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Artificial Intelligence Approaches: Challenges an Opportunities in Elderly Healthcare

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ABSTRACT

Advances in technology and information currently affect health services, especially elderly health services because this group requires intensive care provider assistance. Artificial Intelligence (AI) is one of the alternatives that can help elderly health services. This literature review aims to describe the artificial intelligence for the elderly and its benefits for the elderly's healthcare. The method used is a literature review by analyzing several relevant articles to answer the purpose of the study. The online databases used are Science Direct, ProQuest, and Pubmed from 2020 to 2024. The keywords used to sort articles in this study are: (1) artificial intelligence, (2) elderly, and (3) healthcare. There were nine selected articles that were analyzed. There are three main themes found in this literature review, (1) types of AI in elderly care, (2) benefits of applying AI to elderly care, and (3) challenges in applying it to elderly care. These results can serve as reference materials for consideration of the application of AI in providing health services for the elderly.

Keywords: Artificial Intelligence, Elderly, Healthcare

Introduction

The development of technology, especially Artificial Intelligence (AI), is growing rapidly and affecting various sectors of life. One of the areas that is now increasingly open to opportunities for its utilization is in supporting the welfare of the elderly (WHO, 2022). As the elderly population increases around the world, including in Indonesia, the need for innovative solutions that can improve their quality of life and independence becomes more pressing.

The elderly often face various challenges, including physical decline, limited mobility, social isolation, and cognitive decline. In this regard, AI has great potential to provide solutions that can ease their burden and improve their daily quality of life. The prevalence of AI utilization in the elderly varies globally. In developed countries such as Japan, the US, and Europe, the adoption of this technology is becoming more widespread due to better digital infrastructure, availability of AI devices, and programmes that support the elderly (Qian et al., 2021).

Some of the uses of AI for the elderly include voice-based personal assistant systems such as smart speakers, health applications that monitor body vitals, companion robots that can help with daily tasks, and applications that help detect and warn of emergencies such as falls or disease attacks quickly. In addition, AI can also be used in the context of telemedicine, which allows the elderly to gain access to healthcare services without having to leave home. It can assist in reminding the elderly to take their medication, giving diet and lifestyle recommendations, and monitoring their mental health through behavioural pattern analysis (Elizabeta et al., 2020). With this technology, the elderly can live more independently, but still under good supervision. However, while the utilization of AI provides many benefits, there are challenges that need to be considered, such as data security, privacy, and technology adaptation by the elderly who may not be familiar with advanced technology. Therefore, it is important to design AI solutions that are intuitive, safe, and easy to use by the elderly. With these developments, the hope is that AI can contribute significantly to improving the quality of life of the elderly, reducing the burden of care, and encouraging society to care more about their well-being (Chu et al., 2022).

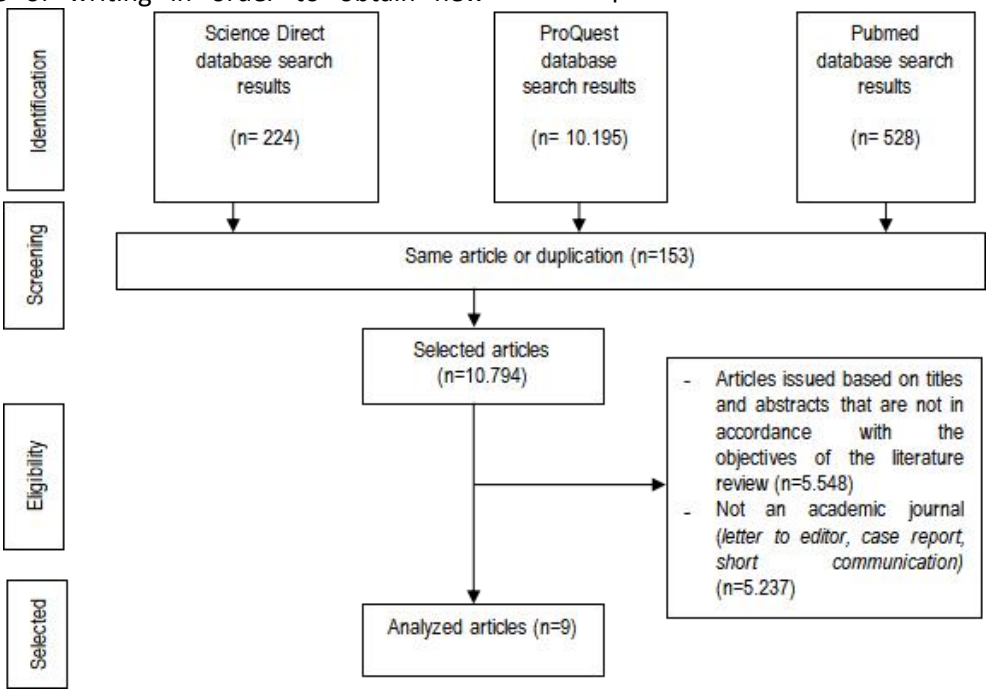
The utilization of AI for the elderly has not yet been done in Indonesia. Access to the internet and technological devices is still limited in many parts of Indonesia, especially in remote areas. To effectively implement AI, adequate technological infrastructure such as a stable and fast internet network is needed, which unfortunately is not yet evenly distributed throughout Indonesia. The development and implementation of AI technology requires substantial investment. Many institutions and elderly care service providers in Indonesia do not have sufficient budget to adopt this advanced technology. In addition, the price of AI-based devices, such as companion robots and health sensors, is still too expensive for most Indonesians (Lukitawati & Novianto, 2023). In addition, current government policies focus more on basic infrastructure development, public health, and education. While there are efforts to support digital transformation in various sectors, specific attention to the utilization of AI for elderly care has not been a top priority.

Technology can be a consideration to the gaps that occur and the urgency of the needs of the elderly with every disease that they suffer today. Further empirical studies are related to the right type of technology to answer this challenge. This literature review aims to describe the artificial intelligence for

the elderly and its benefits for the elderly's healthcare.

Research Method

The method used in this study is a literature review. This study is analyzed by selecting some literature that is relevant to the purpose of writing in order to obtain new conclusions. Online databases used are ProQuest, Pubmed and Science Direct starting from 2020 until 2024. The keywords used to sort articles in this study are: 1) Artificial Intelligent, 2) Elderly, 3) Healthcare. Terdapat 10 artikel yang dipilih setelah cut off the duplication articles.



Results and Discussions

The following are the results of the analysis of the 9 articles selected in this literature review. There are three themes obtained, namely the types of AI in elderly care, the benefits of applying AI to elderly care, and the challenges in applying it to elderly care.

Table 1. Results obtained

No	Author/ Year	Title Research	Journal	Results
1.	Papadopoulos et al., (2022)	The CARESSES Randomised Controlled Trial: Exploring the Health-Related Impact of Culturally Competent Artificial Intelligence Embedded Into Socially Assistive	International Journal of Social Robotics	This study evaluated the use of culturally competent AI embedded in socially assistive robots (Pepper robots) to support the mental well-being of older adults in care homes in the UK and Japan. Results suggested that AI-assisted robots helped improve emotional well-being but had minimal effects on loneliness.

		Robots and Tested in Older Adult Care Homes		
2	Han et al., (2021)	Randomized Controlled Trials Evaluating AI in Clinical Practice: A Scoping Evaluation	medRxiv	This RCT evaluated the impact of an AI-based medication management system. The AI helped elderly patients adhere to complex medication schedules, improving medication compliance and reducing adverse
3.	Damiani et al., (2023)	Potentiality of algorithms and artificial intelligence adoption to improve medication management in primary care: a systematic review	BMJ Open	A trial tested an AI-driven system designed to predict the onset of health deterioration in elderly patients. The system used machine learning algorithms to analyze vital signs and behavioral patterns, showing significant improvements in early detection
4.	Padhan et al., (2023)	Artificial Intelligence (AI) and Robotics in Elderly Healthcare: Enabling Independence and Quality of Life	Cureus	The applications of AI and robotics can promote independence, monitoring health, helping, and enhancing social interaction of elderly.
5.	Salah et al. (2022)	Accelerometer-based elderly fall detection system using edge artificial intelligence architecture	International Journal of Electrical and Computer Engineering	This research found the efficacy of detecting falls in a resource- constrained microcontroller at the edge of the network using a wearable accelerometer.
6.	Sheehy et al. (2024)	Development and Initial Testing of an Artificial Intelligence-Based Virtual Reality Companion for People Living with Dementia in Long-Term Care	Journal of Clinical Medicine	Virtual reality and artificial intelligence can be used to create a virtual companion that can be acceptable and enjoyable to some people living with dementia in long term care.
7.	Wang and Hsu (2023)	Integrating Artificial Intelligence and Wearable IoT System in Long-Term Care Environments	Sensors	The Integrated Intelligent Long-Term Care Service Management System focuses on improving a personalized care service system for the elderly, encompassing health, nutrition, diet, and health education aspects. The Wearable Internet of Things Care System primarily supports the development of portable

				physiological signal detection devices and electronic fences.
8.	Hacking et al. (2022)	Text mining in long-term care: Exploring the usefulness of artificial intelligence in a nursing home setting	PLoS ONE	This study demonstrates the usefulness of text mining to extend our knowledge regarding quality of care in a nursing home setting. Text mining can lead to valuable new insights for long-term care for older adults.
9.	Porkodi and Kesavaraja (2021)	Healthcare Robots Enabled with IoT and Artificial Intelligence for Elderly Patients	AI and IoT-Based Intelligent Automation in Robotics	This study explained that a robot in the future can prevent interventions, perform multiple functions, provide motivational interaction style, provide better educational data, and alert an ambulance in case of an emergency.

The themes found in this literature review are the types of AI in elderly care, the benefits of applying AI to elderly care, and the challenges in applying it to elderly care. The types of AI applied to the elderly are social robots, assistive robots, microcontrollers, Artificial Intelligence-Based Virtual Reality Companion, Text mining, and Robots Enabled with IoT (Hacking et al., 2022; Padhan et al., 2023; Papadopoulos et al., 2022; Porkodi & Kesavaraja, 2021; Salah et al., 2022). These types of AI help the elderly in long-term care and improve their quality of life. The results of this literature review are in line with several previous studies and reviews. Costa et al. (2018) mentioned that a robot named PHAROS (PHysical Assistant RObot System) helps the elderly in planning and performing regular physical exercises. In addition, another study created a robot named CHARMIE that is able to perform tasks, such as the task of picking up and placing items, moving items, following workers/patients/users, verbal communication (listening and speaking), visual analysis of the environment, navigation, object recognition and manipulation (Ribeiro et al., 2021). Virtual reality is also said to be able to help with elderly care. Heiyanthuduwa et al., (2020) mentioned that virtual reality called VirtualPT helps the elderly in demonstrating physical exercise at home. Virtual reality is also able to increase the knowledge, attitude, self-efficacy, and intention of the elderly in performing oral care for the elderly with disabilities (Chang et al., 2022). So, some of the above types of AI are relevant for long-term care of the elderly.

This literature review examines some of the benefits and uses of AI in elderly care. Some of the benefits obtained are assisting daily living activities, monitoring drug compliance, preventing the risk of falls, health education, and also being able to determine the quality of long term care services in the elderly group (Han et al., 2021; Sheehy et al., 2024; Wang & Hsu, 2023). The results of this review are in line with some previous results. Lee et al. (2022) mentioned that the benefits of AI for the elderly are play therapy, counseling service, conversation, and dementia prevention programs and prevent the overload of caregivers. In addition, Shiwani et al. (2023) also mentioned that AI can help the elderly in monitoring and early diagnosis of disease, stratified care and care coordination between healthcare providers. So, the benefits of AI in elderly healthcare can be as monitoring, management, and maintenance functions.

The perceived benefits of AI in healthcare also pose challenges in some countries. Racine et al. (2019) mentioned that the challenges faced in implementing AI in healthcare settings are dynamic information and consent, transparency and ownership, and privacy and discrimination. In addition, there are several challenges mentioned by Schwendicke et al. (2020) mentioned that challenges in the application of AI are limited data availability, accessibility, structure, and completeness, lack of methodological rigor and standards in its development, and practical questions around the value and usefulness of these solutions, as well as ethics and responsibility. Other research from Sun and Medaglia (2019) also mentioned that the challenges of implementing AI in elderly care are social challenges, economic challenges, ethical challenges, political, legal, and policy challenges, organizational and managerial challenges, data challenges, and technological challenges.

There is one nursing theory that is relevant to represent current conditions, namely Roy's adaptation model. This model explains that there are two types of coping mechanisms to deal with stressors, namely regulatory coping and effector coping. Regulator coping emphasises physiological needs while effector coping is a coping mechanism that involves cognitive and emotional (Alligood, 2014). Optimization of coping regulators and cognators is needed to adapt to the stressors caused by aging process.

Conclusion

This literature review resulted in three main themes, namely (1) types of AI in elderly care, (2) benefits of applying AI to elderly care, and (3) challenges in applying it to elderly care. These results can serve as reference materials for consideration of the application of AI in providing health services for the elderly.

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Conflic of Interest

There is no conflict of interest in this study.

Reference

Alligood, M. R. (2014). Nursing theorists and their work. In *Nursing Theorists and Their Work (8th edn)*. https://doi.org/10.5172/conu.2007.24.1.106a.

Chang, A. H., Lin, P. C., Lin, P. C., Lin, Y. C., Kabasawa, Y., Lin, C. Y., & Huang, H. L. (2022). Effectiveness of Virtual Reality-Based Training on Oral Healthcare for Disabled Elderly Persons: A Randomized Controlled Trial. *Journal of Personalized Medicine*, *12*(2). https://doi.org/10.3390/jpm12020218.

Chu, C. H., Nyrup, R., Leslie, K., Shi, J., Bianchi, A., Lyn, A., McNicholl, M., Khan, S., Rahimi, S., & Grenier, A. (2022). Digital Ageism: Challenges and Opportunities in Artificial Intelligence for Older Adults. *Gerontologist*, *62*(7), 947–955. https://doi.org/10.1093/geront/gnab167.

Costa, A., Martinez-Martin, E., Cazorla, M., & Julian, V. (2018). PHAROS—PHysical assistant RObot system. *Sensors (Switzerland)*, *18*(8), 1–19. https://doi.org/10.3390/s18082633.

Damiani, G., Altamura, G., Zedda, M., Nurchis,

M. C., Aulino, G., Heidar Alizadeh, A., Cazzato, F., Della Morte, G., Caputo, M., Grassi, S., & Oliva, A. (2023). Potentiality of algorithms and artificial intelligence adoption to improve medication management in primary care: a systematic review. *BMJ Open*, *13*(3), 1–9. https://doi.org/10.1136/bmjopen-2022-065301.

Elizabeta, B. M.-L., Tracy, H., & John, M. (2020). Artificial Intelligence in the healthcare of older people. *Archives of Psychiatry and Mental Health*, *4*(1), 007–013. https://doi.org/10.29328/journal.apmh.1001011.

Hacking, C., Verbeek, H., Hamers, J. P. H., Sion, K., & Aarts, S. (2022). Text mining in long-term care: Exploring the usefulness of artificial intelligence in a nursing home setting. *PLoS ONE*, *17*(8 August), 1–17. https://doi.org/10.1371/journal.pone.0268281.

Han, R., Acosta, J. N., Shakeri, Z., Ioannidis, J. P. A., Topol, E. J., & Rajpurkar, P. (2021). Randomized Controlled Trials Evaluating AI in Clinical Practice: A Scoping Evaluation. *MedRxiv*, *1*(165), 1–13.

Heiyanthuduwa, T. A., Nikini Umasha Amarapala, K. W., Vinura Budara Gunathilaka, K. D., Satheesh Ravindu, K., Wickramarathne, J., & Kasthurirathna, D. (2020). VirtualPT: Virtual reality based home care physiotherapy rehabilitation for elderly. *ICAC 2020 - 2nd International Conference on Advancements in Computing, Proceedings*, 311–316. https://doi.org/10.1109/ICAC51239.2020.9357281.

Lee, H., Chung, M. A., Kim, H., & Nam, E. W. (2022). The Effect of Cognitive Function Health Care Using Artificial Intelligence Robots for Older Adults: Systematic Review and Meta-analysis. *JMIR Aging*, *5*(2). https://doi.org/10.2196/38896.

Lukitawati, R., & Novianto, W. T. (2023). Regulasi Layanan Kesehatan Digital di Indonesia: Tantangan Etis dan Hukum. *Ajudikasi : Jurnal Ilmu Hukum*, *7*(2), 391–414. https://doi.org/10.30656/ajudikasi.v7i2.7862.

Padhan, S., Mohapatra, A., Ramasamy, S. K., & Agrawal, S. (2023). Artificial Intelligence (AI) and Robotics in Elderly Healthcare: Enabling Independence and Quality of Life. *Cureus*, *15*(8), 8–11. https://doi.org/10.7759/cureus.42905.

Papadopoulos, C., Castro, N., Nigath, A., Davidson, R., Faulkes, N., Menicatti, R., Khaliq, A. A., Recchiuto, C., Battistuzzi, L., Randhawa, G., Merton, L., Kanoria, S., Chong, N. Y., Kamide, H., Hewson, D., & Sgorbissa, A. (2022). The CARESSES Randomised Controlled Trial: Exploring the Health-Related Impact of Culturally Competent Artificial Intelligence Embedded Into Socially Assistive Robots and Tested in Older Adult Care Homes. *International Journal of Social Robotics*, *14*(1), 245–256. https://doi.org/10.1007/s12369-021-00781-x.

Porkodi, S., & Kesavaraja, D. (2021). Healthcare Robots Enabled with IoT and Artificial Intelligence for Elderly Patients. *AI and IoT-Based Intelligent Automation in Robotics*, 87–108. https://doi.org/10.1002/9781119711230.ch6.

Qian, K., Zhang, Z., Yamamoto, Y., & Schuller, B. W. (2021). Artificial Intelligence Internet of Things for the Elderly: From Assisted Living to Health-Care Monitoring. *IEEE*

Signal Processing Magazine, *38*(4), 78–88. https://doi.org/10.1109/MSP.2021.3057298.

Racine, E., Boehlen, W., & Sample, M. (2019). Healthcare uses of artificial intelligence: Challenges and opportunities for growth. *Healthcare Management Forum*, *32*(5), 272–275. https://doi.org/10.1177/0840470419843831.

Ribeiro, T., Gonçalves, F., Garcia, I. S., Lopes, G., & Ribeiro, A. F. (2021). CHARMIE: A collaborative healthcare and home service and assistant robot for elderly care. *Applied Sciences*, *11*(16). https://doi.org/10.3390/app11167248.

Salah, O. Z., Selvaperumal, S. K., & Abdulla, R. (2022). Accelerometer-based elderly fall detection system using edge artificial intelligence architecture. *International Journal of Electrical and Computer Engineering*, *12*(4), 4430–4438. https://doi.org/10.11591/ijece.v12i4.pp4430-4438.

Schwendicke, F., Samek, W., & Krois, J. (2020). Artificial Intelligence in Dentistry: Chances and Challenges. *Journal of Dental Research*, *99*(7), 769–774. https://doi.org/10.1177/0022034520915714.

Sheehy, L., Kakkar, A., Hakim, R. El, Lhoest, J., & Frank, A. (2024). Development and Initial Testing of an Artificial Intelligence-Based Virtual Reality Companion for People Living with Dementia in Long-Term Care. *Journal of Clinical Medicine*, *13*(2024), 1–15. https://doi.org/https://www.mdpi.com/2077-0383/13/18/5574.

Shiwani, T., Relton, S., Evans, R., Kale, A., Heaven, A., Clegg, A., & Todd, O. (2023). New Horizons in artificial intelligence in the healthcare of older people. *Age and Ageing*, *52*(12), 1–11. https://doi.org/10.1093/ageing/afad219.

Sun, T. Q., & Medaglia, R. (2019). Mapping the challenges of Artificial Intelligence in the public sector: Evidence from public healthcare. *Government Information Quarterly*, *36*(2), 368–383. https://doi.org/10.1016/j.giq.2018.09.008.

Wang, W. H., & Hsu, W. S. (2023). Integrating Artificial Intelligence and Wearable IoT System in Long-Term Care Environments. *Sensors*, *23*(13). https://doi.org/10.3390/s23135913.

WHO. (2022). *Ageing and health* (Issue October). htt