



Management of Health Services Through Telemonitoring in The Elderly

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ABSTRACT

The increasing number of elderly people around the world will increase chronic diseases and multimorbidity. A consistent health care system at home that can help the elderly in dealing with their illness is needed. Effective health management can slow disease progression and minimize complications. Telemonitoring is part of a telehealth system that uses a patient management approach by combining various information technologies to monitor patients remotely via smart phones, which can be considered as a solution, because it has been proven to reduce treatment costs, shorten length of stay, reduce hospital readmission rates, and improve the quality of life of elderly patients.

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ABSTRAK

Peningkatan jumlah penduduk lanjut usia di seluruh dunia akan meningkatkan penyakit kronik dan multimorbiditas. Sistem pelayanan kesehatan secara konsisten terhadap diri sendiri di rumah yang dapat membantu lansia dalam menangani penyakitnya sangat dibutuhkan. Manajemen kesehatan yang efektif dapat memperlambat perkembangan penyakit dan meminimalkan komplikasi. Telemonitoring merupakan bagian dari sistem telehealth yang menggunakan pendekatan manajemen pasien dengan menggabungkan berbagai teknologi informasi untuk memantau pasien dari jarak jauh melalui ponsel pintar dapat dipertimbangkan sebagai salah satu solusi, karena terbukti dapat menurunkan biaya perawatan, memperpendek lama rawat inap, menurunkan angka readmisi RS, dan meningkatkan kualitas hidup pasien lansia.

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INTRODUCTION

Demographic trends of a region have a major influence on future diseases. Increasing the number of elderly people worldwide will also increase chronic disease and multimorbidity. This will have a significant impact on the health system because an increase in chronic disease will change the priority of providing curative health services to promotive and palliative ones such as control of clinical symptoms, increased mobility, autonomy, and improved

quality of daily life. Monitoring will be key in the concept of therapy. (Van Doorn-Van Atten, Haveman-Nies, Van Bakel, et al., 2018)

A growing issue in the elderly population is the increasing incidence of chronic and degenerative diseases. This makes more attention and focuses on financing in handling, especially in medical matters. The main ones of great importance are some infectious diseases, fractures, metabolic diseases like type 2, diabetes and degenerative diseases like cancer. Some of the diseases that arise in the

elderly are initially only treated with short-term therapy methods, namely by giving drugs. However, chronic diseases suffered by the elderly often require more comprehensive therapy; so the pattern of management should be modified from short-term therapy to long-term therapy management.(Linn et al., 2021)

Chronic disease management will be more effective if it is carried out through periodic management in the hospital with a combination of self-monitoring of health at home. The need for a consistent health care system for oneself at home that can help the elderly in dealing with chronic diseases they suffer from using telemonitoring via smartphones can be considered as one solution. The concept of health services with a telemonitoring component can shorten the distance between needs and health service providers so that it is more flexible and makes it easier for the elderly to obtain adequate health services. Telemonitoring is part of the Telehealth system.(Kristiana, 2022) Telemonitoring is a patient management approach that combines various information technologies to monitor patients remotely.(Laksono et al., 2018) This monitoring system is felt to be very helpful for patients to record and report symptoms and complaints that are felt so that they can be evaluated more quickly by health workers and take appropriate action even though it is constrained by distance.(Kim et al., 2014)

The study noted several benefits of telemonitoring in patients with chronic disease conditions, it was found that telemonitoring reduced treatment costs, shortened hospital stays, reduced hospital readmission rates, and improved patient quality of life.(Arsiyah, 2019) The development of health technology can help in improving the quality of life, and improving the health status and nutritional status of the elderly. The current health service that should be developed is a paradigm shift that was initially only based on therapy in hospitals, shifting towards a disease prevention strategy through cellular phone-based medical information or known as cellular phone-based medical informatics (CPBMI) which combines Information Technology (IT) and conventional health services.(Van Doorn-Van Atten, Haveman-Nies, Pilichowski, et al., 2018)

The use of mobile phones as nutrition telemonitoring is expected to make it easier for patients to control their health thoroughly and be more comfortable to use than manual monitoring.(Arifin et al., 2020) However, not all the elderly can use cell phones properly due to limited knowledge or physical such as reduced vision and hearing, so they find it difficult to use telemonitoring. For this reason, we reviewed several journals related to health management related to the use of information technology using telemonitoring via mobile phones. We also describe some of the difficulties associated with using telemonitoring in the elderly and possible ways of dealing with these difficulties.

METHOD

We searched for health articles on ScienceDirect, Microsoft Academic, DOAJ, ResearchGate, Google Scholar, and Academia.edu about medicine and health with the inclusion criteria in this article are (1) the article is an original research paper (original research), (2) the article contains variables or reviews that are relevant to the research objectives, (3) the article is published for 7 years. last year (2016 to 2022), and (4) articles are available in full text. The keywords we used to search for the article: "Telemonitoring, Health Service". We found 164 scientific articles, after which we focused on searching in more detail by adding the keyword "Elderly", and identified 13 articles targeting subjects 50 years of age: 6 of which were less relevant (e.g. focusing on communication between medical doctors, and only analyze the IT system) so that the remaining 8 articles were included in this study (Table 1). Most of these articles have limitations, namely, they involve a small sample and do not explore more deeply efficiency, and the research location is mostly carried out in developed countries, namely Europe. Therefore, future research is needed for larger, longer-term trials with populations in multiple countries. The screening article process will be show in figure 1.

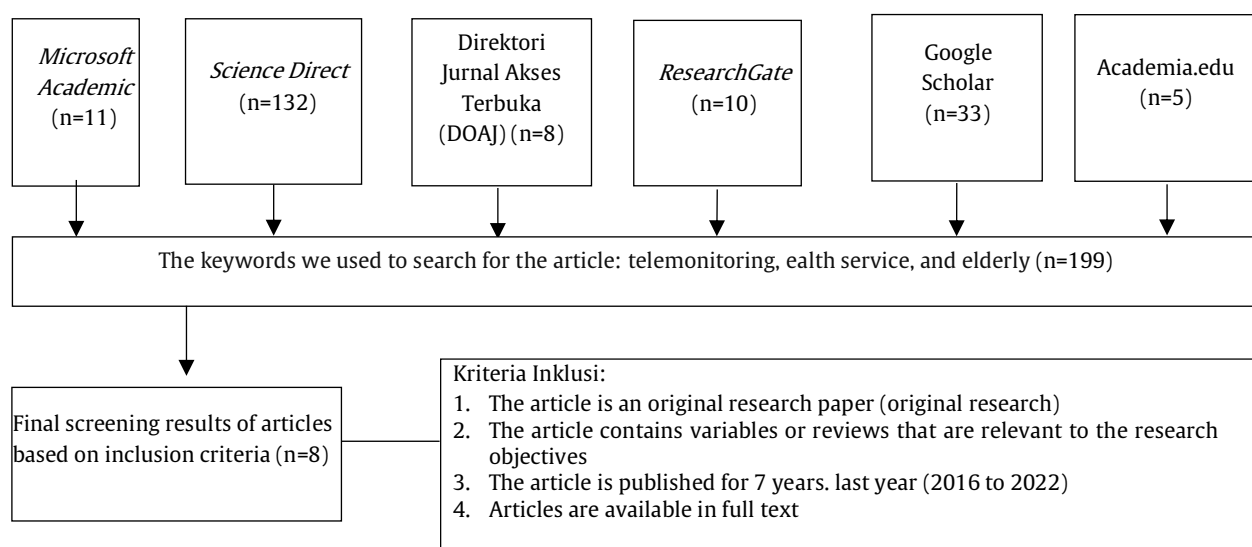


Figure 1. The article screening process(Firmansyah et al., 2021)

RESULTS

Integrating mobile phones into a health management system will involve the use of various sensors that allow health status to be checked regularly and comprehensively. Users can send self-defined health measurement data to a medical team (doctors, nurses, and nutritionists) who analyze the data and send back therapeutic recommendations to the user. The ability to check the health status and receive results via mobile phone enables health monitoring regardless of distance and time. Feedback obtained from the medical team is an important part of this telemonitoring system. Medical feedback involves providing various hospital care/management services to users via mobile. The current implementation requires the direct involvement of every health care professional and the provision of manual feedback, making the system impractical on a large scale. Therefore, an analysis is needed to determine whether it is economically feasible for the medical team to invest time and energy, and to assess

whether the patient feels that it is useful to use the telemonitoring technology.

The short-term and long-term effects of telemonitoring programs have been demonstrated, not only in increasing user satisfaction but also in ensuring effective chronic disease management. In addition, using mobile phones for telemonitoring helps make informed decisions in daily life regarding diet and exercise will improve lifestyle, and enable health management by increasing users' ability to manage their health status. Telemonitoring can help increase users' self-awareness of their role as active health managers. This medical service is also easier and cheaper for patients because they can simply use their mobile phones at home. A service that sends real-time recommendations from doctors to patients is reported to provide satisfactory results.

The following describes the results of the selection of research articles that will be reviewed in a literature study classified by author, participant description, research description, research design, location, type of intervention, and research results:

Table 1. Research Article Extract Results

Author	Participant Description	Research Description	Research design, place, country	Type of intervention	Result
Rosaria De Luca, et al (2021)(de Luca & Torrisi M, 2021)	N= 60 Age 77.4 ± 9.1 years with inclusion criteria >65 years, not in clinical research, and having one of the chronic diseases such as diabetes, hypertension, heart and lung disease, depression, and cognitive decline.	A sample of 60 elderly people with chronic diseases was divided into 2 groups. 30 samples were the telemedicine intervention group, 30 samples were the control group.	Randomized control trial, follow-up after 6 months. Southern Italy.	Monitoring, measurement.	Telemedicine was more effective in improving mood (p<0.001), behavior (p<0.01), daily activities (p<0.01), and nutritional status in the intervention group compared to the control group.
Maria, et al (2020)(de Cola & Maresca G, 2020)	N=150 Age >65 years old, living alone.	Provide telemonitoring in the form of tele-assistant to monitor vital signs on a weekly basis and consultation for neurological signs (30 minutes) once a month	Exploration descriptive. Sicily, Italy	Monitoring, measurement	Telemedicine is useful for improving the health and quality of life of the elderly, especially in severe comorbid conditions and living in places far from health care centers.
Menghi, et al (2019)(Menghi et al., 2019)	N= 1346 Age >75 years old	Provide input on the needs and design of telemonitoring application platforms that can improve the quality of life of the elderly.	Qualitative. Marc, Italy.	Surveys, Focus groups, brainstorming sessions	Provide input on the combined design of a telemonitoring application platform that summarizes the potential of technology, volunteers, communities and specific users.
Frederico, et al (2022)(Vozzi et al., 2020)	N=32 25 samples of the intervention group, 7 samples of the control group. Age 65-80 years.	Evaluating factors influencing dietary habits by using telemonitoring DOREMI remote coaching and increasing physical activity.	Quantitative. United Kingdom and Italy.	Monitoring, measurement.	There was a significant decrease in systole (p=0.001), diastole (p=0.025), mean blood pressure (p=0.001). Telemonitoring is an innovation that can stimulate a healthy diet and behavior change Health and

Author	Participant Description	Research Description	Research design, place, country	Type of intervention	Result
					support clinical management of patients.
Van Doorn, et al (2018)(Van Doorn-Van Atten, Havema n-Nies, Van Bakel, et al., 2018)	N= 214 97 samples of the intervention group, 107 samples of the control group. Age ± 80 years.	This study evaluated the effect of telemonitoring intervention on nutrition education and follow-up from nurses for 6 months on nutritional status, diet quality, appetite, functional capacity, and quality of life of the elderly.	Quantitative. Dutch.	Monitoring, measurement.	The intervention showed an increase in the nutritional status of the elderly with malnutrition and improved the quality of diet and the level of physical activity in the elderly.
Scherren berg, et al (2021) (Scherre nberg et al., 2021)	N= 79 Taken from 5 centers of cardiac rehabilitation program in 6 countries. Divided into intervention group and control group.	This study compared the cost-effective intervention with telemonitoring cardiac rehabilitation for 6 months in both study groups.	Quantitative. EU-CaRE RCT at Isla Heart Center (Netherlands), Bispebjerg university Hospital (Denmark), Assistance publique-Hopitaux (France), Bern University Hospital (Switzerland), Servizio Galego de Saude (Spain), Radboud University Medical Center (Netherlands)	Monitoring, measurement.	There was no significant difference in the use of health care costs from the two study groups.
Koulaou zidis, et al (2016)(K oulaouzi dis et al., 2016)	N=224	This study provides a telemonitoring intervention to detect risk factors in heart failure patients.	Quantitative. Kingston-upon-Hull, United Kingdom.	Monitoring, measurement.	With telemonitoring given to patients and certain algorithms it is known that heart failure can be predicted through body weight and systolic blood pressure.
Van Doorn, et al (2018)(Van Doorn-Van Atten, Havema n-Nies, Pilichow ski, et al., 2018)	N=215 Age >65 years.. Quantitative.	This study shows the effect of telemonitoring intervention on diet intake for 6 months by assessing pretest and post-test in terms of nutritional status, diet quality, appetite, body weight, physical activity, physical function, and quality of life of the elderly	Dutch. Monitoring,	Measurement.	Telemonitoring is proven to be effective in improving the nutritional status of the elderly.

DISCUSSION

Telemonitoring

Telemonitoring is part of the telehealth system. The study noted several benefits of telemonitoring in patients with chronic disease conditions, it was found that telemonitoring reduced treatment costs, shortened hospital stays, reduced hospital readmission rates, and improved patient quality of life. The telemonitoring application also

has the potential to increase the productivity, professionalism, and competence of doctors and nurses managing patients because it shortens the time to do documentation because it is already available in the application. Doctors can also shorten the consultation time without reducing the accuracy of the diagnosis and therapy program because it is supported by monitoring data in the application.(Wahjusaputri & Saputra, 2018)

This system has a role in helping patients who have undergone treatment so that they stay connected with

doctors anywhere. The main target patients in making this system are patients with chronic diseases as well as improving outpatient care with hospital service standards. The development of information technology in the field of medicine has increased, the latest various devices can be used to transmit clinical needs between doctors and patients with the help of signals, so that later they are sent to the hospital as medical records. This can be used as a feedback effort and chronic disease monitoring, so that patients can manage their own health status.(Sarasati et al., 2019)

Submission of Medical Information

Recent developments, information technology is also used in commercial health service management programs. The program mostly includes medical consultation facilities, such as the patient submits his complaint, then the doctor responds.(Faridah, 2018) This shows that patients easily get good health services through their cellphones. In addition, patients can get health education, as an effort to improve or improve the patient's lifestyle for the better.(Kusmana et al., 2018)

Hospital Visit Scheduling

The decline in cognitive capacity due to aging can make self-management difficult for the elderly. The alarm function can be used to notify patients about scheduled hospital visits (blood tests, medical consultations, diet counseling, etc.) or to remind patients at certain times to take medication and provide good diet management independently of the elderly. This is very helpful because most of the elderly will have memory loss or poor short-term memory. Many elderly patients skip their medication simply because they forget to take it.(de Luca & Torrisi M, 2021)

Studies evaluating the use of cell phones to improve adherence have yielded mixed results, with some finding that cell phone counseling improves medication adherence and dietary adherence. Future research should be carried out with ti identify appropriate methods to convey information that can improve medication adherence.(Olivares-Gandy HJ, Domínguez-Isidro S, López-Domínguez E, Hernández-Velázquez Y, Tapia-McClung H, 2019)

Improving Compliance with Medication and Dietary Compliance

Many patients stop taking medication simply because they forget. This is reported to be the main reason for low drug adherence in the US, affecting 46% of patients. Various studies have shown that medication adherence can be improved by using mobile phones.(Ali et al., 2017) An application introduced with various functions, such as notifying when to take medication and preventing overdose so that the prescribed drug can be taken in the required dose at the right time, allowing patients and doctors to monitor the status of taking medication through a telemonitoring application via mobile phones.

The high number of complications that accompanies an elderly in the course of therapy requires a comprehensive service management system including a nutrition monitoring system to be a very important part for patients. This nutrition monitoring system is a patient self-management system because it is not only carried out while the patient is doing therapy in the hospital but continuously monitored while the patient is at home.(Buysse et al., 2013)

Self-management is the ability to manage illness symptoms, treatment response, physical, psychosocial, cultural, and spiritual consequences, and inherent lifestyle changes necessary to live with a chronic illness long-term. Self-monitoring is defined as awareness and recording of information that varies with daily routine.(Zulfitri, 2017) Individual's ability to self-monitor daily diet and fluid intake is often hampered by several factors including incomplete information on target amounts of food, and insufficient information on diet programs. Interventions are needed to overcome these barriers to self-management. Mobile technology can be a useful tool to help self-management of chronic diseases in the elderly.(Buysse et al., 2013)

Telemonitoring as a form of improving the quality of health services

Customer satisfaction is an important measure in assessing service quality because it describes the success of service providers in meeting client expectations. Telemonitoring technology as part of telemedicine technology is emerging as a technology with great potential to ensure the welfare of beneficiaries, facilitate monitoring of chronic disease patients and reduce the need for hospitalization.(Supriyana & Prasetyawati, 2020) When an institution that provides health services begins to use this technology, the institution will get a collection of information about its customer patients quickly, even before the patient initiates contacting the institution, the institution can to recognize the patient's condition wherever the patient is.(Olivares-Gandy HJ, Domínguez-Isidro S, López-Domínguez E, Hernández-Velázquez Y, Tapia-McClung H, 2019)

This technology also has the goal of changing the perception of patients to be closer to health care providers, patients will feel safer and protected by a continuous hospital service system. The result of this favorable perception by the patient was a significant improvement in patient communication and loyalty.(Fitriahadi & Khusnul, 2019) The role of the government in regulating regulations is also very much needed in the development of this technology in the future. Consideration of the high investment value must be taken into account, but the benefits that a patient telemonitoring system brings to operators, institutions, communities, and even governments, guarantee a return on what is invested. More than that, it ensures a smart and useful health ecosystem for all continuums of the global health care system.(Snoswell et al., 2022)

Difficulties faced by the elderly in using IT

The physical ability of the elderly always decreases over time, so it will be difficult for the elderly to be able to come for treatment at the hospital. Chronic diseases in the elderly that often occur such as type 2 diabetes mellitus, hypertension, chronic obstructive pulmonary disease, and others, cause short-term treatment to be less effective, so multifaceted integrative approaches/management are needed. The elderly group in particular has limited access to the system, so it is necessary to design a system interface that is friendly to all age groups (Marsela et al., 2022). Not all applications are also supported on all types of mobile phones, so applications made must be accessible to all types of mobile phones. This condition will cause patient dissatisfaction with the application and type of cellphone.(Prinz et al., 2008)

Physical and Cognitive Changes in the Elderly Due to Aging

The physical and mental degradation experienced by older people leads to memory loss and attention deficits, and phones that require precise interfaces using various sensations such as sight, hearing, and touch are more difficult for older people to use. Such a system may also be ineffective in patients who are not accustomed to using mobile phones.(Purdiyani, 2016) To solve this problem, applications running on mobile phones need to focus on convenience, use large icons and fonts and distinguishable colors, and have simple structures and intuitive visual representations for elderly mobile users. For example, if a cognitively impaired user cannot see blue clearly due to retinal aging, the program should not use blue or use it with high saturation. Minimizing the complexity and number of letters, combined with voice guidance, is also expected to help.(Koch S, 2009)

Difficulty Using Cell Phones And Decreased Learning Ability

Elderly users often find it difficult to learn new tasks and understand the information provided to them, and many of them are unfamiliar with cell phone-related terminology.(Indarjo et al., 2019) This means they may find it difficult to learn how to use a phone, especially newer phones and more technically complex apps. Therefore, the system should initially use simple words, taking into account the user's learning ability and step-by-step service implemented for elderly users.(Kraft M & N, 2012)

CONCLUSIONS AND SUGGESTIONS

The increasing elderly population due to increased life expectancy has increased health care costs. Disease prevention and related lifestyle changes are important goals to reduce these medical costs. In particular, medical expenses continue to rise due to the increasing prevalence of chronic diseases such as hypertension and diabetes. The aging population is a major problem that affects not only the elderly themselves but society as a whole. Telemonitoring through applications on mobile phones is a health management service that can reduce the magnitude of these problems. Elderly people can receive high-quality medical services both at home and away from home due to distance and time monitoring of health that is possible through mobile phones. In particular, the elderly in areas with remote health care centers can be continuously monitored for their health consistently and provided with adequate medical services to promote a healthy life. The mobile-based lifestyle management system can be developed for various chronic diseases, such as heart disorders, hypertension, respiratory diseases, obesity, hyperlipidemia, digestive tract diseases, cancer, etc. Effective Health Management can slow the progression of this disease at an early stage and thus minimize complications.

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Conflict of Interest Statement

The authors declared that no potential conflicts of interest with respect to the authorship and publication of this article.

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