with the related health applications, are the definition and remote medical center given. The use of mHealth in performance assessment metrics applied to mobile technologies to improve health outcomes is examined in detail in Section 4. Section 5 presents the conclusion as well as upcoming improvements.

2 RELATED WORKS

In a similar vein, we extracted from the exploratory research, the literature, and conversations with other researchers all potential acronyms, alternate spellings, and word combinations that are typically connected to the definition of "mobile devices health" in an attempt to be as thorough as possible [4]. As of right now, the major players in the mHealth space—mobile operators, device manufacturers, healthcare providers, content creators, foundations, and governments—have introduced several mHealth apps and services globally. The GSMA tracker currently records over 300 commercial installations globally. Particularly, advances in novel mHealth technologies and solutions tailored to the elderly are rapidly expanding. To date, these have focused on a variety of applications, including medication adherence, monitoring vital signs, activity tracking and alert structures, health and recovery, distant advice, and caregiver remedies.

Heart rate is determined by the frequency of heart beats per minute. This physiologic variable is frequently used to measure heart activity in the human body under various physical situations, such as during periods of physical exercise or inactivity. Due to its dual application in measuring physical activity resulting from exercise and in monitoring people with health-risk situations, this variable is becoming more and more popular. When it comes to keeping an eye on people in the medical field who have cardiovascular disease, HR is a very helpful metric [5]. Analyzing the interval between two consecutive R wave peaks found is the standard method for reading HR. Additional methods of interpreting data that take into account the application of HR as a measure include impedance cardiography, phonocardiography (PCG), and ballisto cardiography.

One of the greatest topics in medical informatics and healthcare these days is health telematics. In order to increase the productivity, safety, and quality of healthcare services, hospitals and health systems currently rely on computer technology, or ICT. With related technologies such as the Internet, e-health links public health, business, and medical informatics. But because hospitals and health systems did not prioritize information and communication technology in the 1990s, it got off to a slow start. That said [6], it was imperative that a standard be created for hospital information technology. It has published multiple structures and associated standards for the interchange, integration, communication, and retrieval of electronic medical records.

The field of mobile integrated health (MIH) is a quickly developing approach to patient-centered, mobile resource-based out-of-hospital healthcare provision. Services such as offering phone guidance to 9-1-1 callers in place of resource delivery, group paramedic's care, managing chronic illnesses, preventive medicine, or follow-up visits after departure, or transportation or referral to a wide range of suitable care, not just hospital emergency departments, are just a few examples of what it might include [7]. Delivering high-quality and reasonably priced out-of-hospital treatment is MIH's mission in an effort to cut down on pointless ED visits and unforeseen hospital stays.

However, older people have a relatively low adoption and acceptance rate for mobile apps. This could be caused by a number of risks associated with using mobile apps and barriers to adoption, such as doubts about the usefulness and quality of mobile technologies, information provided being inaccurate, fear of misdiagnosis, worries regarding privacy and insecurity related to transmitting information, costs associated with using the apps, the app developers' qualifications [8], a lack of supporting data, and poor usability. Additionally, there are times when older persons exhibit a lack of perceived self-efficacy in using mobile apps, which has a detrimental effect on uptake.

Heart rehabilitation (CR), which is proven to save long-term healthcare expenses and subsequent events, has notoriously low uptake and graduation rates. Cellphones can help with these problems by extending care amenities to remote locations where traditional services are unable to reach and by enabling the remote delivery of properly supervised rehabilitation programmers. Similar to this, mHealth can assist in the long-term treatment of chronic disease by providing safer and more individualized care [9]. Real-time smart monitoring can open up new avenues for actively managing risk factors and suitable early detection. By enabling patients to view electronic medical records on their handheld devices, mobile devices can also assist patients with self-care and medication management.

The visual components of telemedicine protocols are often synchronous and episodic, and they are not intended for continuous recovery after surgery monitoring. Usually, the purpose of these protocols is to substitute an in-person office visit with digital photos or videoconferencing. Although these can reduce travel time and expenses, they are insufficient to identify an early wound problem due to the previously mentioned fact that surgery site infections (SSI) frequently manifest before numerous follow-up appointments are planned [10]. Although patients can submit photographs through other procedures meant for wound monitoring, including the mobile post-operative wound evaluator (mPOWER), there is no assurance that a practitioner will examine them unless asked to do so.

3 METHODS AND MATERIALS

3.1 Research plan and conceptual structure

The theoretical framework that serves as the foundation for this investigation is depicted in Figure 2 [11]. To identify the key components of connected health (CH), we first looked over definitions found in the available information. Second, in order to assess how patient-centric medical care may be provided through CH, three characteristics of timely, intelligent, and focused care were identified and put into practice. Third, in order to determine practical approaches for putting CH into practice, we engaged in case studies and interviewing. Even though CH seems

promising, there are still a lot of obstacles to be solved, including those related to infrastructure, expenses, technology, and commercial sustainability.

In order to find out how to accomplish these objectives, we thus looked at current and cutting-edge approaches for integrating CH and/or enhancing current healthcare systems and spoke with pertinent stakeholders in the CH ecosystem. In order to convey the consequences of addressing an integrated healthcare system that can meet patients' requirements and offer recommendations on how to do so, the results were finally analyzed.

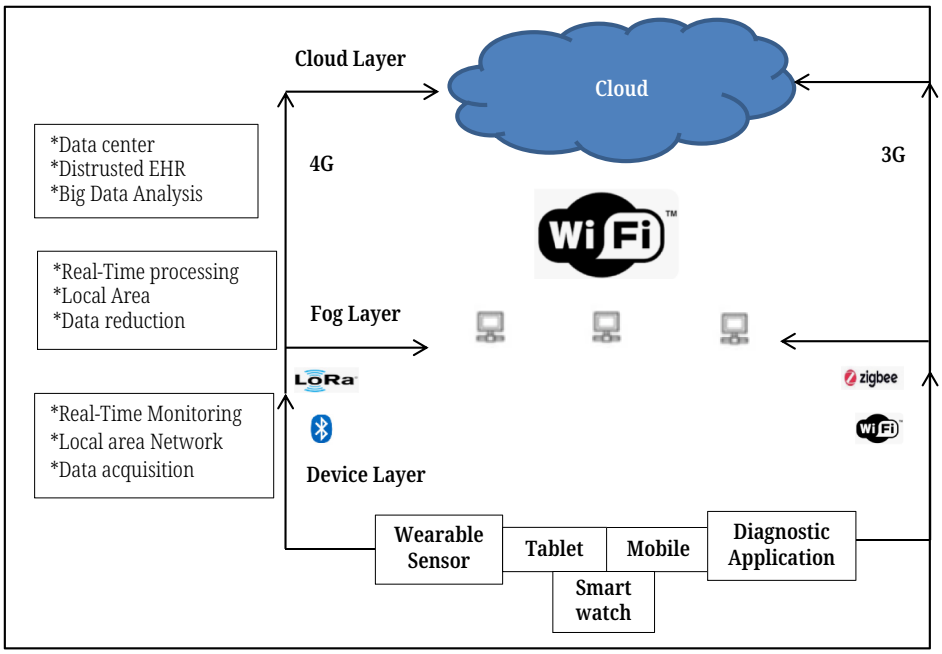

Fig. 2. The conceptual framework and research methodology

Connected health: definition. Connected health is a general term that refers to the entire family of telemedicine. A growing body of knowledge about CH and CH activities has led to a variety of definitions of what precisely CH is [12]. The American Medical Association, for example, describes CH as a paradigm that makes use of technology to optimize healthcare resources and provide patients with more flexible and expanded chances to interact with physicians and better manage their own treatment. Numerous technologies, such as telehealth and mobile healthcare, are employed to provide distant, mobile, and on-site medical care in order to accomplish these goals. We divided definitions of CH into three categories—remote, smart, and precise—based on their key characteristics in order to narrow the focus of our research. The definition of CH given by this study is a platform that provides patients with the ability to monitor and manage their own healthcare remotely, utilizing information and communication technologies (ICTs) to enable people to make informed decisions about their own care. Our three categories of CH descriptions are briefly explained here.

Remote medical services. A crucial aspect of CH is remote medical treatment. Empirical research suggests that the notion of remote healthcare and the real-world implementation of IT systems in the healthcare industry encompass elements of remote medical care, including patient monitoring, personally controlled health records, and telecare medicine information systems. Furthermore, these research highlights how "user authentication can ensure the legality of patients' care" in

CH apps. CH definitions with a focus on remote healthcare are frequently perceived as a new vocabulary for telemedicine, despite the fact that these definitions and their proponents may place more emphasis on the most effective ways to link patients and medical personnel.

Astute medical care. Researchers point out that while technology is important in CH, the disease is more about individuals and the healthcare system than it is about technology alone. Intelligent definitions of CH show that it is about managing patients and their care rather than just medical care and technology; they suggest that CH is a new paradigm for managing health and that it has the ability to improve care and decision-making by putting the right information in the right hands at the right time. Making these choices can "assure an improved standard of life after and during therapy, save lives, and save money." Better administration and coordination of healthcare systems and services—which are, in theory, represented by smart healthcare—can enable CH to allocate medical assets more effectively and efficiently, improving medical results.

The analysis of the literature indicates that people, procedures, and technology are typically combined to create CH. Consider the meaning that follows: "gadgets, offerings, or treatments are created around the needs of the patient in a theoretical framework for health management known as connected health." The above description of CH indicates that it is a patient-centered care model in which the patient is at the center of the processes that link stakeholders [13]. These activities occur in a range of venues, including the patient's home and an acute care facility. This description also says that the CH platform's technology can link patient care paths, business models, and data analytics. Consequently, in contrast to the more reactive paradigm of conventional healthcare, technology can facilitate the adoption of a more proactive, periodic healthcare paradigm. Technology can help healthcare providers, patients, and/or caregivers become more capable of providing more effective and efficient treatment.

Accurate medical care. In contrast to traditional healthcare, CH gathers data in a fast and seamless manner, giving practitioners greater knowledge to precisely meet patients' needs. Additionally, by "more intelligent using data, gadgets, communication tools, and individuals," "stakeholders in the process are connected using timely sharing and display of precise and relevant data regarding client status." As a result, patients can obtain care through CH that is as accurate and efficient as feasible.

Trend-based value arguments. As previously said, the patient-centric principles of CH can be categorized and described as exact, timely, and intelligent care. The pertinent literature examines the various ways that can be used to propose and capture these values. A value chain made up of suppliers, companies, and customers creates values. The ability of a strategy to improve an item or care practice determines how much value can be extracted from it. Value-based company tactics are subject to scrutiny based on collaborative gaming theory, firm behavior towards competitors, companies' readiness to pay, and potential expenses.

Value arguments in companies are essential to attracting enterprises' willingness to pay, despite the fact that value forms differ. Three creative approaches—combining and transcending, counteracting and reaffirming, and infusing and augmenting—have been recognized as potential means of reconstructing the economic model. We examine case studies from notable businesses in the research to bolster the notion that these tactics can affect service innovation success. Moreover, client appeal and motives should drive innovation; as such, employing these tactics could be a useful means of achieving this objective.

The majority of research focuses on two key success variables: affordability and operational effectiveness, notwithstanding the significance of value propositions and strategic thinking. Further research is needed to examine how these objectives can be met in practice, even though prompt, intelligent, and precise healthcare are necessary to develop a patient-centric healthcare paradigm. Studies show that more individualized healthcare services are being driven by factors other than technology. A CH platform may support the preservation of human dignity and self-worth through administration and other aspects involving qualitative elements. Although the benefits of CH have been shown in the treatment of chronic illnesses, researchers anticipate significant advancements in the use of CH in the avoidance of illness. The widespread use of cutting-edge technology allows CH to take a more proactive approach than traditional treatment. In order to provide more preemptive, accurate, and active medical care, a qualitative method is used.

Despite the above-mentioned benefits of CH, obstacles to its implementation still need to be found and removed in order to speed up the delivery of more effective and affordable healthcare models. According to research on how medical treatments like the use of CH may be both beneficial and preserve the respect of senior clients, active, proactive, and tailored medical services are likely to lessen many of the responsibilities of an aging society. In order to close this gap, the present study investigates how technology and wellbeing are related, as well as how each has been enhanced in specific situations. In order to address the research topic, it lists the prerequisites and necessary elements for creating a CH ecosystem and offers representative, illustrative case studies. Thus, the purpose of this investigation is to investigate and unearth previously undiscovered elements of how healthcare can be made smarter, faster, and more accurate while still being more complete.

3.2 RPM fog computing layers

The phrase “fog computing” was first used by Cisco in 2012. The phrase “fog computing” was invented by Cisco in 2012 [14]. Applications that would normally operate in the cloud can now run on the edges of networks thanks to fog computing. The definition of fog is “a lightweight cloud that provides many facilities at the user’s smart device’s proximity.” Although it offers computation at the fog node and the ability to interface directly with the cloud, fog is not a cloud complement but rather a potent additional tool.

The idea behind fog technology is to move certain sensitive app processing to the edge, or close to the end device, while remaining work can be done on the cloud. Fog computing solves a wide range of issues, including latency, dependability, and location awareness. In this field, cloud computing in PM systems is a novel idea. It has numerous benefits over the cloud, which can be summed up as follows:

- Fog computing reduces overall costs by processing and analyzing data locally rather than transmitting it to the cloud, which uses fewer resources.
- Local data processing will reduce transfer latency, helping to prevent issues, particularly for time-sensitive applications (e.g., continuous tracking of a self-driving car, etc.).
- Better privacy for consumers because patient data may be evaluated locally rather than being transferred to the internet.

- By installing fog servers in PMs, the amount of bandwidth needed for transfer is reduced, giving clinicians access to real-time data without requiring a web connection.
- Fog computing will benefit nations with lower doctor-to-patient ratios in addition to helping consumers check their fundamental health more easily.
- Additional benefits of using fog nodes include reduced power usage while continuously transferring data to cloud services.
- Instead of having two layers for devices and clouds in systems using cloud computing, fog IoT systems have three major layers: devices, fog, and clouds.

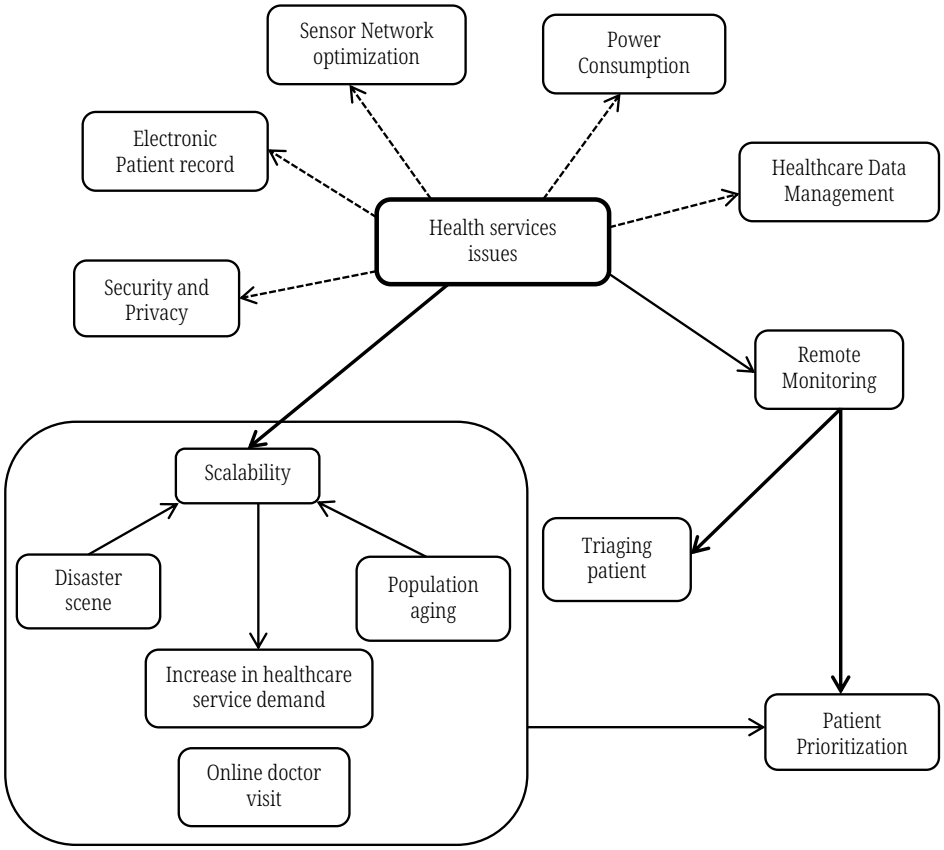

Fig. 3. RPM cloud computing layers

The role of fog computing has been examined in a number of different polls. The fundamental fog computing model for PMs is depicted in Figure 3 [15].

4 IMPLEMENTATION AND EXPERIMENTAL RESULTS

4.1 Confidentiality

The exit survey contained three items that were in line with the DHC private field: (1) Do you think it is worthwhile to give up some security of your health data for a cause that is significant to you (in this example, the advancement of cognitive aging science)? (2) I would like access to the findings if an app for fitness uses my exercise data for analysis. (3) In my opinion, no fitness app

should divulge my personal information to outside parties without my permission (see Figure 4).

Informed consent procedures are typically used in biomedical and behavioral research to illustrate the ethical concept of "respect for persons." Respect can also be shown in the way that an investigator or research organization discloses study results and individual data. In this regard, the exit survey asked a number of questions about circumstances in which sharing personal information might require or benefit from permits or permission.

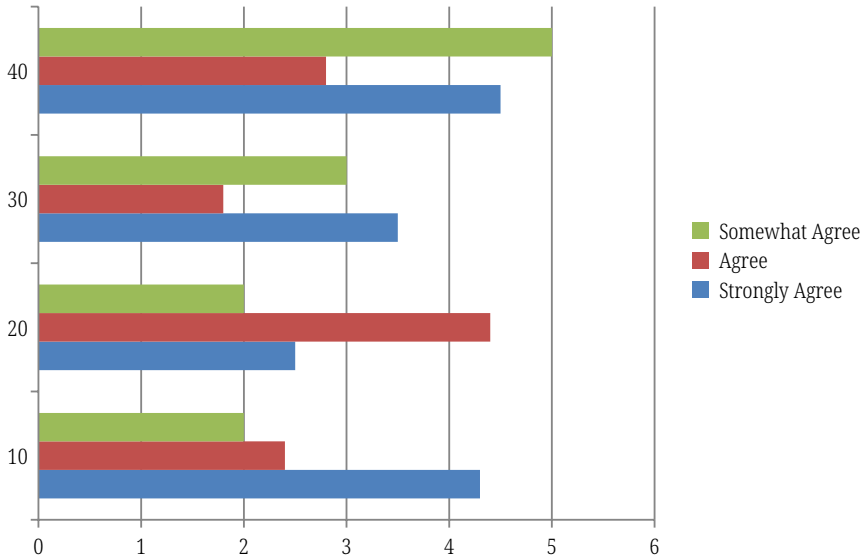

Fig. 4. Items from the exit survey that matched the privacy category

When asked if they felt it "is worthwhile giving up some privacy" of private health information for causes they considered significant, 66.3 (n = 29) said it was "absolutely worth it," compared to just 4.9% (n = 3) who said it was "not at all worthwhile it" and 36.6 (n = 16) who said it was "partially worth it." Participants were obviously interested in seeing the findings when asked whether they would prefer to have access to them if their fitness data were used for investigation, with 85% (n = 49) saying that they would prefer access. Similarly, 92.7% of the respondents agreed, at least in part, that no health app should divulge user information to unaffiliated organizations.

4.2 Information administration

The next five items from the exit survey matched the data management domain: It seems reasonable to give the app creators my name and email address when I use an online or mobile app. (2) My app data should be "de-identified" by app developers (Fitbit, for instance, should utilize my data without my name or other personal information associated with it if it uses my exercise data internally). (3) Fitness apps must obtain my permission before using my workout data for internal uses (e.g., app development, internal searching). (4) A fitness app must first get my permission before using my workout data for marketing. (5) I must give permission for an app for fitness to use my workout data for research projects in collaboration with a school (see Figure 5).

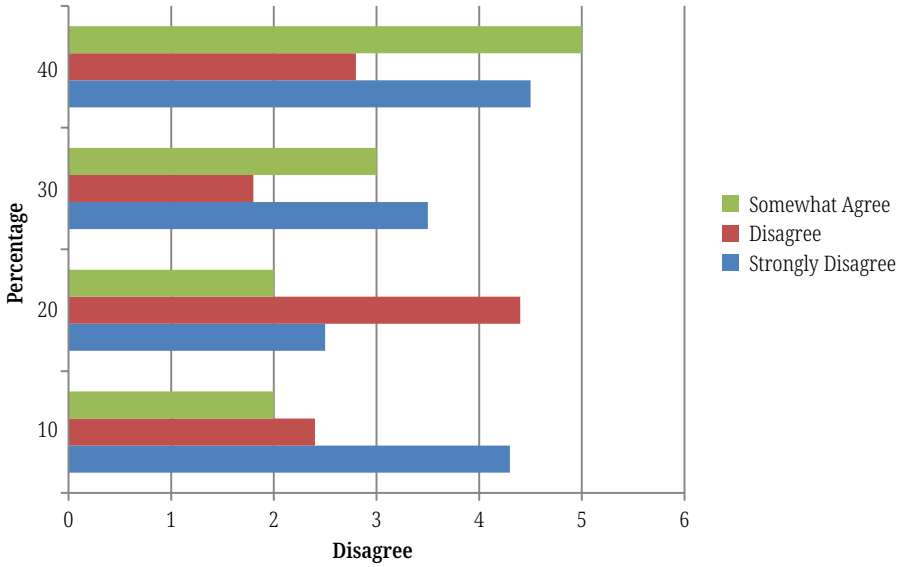

Fig. 5. Items from the departure assessment related to the data management area

When asked if it makes sense to give the app developers access to your name and email, only 3.4% of respondents agreed or strongly agreed (n = 4) [16], while 4.9% of respondents indicated some agreement. The majority of respondents, however, disagreed (n = 25; 27.1% of respondents indicated disagreement, and 32% of respondents indicated strong disagreement). Following this, a minority expressed ambivalence, with 24.6% (n = 8) saying they were neither in favor of nor against app developers disclosing their contact details. On the other hand, 70.4% (n = 43) of respondents said they preferred to be questioned first if the app developers intended to utilize potentially identifiable exercise data for internal objectives (such as to enhance their product), with 46.3% of those respondents selecting to "strongly concur" with that stance. When the decision was made to share particular fitness information with an educational organization in order to use it to advance health research, nearly half of the respondents, or 56.4% (n = 29), strongly agreed, with only 7.2% (n = 4) disagreeing and a comparable percentage (n = 4) reacting with "not agree or disapprove."

Respondents made it clear that they would want to give consent in advance if the app developer intended to utilize their private information for marketing; 80.7% strongly agreed with that position, while only 8.7% (n = 5) disagreed.

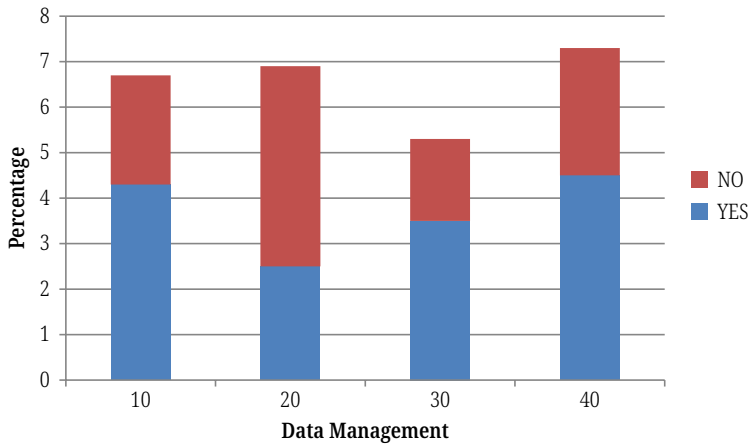

Fig. 6. Items from the leaving survey related to the data management area

Regarding the notion that the app developer may utilize "de-identified" private fitness data for internal purposes, a resounding majority of 82.7% (n = 48) said the data used for internal purposes ought not to be connected to personal data (see Figure 6) [17].

5 CONCLUSION

The promise of digital health treatments in supporting older individuals' healthy aging is highlighted in this comprehensive study. The results show how these interventions—which include mHealth apps, wearable technology, telehealth platforms, and personalized medicine made possible by big data analytics and artificial intelligence—can improve older people's access, monitoring, and self-care.

According to the survey, there has been a rise in the deployment of digital health tools, especially since the COVID-19 epidemic. Still, in order to guarantee fair access to and use of these treatments, a number of divides and obstacles, including mistrust and technological difficulties, must be overcome. Remote rehabilitation and web-based programmers have demonstrated encouraging results in encouraging balance and good habits in senior citizens. Although most users are in favor of digital health solutions, they do stress the significance of ethical and patient-centered design. When implementing these advances, it is imperative to take older individuals' unique needs and capacities into account in order to optimize their efficacy.

One limitation was that the departure assessment was only collected after the conclusion of the research, as opposed to prior to device selection. In order to guide future research, we conducted this study to find out how participants felt about the device's usability and their opinions about taking part in the intervention. To increase device adoption, future research should collect older adults' opinions before they select a device or ask them to participate in the selection process. This study's homogeneous design and limited sample size present additional limitations.

6 REFERENCES

[1] N. El-Rashidy, S. El-Sappagh, S. R. M. Islam, H. El-Bakry, and S. Abdelrazek, "Mobile health in remote patient monitoring for chronic diseases: Principles, trends, and challenges," *Diagnostics*, vol. 11, no. 4, p. 607, 2021. https://doi.org/10.3390/diagnostics11040607

[2] S. Abbaspur-Behbahani, E. Monaghesh, A. Hajizadeh, and S. Fehresti, "Application of mobile health to support the elderly during the COVID-19 outbreak: A systematic review," *Health Policy and Technology*, vol. 11, no. 1, p. 100595, 2022. https://doi.org/10.1016/j.hlpt.2022.100595

[3] J. H. Shin *et al.*, "Quality and accessibility of home assessment mhealth apps for community living: Systematic review," *JMIR mHealth and uHealth*, vol. 12, p. e52996, 2024. https://doi.org/10.2196/52996

[4] G. Chiarini, P. Ray, S. Akter, C. Masella, and A. Ganz, "mHealth technologies for chronic diseases and elders: A systematic review," *IEEE Journal on Selected Areas in Communications*, vol. 31, no. 9, pp. 6–18, 2013. https://doi.org/10.1109/JSAC.2013.SUP.0513001

[5] J. O. Olmedo-Aguirre, J. Reyes-Campos, G. Alor-Hernandez, I. Machorro-Cano, L. Rodriguez-Mazahua, and J. L. Sanchez-Cervantes, "Remote healthcare for elderly people using wearables: A review," *Biosensors*, vol. 12, no. 2, p. 73, 2022. https://doi.org/10.3390/bios12020073

[6] B. M. Silva, J. J. Rodrigues, I. de la Torre Díez, M. López-Coronado, and K. Saleem, "Mobile-health: A review of current state in 2015," *Journal of Biomedical Informatics*, vol. 56, pp. 265–272, 2015. https://doi.org/10.1016/j.jbi.2015.06.003

[7] N. Louras *et al.*, "Mobile integrated health interventions for older adults: A systematic review," *Innovation in Aging*, vol. 7, no. 3, 2023. https://doi.org/10.1093/geroni/igad017

[8] A. A. Portenhauser *et al.*, "Mobile apps for older adults: Systematic search and evaluation within online stores," *JMIR Aging*, vol. 4, no. 1, p. e23313, 2021. https://doi.org/10.2196/23313

[9] E. Honeyman, H. Ding, M. Varnfield, and M. Karunanithi, "Mobile health applications in cardiac care," *Interventional Cardiology*, vol. 6, no. 2, pp. 227–240, 2014. https://doi.org/10.2217/ica.14.4

[10] R. Gunter *et al.*, "Evaluating patient usability of an image-based mobile health platform for postoperative wound monitoring," *JMIR mHealth and uHealth*, vol. 4, no. 3, p. e113, 2016. https://doi.org/10.2196/mhealth.6023

[11] C. Nebeker and Z. Z. Zlatar, "Learning from older adults to promote independent physical activity using mobile health (mHealth)," *Frontiers in Public Health*, vol. 9, p. 703910, 2021. https://doi.org/10.3389/fpubh.2021.703910

[12] K. I. Mohammed *et al.*, "Real-time remote-health monitoring systems: A review on patient's prioritisation for multiple-chronic diseases, taxonomy analysis, concerns and solution procedure," *Journal of Medical Systems*, vol. 43, 2019. https://doi.org/10.1007/s10916-019-1362-x

[13] N. El-Rashidy, S. El-Sappagh, S. R. M. Islam, H. El-Bakry, and S. Abdelrazek, "Mobile health in remote patient monitoring for chronic diseases: Principles, trends, and challenges," *Diagnostics*, vol. 11, no. 4, p. 607, 2021. https://doi.org/10.3390/diagnostics11040607

[14] M. M. Alruwaili, M. Shaban, and O. M. Elsayed Ramadan, "Digital health interventions for promoting healthy aging: A systematic review of adoption patterns, efficacy, and user experience," *Sustainability*, vol. 15, no. 23, p. 16503, 2023. https://doi.org/10.3390/su152316503

[15] S. Macis *et al.*, "Design and usability assessment of a multi-device SOA-based telecare framework for the elderly," *IEEE Journal of Biomedical and Health Informatics*, vol. 24, no. 1, pp. 268–279, 2019. https://doi.org/10.1109/JBHI.2019.2894552

[16] L. O'Connor *et al.*, "Factors impacting the implementation of mobile integrated health programs for the acute care of older adults," *Prehospital Emergency Care*, vol. 28, no. 8, pp. 1037–1045, 2024. https://doi.org/10.1080/10903127.2024.2333034

[17] M. Ali Saare, A. B. Hussain, O. M. Jasim, and A. A. Mahdi, "Usability evaluation of mobile tracking applications: A systematic review," *International Journal of Interactive Mobile Technologies (iJIM)*, vol. 14, no. 5, pp. 119–128, 2020. https://doi.org/10.3991/ijim.v14i05.13353

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