

The Effectiveness of Nursing Care-Based Digital Reminder Systems on Elderly Treatment Adherence in the Community

Hendri Tamara Yuda^{1*}, & Mery Lingga Anggraini²

¹*Universitas Muhammadiyah Gombong, Indonesia, ²Poltekkes Kemenkes Padang, Indonesia

*Co e-mail: hendritamara@gmail.com¹

Article Information

Received: July 24, 2026

Revised: September 08, 2026

Online: September 18, 2026

Keywords

Medication Adherence, Elderly, Digital Reminders, Nursing Care, Community

ABSTRACT

Non-adherence to treatment among older adults with chronic diseases such as hypertension and diabetes mellitus remains a major public health challenge due to cognitive decline, limited mobility, and inadequate medication reminders. This study aimed to evaluate the effectiveness of a nursing care-based digital reminder system in improving medication adherence among older adults. A quantitative quasi-experimental one-group pretest–posttest study was conducted at Dayeuhkolot Community Health Center, Bandung, involving 62 older adults with chronic diseases selected through purposive sampling. Medication adherence was assessed using the Morisky Medication Adherence Scale (MMAS-8) before and after a four-week intervention, with application use monitored using an observation sheet. Data were analyzed using descriptive statistics and the Wilcoxon Signed Rank Test. Most respondents were aged 60–74 years (75.8%) and female (67.7%). Before intervention, 61.3% had low adherence, 27.4% moderate, and 11.3% high adherence. After intervention, low adherence decreased to 12.9%, while moderate and high adherence increased to 32.3% and 54.8%, respectively. A significant improvement in medication adherence was observed ($p < 0.001$). The findings indicate that nursing care-based digital reminders effectively improve medication adherence. Integration into community nursing services and chronic disease management programs may support long-term treatment adherence and health outcomes.

Keywords: Medication Adherence, Elderly, Digital Reminders, Nursing Care, Community

INTRODUCTION

The world's elderly population continues to increase as a consequence of successful global health development that reduces mortality from infectious diseases and extends life expectancy. This increase in the number of elderly people is accompanied by a considerable gap between life expectancy and healthy life expectancy, so that many elderly people spend their old age with chronic diseases or functional limitations. These conditions require health care systems in various countries to adapt to the needs of an increasingly complex aging population. This phenomenon is of global concern because it is closely related to the increase in the burden of non-communicable diseases that require long-term treatment (World Health Organization, 2023).

Indonesia is also experiencing this demographic transition and has officially entered the aging population phase since 2021, when the proportion of the elderly population exceeds 10 percent of the total population. The latest Data shows that about 12 percent or 29 million of Indonesia's population are elderly, with a projected increase of up to 20 percent by 2045. This rapid increase in the number of elderly people is not balanced by the readiness of adequate health and social support systems at the community level. As a result, challenges related to independence, dependence and management of chronic diseases in the elderly are becoming increasingly urgent issues to address (Central Bureau of Statistics, 2024).

The increasing number of elderly people contributes directly to the increasing burden of non-communicable diseases in society. A survey conducted by the Indonesian medical gerontology Association showed that 24.6 percent of the elderly had a history of chronic disease, with hypertension as the most common disease at 37.8 percent, followed by diabetes mellitus at 22.9 percent. Both diseases are chronically progressive and require continuous pharmacological therapy throughout the patient's life. This high prevalence confirms that the management of chronic diseases in the elderly is no longer an individual problem, but a public health problem that requires systematic intervention (Indonesian medical gerontology Association, 2022).

The Indonesian Health Survey in 2023 also recorded an increase in the prevalence of non-communicable diseases among the elderly such as hypertension, diabetes, and stroke, which ultimately affects their level of independence in carrying out daily activities. The degree of dependence of the elderly on the help of others also increases with age, especially in the age group of 80 years and older. Non-communicable diseases that are not well controlled are the main cause of decreased body function and quality of life in old age. These Data reinforce the urgency of preventive and promotive efforts, including improving treatment adherence, as a strategy to maintain the health of the elderly in the community (Ministry of Health, 2023).

The level of treatment adherence in the elderly with hypertension is still at suboptimal levels in various parts of the world. This non-compliance contributes to uncontrolled blood pressure and increases the risk of cardiovascular events in the elderly population. The elderly factor itself also aggravates this problem because it is related to decreased memory, polypharmacy, and limited mobility to access health services on a regular basis. These findings confirm that



interventions to improve treatment adherence in the elderly require approaches specifically designed according to the characteristics of these age groups (Ruksakulpiwat et al., 2024).

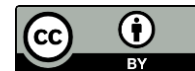
A number of studies in Indonesia have also identified factors that affect medication adherence in hypertensive elderly, including the level of knowledge, family support, and forgetting habits due to unmonitored medication schedules. Seniors who live alone or have limited family support tend to show lower levels of compliance than seniors with consistent family mentoring. In addition, lack of education about the importance of continuing treatment also increases the risk of non-compliance. This combination of cognitive, social, and educational factors suggests that a single approach alone is not enough to solve the problem of treatment adherence in the elderly (Massa & Manafe, 2022; Wanta et al., 2024).

This problem is also clearly illustrated in West Java, where the number of hypertensive patients who receive health services is consistently high from year to year in almost all districts/cities, including Bandung Regency. Research conducted at one of the health centers in Bandung regency found that the factor of adherence to taking medication in hypertensive elderly is still influenced by the low understanding of patients about the importance of long-term treatment and the lack of a structured reminder system. Geographical and demographic conditions in densely populated urban areas such as Bandung regency also affect the pattern of public access to primary health services. This phenomenon shows that the problem of elderly treatment adherence is not only a national issue, but also real at the regional level of puskesmas (West Java provincial Health Office, 2024; Chang et al., 2023).

The characteristics of hypertensive elderly health behavior in various working areas of the Health Center showed a relatively similar pattern, namely the tendency of the elderly not to routinely take and consume drugs according to the schedule recommended by health workers. This pattern is generally exacerbated by the limitations of home-based treatment monitoring systems that involve health workers on an ongoing basis. Puskesmas as a first level health care facility has a strategic role in breaking this pattern of non-compliance through sustainable elderly development programs. However, the limited resources and scope of coaching programs are often the main obstacles in the field (Bura et al., 2023).

Puskesmas Dayeuhkolot Bandung, as one of the primary health care facilities in Bandung Regency with coverage of densely populated work areas, also faces similar challenges in managing health programs for the elderly with chronic diseases. Studies related to adherence to taking medication in hypertensive elderly in various health centers show that low adherence is often only identified when the elderly experience complications or re-visits with uncontrolled blood pressure. The pattern of services that are still curative and less oriented to routine monitoring at home widens the gap between treatment recommendations and their implementation by patients. This kind of condition becomes an important basis for puskesmas to develop a more structured and sustainable compliance coaching strategy (Fitriananci et al., 2022).

The results of a preliminary study conducted by researchers at the Puskesmas Dayeuhkolot Bandung through interviews with health workers and a number of elderly people with chronic



diseases found that most respondents admitted that they had forgotten or deliberately did not take medication on schedule due to the absence of consistent reminders at home. Some elderly people even rely on personal memories without the help of any reminder tools or media. Local health workers also said that there was limited time to monitor individual treatment adherence given the high number of visits by elderly patients every day. These preliminary findings reinforce the need for innovative solutions that can bridge the limitations of such conventional monitoring.

The role of community nurses is key in overcoming this problem because nurses have promotive, preventive, and educational functions that are close to the community. A qualitative study of nurses' experience in providing nursing care for hypertensive elderly in the community found that the main obstacles faced by nurses are limited service time in the building and high workload, so that monitoring of treatment adherence of elderly patients has not been running optimally. However, nurses still strive to maintain the quality of care through an approach that focuses on the needs of patients during visits. This condition indicates the need for technological support that can expand the reach of nursing care without significantly increasing the workload of nurses (Wanta et al., 2024).

Various conventional interventions have actually been developed to improve medication adherence, such as the use of medication reminder cards and education through videos, which have been shown to be effective in improving compliance and blood pressure control in hypertensive patients. In addition, the use of reminder messages via WhatsApp has also been shown to improve medication adherence in hypertensive patients in primary services. Both of these approaches show that reminder media, both conventional and simple technology-based, have great potential in changing patient treatment behavior. Nevertheless, most of these interventions are still general in nature and have not been specifically integrated into a structured nursing care framework (azhimah et al., 2022; Artika et al., 2023).

Broader evidence from Systematic Reviews suggests that the use of mobile health is effective in monitoring treatment adherence in hypertensive patients, while other studies confirm the significant effect of M-health interventions on improving treatment adherence in hypertensive patients. The digital reminder system is considered capable of reducing patient forgetfulness, personalizing treatment schedules according to individual needs, and improving quality of life through optimizing therapeutic benefits. Nevertheless, research on primary care-based Chronic Disease Control Programs in Indonesia during the pandemic shows that the implementation of such programs in densely populated rural and urban areas still faces many technical and resource constraints. The gap between the potential of digital technology and its implementation, which is integrated with professional nursing care, is a research gap that has not been widely studied, especially in the elderly population at the puskesmas level (Nurscope, 2022; Noviyanti et al., 2024; Salamah et al., 2023).

Based on all the phenomena that have been described, ranging from the increase in the global and national elderly population, the high burden of chronic diseases, especially hypertension, low treatment adherence, which was also identified at the Dayeuhkolot Bandung



Health Center, to the limitations of conventional monitoring by community nurses, researchers are interested in further examining the effectiveness of digital reminder systems integrated with nursing care in improving elderly treatment adherence.

METHODS

This study uses a quantitative approach with quasi experiment design using one-group pretest-posttest design to evaluate the effectiveness of the integration of nursing care and digital reminder system to the elderly treatment adherence in the community. The study was conducted at the Health Center Dayeuhkolot Bandung. The study population was all elderly people with chronic diseases who undergo routine treatment in the working area of the health center. The sample consisted of 62 respondents who were selected using purposive sampling technique based on inclusion criteria, namely: (1) 60 years old; (2) diagnosed with chronic diseases, such as hypertension or diabetes mellitus, and undergoing routine drug therapy for at least three months; (3) able to communicate well; (4) have a smartphone or accompanied by a family member who can operate a digital reminder system; and (5) willing to be a research respondent. The exclusion criteria included elderly people who had severe cognitive impairment, hearing or vision impairment that hindered the implementation of the intervention, as well as respondents who did not follow the entire series of studies to completion.

The intervention was provided over four weeks of nursing care combined with the use of a digital reminder system to assist with medication adherence. Data collection was conducted through the measurement of treatment adherence before (pretest) and after (posttest) intervention using Morisky Medication Adherence Scale-8 (MMAS-8), as well as observation sheets to assess compliance with the use of digital reminder applications. Data analysis was conducted in a univariate manner using frequency and percentage distributions to describe respondent characteristics and treatment adherence levels, while bivariate analysis used the Wilcoxon Signed Rank Test because it compared adherence scores before and after the intervention in the same group. All respondents were given an explanation of the objectives, benefits, procedures, potential risks, and confidentiality of research data, then signed a consent sheet after the explanation (informed consent) as a form of willingness to participate voluntarily.

RESULTS

1. Characteristics of Respondents

The characteristics of the respondents in this study were described based on age, gender, education level, and duration of chronic illness to provide a general overview of the demographic profile of the elderly who were the subject of research at Puskesmas Dayeuhkolot Bandung.

Table. 1 Characteristics of The Respondents (n=62)

Characteristics	Categories	Frequency (n)	Percentage (%)
Age	60-74 years old (elderly)	47	75,8

Characteristics	Categories	Frequency (n)	Percentage (%)
Gender	75 years (old)	15	24,2
	Girls	42	67,7
	Men	20	32,3
Education	Elementary (no school / elementary school)	34	54,8
	Secondary (SMP / SMA)	21	33,9
	College (College)	7	11,3
Long Suffering From Chronic Diseases	< 5 years	23	37,1
	- 5 years	39	62,9
Total		62	100

The table above shows that the majority of respondents are in the elderly age group (60-74 years) as much as 75.8%, with a predominance of female gender (67.7%). This characteristic is in line with the demographic pattern of the elderly in Indonesia which shows that women's life expectancy is higher than that of men. In terms of education, more than half of respondents (54.8%) only attended primary education, which has the potential to affect their level of understanding of the importance of treatment adherence. In addition, the majority of respondents (62.9%) had suffered from chronic diseases for more than 5 years, indicating that the majority of participants had long-term experience in undergoing routine medication therapy, making them susceptible to treatment fatigue.

2. Univariate Analysis Pre-And Post-Intervention Treatment Adherence Rates

Univariate analysis was conducted to describe the frequency distribution of treatment adherence rate of respondents based on the score of Morisky Medication Adherence Scale (MMAS-8) before and after the intervention of nursing care-based digital reminder system.

Table. 2 Treatment Adherence Rate Before and After Intervention (n=62)

Compliance Rate	Before The Intervention (n)	Percent (%)	Post The Intervention (n)	Percent (%)
Low	38	61,3	8	12,9
Medium	17	27,4	20	32,3
Height	7	11,3	34	54,8
Total	62	100	62	100

The results in Table 2 showed that before the intervention was given, most respondents (61.3%) were in the low compliance category, while only 11.3% had high compliance. This condition illustrates that non-compliance with treatment is a significant problem in the elderly in



the working area of the Dayeuhkolot Health Center before the reminder system. After four weeks of implementation of the nursing care-based digital reminder system, there was a considerable shift in distribution, where the proportion of high adherence increased sharply to 54.8% and low adherence decreased dramatically to 12.9%.

3. Bivariate Analysis: Wilcoxon Signed Rank Test

To test the difference in the level of treatment adherence before and after the intervention, the Wilcoxon Signed Rank Test was used because the data were ordinal Scale and came from the same group (paired/dependent samples) with one group pretest-posttest design.

Table. 3 Bivariate Analysis: Wilcoxon Signed Rank Test

Variable	N	Mean Rank (Negative/Positive)	Z	p-value
Medication Adherence (Before → After)	62	Negative Ranks: 3 (Mean Rank 5,17) Positive Ranks: 54 (Mean Rank 30,44) Ties: 5	-6,214	0,000

The results of the Wilcoxon Signed Rank Test showed a value of $p = 0.000$ ($p < 0.05$), which means that there is a statistically significant difference between the level of treatment adherence before and after the implementation of the nursing care-based digital reminder system. The number of positive ranks (54 respondents who experienced an increase in compliance scores) was much larger than negative ranks (3 respondents who experienced a decrease in scores), while 5 respondents showed no change (ties). The Z value of -6.214 confirms the strength of the direction of consistent change towards improved compliance.

DISCUSSION

1. Treatment Adherence Rate Before and After Intervention

The results of the univariate analysis at the stage before the intervention showed that the majority of respondents, as many as 38 people (61.3%), were in the category of low treatment adherence. A total of 17 respondents (27.4%) were in the medium category, while only 7 respondents (11.3%) were in the high compliance category. This picture shows that before the intervention, the majority of elderly in Puskesmas Dayeuhkolot Bandung have not run the treatment as recommended consistently. This condition confirms that non-compliance with treatment was a real and quite dominant problem in the elderly population with chronic diseases in the region before the existence of a structured reminder system.

After a four-week nursing care-based digital reminder system was implemented, there was a considerable shift in distribution across all compliance categories. The proportion of low compliance decreased sharply from 61.3% to only 12.9% (8 respondents), while the medium category increased from 27.4% to 32.3% (20 respondents). The most significant increase was seen in the high compliance category, which jumped from 11.3% to 54.8% (34 respondents). This change in

frequency distribution descriptively describes an improvement in treatment adherence behavior patterns in the majority of respondents after receiving the intervention.

The finding of low adherence to treatment before intervention in this study is in line with various previous studies that also found a low proportion of adherence to dominate in the elderly with hypertension in the work area of the health center, where non-compliance is often only realized after patients experience complications or repeat visits with uncontrolled blood pressure. This similar pattern reinforces that the problem of non-compliance is not a phenomenon unique to one region, but rather a common challenge in primary health care for the elderly with chronic diseases. The similarity of these patterns also indicates that the root causes of non-compliance in the elderly are multifactorial and tend to be consistent across various geographical contexts (Fitriananci et al., 2022).

Theoretically, the low level of adherence at the pretest stage can be explained through a literature review that identifies various factors that contribute to treatment adherence in patients with chronic conditions, including cognitive factors such as forgetfulness, emotional factors, social factors such as family support, as well as health care system factors such as the availability of reminders or continuous monitoring. Compliance is not a single behavior, but rather the result of a complex interaction between the patient, the disease condition and the surrounding support systems. Without one of these supporting factors, in particular a consistent reminder system, the risk of non-compliance in the elderly will remain high. This theoretical framework is relevant to explain the high proportion of low adherence to this study before the intervention was administered (Kvarnström et al., 2021).

Based on the results of the characteristics of the respondents in Table 1, most of the elderly (54.8%) only attended primary education, so the researchers assume that the limited understanding of the importance of long-term treatment also contributes to the high proportion of low compliance at the pretest stage. Seniors with low educational backgrounds tend to have a limited understanding of the risk of complications if treatment is not carried out regularly. This limited understanding is likely to make respondents less motivated to be disciplined in the schedule of taking medication in the absence of external accompaniment or reminders. This assumption reinforces the link between the demographic characteristics of respondents with low compliance achievement before the intervention was given.

This link between education level and medication adherence is also supported by other studies that have found a significant relationship between the level of knowledge of hypertensive patients and adherence to taking antihypertensive drugs, where patients with low knowledge are more at risk of showing disobedient behavior than patients with good knowledge. Adequate knowledge of the disease and treatment allows the patient to understand the long-term consequences of non-compliance. Conversely, a lack of understanding can lead to an indifferent attitude towards the established treatment schedule. This confirms the importance of the educational aspect as an integral part of the intervention to increase adherence in populations with limited educational levels (Fauziah et al., 2022).



In addition to the educational aspect, it also indicates that the vast majority of respondents (62.9%) have suffered from chronic diseases for more than 5 years, a characteristic that is also relevant to explain the low adherence at the pretest stage. The long duration of illness is often associated with a decrease in motivation for treatment due to saturation with monotonous and prolonged treatment routines. Previous research found a relationship between long suffering from hypertension and motivation to take medication with the level of adherence to taking medication, where the longer the duration of illness without adequate assistance, the greater the tendency of patients to experience a decrease in motivation for treatment discipline. These findings reinforce the assumption that the long duration of chronic disease in the majority of respondents also contributed to one of the important determinants of low adherence before intervention (Merlis, 2022).

The psychological aspect also plays an important role in explaining the low adherence to treatment at the pretest stage. Research related to psychological well-being found that the psychological condition of patients is an important predictor of treatment adherence in hypertensive patients, where patients with low psychological well-being tend to show lower compliance as well. The patient's self-efficacy in their ability to undergo long-term treatment also affects the consistency of obedient behavior. Elderly people who lack psychological and social support are at greater risk of experiencing a decrease in enthusiasm for routine therapy. This psychological dimension complements the factors of education and duration of illness as part of a multifactorial explanatory framework to low pretest compliance (Azijah et al., 2021).

Based on the overall description above, the researchers assume that the combination of a predominantly basic level of Education, long duration of chronic disease, and the absence of a consistent medication reminder system at home are the three main factors that reinforce each other, causing a high proportion of low compliance at the pretest stage. All three factors form a layered condition of vulnerability in the elderly, in which the limitation of understanding is aggravated by the saturation of long-term treatment and the lack of external support. Without interventions that target these gaps directly, this condition has the potential to continue and increase the risk of complications of chronic diseases in the elderly in the working area of the Dayeuhkolot Health Center. This condition underlies the importance of implementing a digital reminder system based on nursing care as an intervention solution in this study.

After the implementation of a four-week nursing care-based digital reminder system, the proportion of high adherence increased significantly from 11.3% to 54.8%, while low adherence decreased dramatically from 61.3% to only 12.9%. This increase indicates that the majority of respondents experienced improvement in treatment adherence behavior within a relatively short intervention period. Large shifts in frequency distribution across categories indicate that interventions are effective in changing overall patterns of respondent behavior, rather than just a small subset.

The improvement in post-intervention adherence in this study is in line with the findings of previous studies that showed that the administration of medication reminder alarms was able to

significantly improve medication adherence in hypertensive patients. Reminder systems, both simple alarm-based and digital applications, have proven effective in helping patients overcome cognitive barriers in the form of forgetfulness, which is one of the main causes of non-compliance in the elderly. The effectiveness of this reminder works by providing a scheduled external stimulus that replaces the role of the patient's internal memory that begins to decline due to the aging process. The consistency of the findings between these studies reinforces the validity of the results that the reminder system is a relevant intervention strategy to address treatment non-compliance in the elderly population (Yusmaniar et al., 2020).

This significant increase in high compliance categories can also be explained through the theoretical framework of the Imogene King nursing interaction model, which emphasizes the importance of the interaction process between nurses, patients and support systems in achieving shared health goals. This Model is a relevant conceptual basis for nursing care-based interventions, because the application of digital reminder systems in this study does not stand alone but is integrated with the process of nursing interaction involving education and continuous monitoring. Through this interaction system, families and health workers take an active role in reminding and monitoring elderly compliance in taking drugs. The alignment between this theory and the results of the study confirms that a technology-integrated nursing approach can strengthen the effectiveness of treatment adherence interventions (Sunaringtyas et al., 2023).

Interestingly, although Table 1 showed that more than half of the respondents (54.8%) were only primary educated, the improvement in post-intervention compliance was still achieved significantly. This is in line with research examining the relationship of the Health Belief Model to medication adherence, which suggests that perceptions of benefits and barriers to treatment can be reshaped through appropriate interventions, regardless of the patient's level of formal education. The digital reminder system accompanied by nursing care assistance seems to be able to bridge the limitations of health literacy of respondents by providing information and reminders directly and repeatedly. This condition shows that limited education is not an absolute barrier to the success of the intervention, as long as the approach used is simple, consistent, and accompanied by nursing staff (Laili et al., 2023).

Despite the significant improvement, there were still 8 respondents (12.9%) who remained in the low compliance category after the intervention. This condition is in line with research on family support for adherence to hypertension medication in the elderly, which found that weak family support factors remained an obstacle to adherence even though patients had received reminder interventions. Respondents who live without adequate family accompaniment are likely to receive no additional reinforcement beyond the digital reminder system itself. This indicates that the nursing care-based digital reminder system, although effective in general, still needs to be supplemented by strengthening family support so that the results achieved are more optimal and evenly distributed among all respondents (Wanta et al., 2024).

Overall, the results of the univariate analysis illustrate a consistent and meaningful pattern of change, where the initial conditions dominated by low adherence influenced by the



characteristics of respondents in the form of primary education dominance and long duration of chronic pain managed to shift significantly towards high adherence dominance after the implementation of a nursing care-based digital reminder system. Researchers assume that this success occurs because the interventions provided work on two levels at once, namely overcoming cognitive barriers through scheduled reminders and strengthening patient understanding through direct nursing assistance.

2. Effectiveness of Nursing Care-Based Digital Reminder System on the Level of Treatment Adherence of the Elderly

Wilcoxon Signed Rank Test results in this study showed a Z value of -6.214 with a p value of 0.000 ($p < 0.05$). This value was obtained from 62 respondents, with details of 54 respondents increased compliance scores (positive ranks), 3 respondents decreased scores (negative ranks), and 5 respondents did not show changes in scores (ties). A p-value well below the 0.05 threshold indicates that the difference in treatment adherence scores before and after the intervention is statistically significant, not merely coincidental. Thus, the null hypothesis (H_0) stating that there was no difference in treatment adherence before and after the intervention was rejected, while the alternative hypothesis (H_a) was accepted.

The predominance of a much larger number of positive ranks (54 respondents) over negative ranks (3 respondents) indicates that the direction of change that occurs is consistent towards improvement, not worsening compliance. This 18:1 ratio between improving and worsening respondents indicates that the effect of the intervention was unidirectional and strong in almost the entire study group. The presence of a ties value of 5 respondents is also relatively small, which means that only a small percentage of respondents are not affected at all by the intervention given. This pattern of results is commonly found in one group pretest-posttest quasi-experimental research designs that test the effectiveness of an intervention on health behavior.

The significant results of this study are in line with previous studies that tested the effectiveness of educational video interventions and medication reminder cards on treatment adherence of hypertensive patients, which also found a significant effect on increasing the MMAS-8 compliance score with a p value of 0.000. The similarity of these results confirms that reminder media, both print-based, video, and digital, are consistently able to significantly change the treatment adherence behavior of hypertensive patients. The consistency of the p-values, which were both at 0.000 in both studies, reinforces the external validity of the finding that structured reminder interventions are effectively applied to various populations of hypertensive patients, not least in the elderly group. This shows that reminder-based approaches have a strong scientific evidence base and can be replicated in various primary care contexts (azhimah et al., 2022).

Another study that applies a reminder media in the form of pill cards combined with drug monitoring (PMO) also found a significant effect on drug adherence elderly hypertension based on the results of the Wilcoxon test. The similarity of the pattern of results with the study reinforces that the involvement of companion parties, both in the form of physical cards and digital systems,

has a strengthening effect on the adherence of elderly patients. Approaches that involve elements of external surveillance seem to work complementary to the reminder mechanism itself, so the final results obtained tend to be consistently significant in various similar research designs. Consistency across these studies shows that the effectiveness of reminder systems is not a single finding, but rather a pattern that can be replicated empirically (Sundari, Latifah, & Tasalim, 2024).

The significance of Wilcoxon test results in this study can be analyzed through the framework of The Theory of Planned Behavior, which explains that a person's compliance behavior is influenced by attitudes toward behavior, subjective norms, and perceptions of behavioral control. The nursing care-based digital reminder system in this study plays a role in strengthening the perception of behavioral control of respondents, because they feel better able to control their medication schedules with the help of automatic reminders. In addition, the involvement of nurses in the mentoring process helped strengthen the subjective norms of respondents through professional social support received regularly. The combination of the three components of the theory theoretically explains why the change in adherence to this study occurred significantly and consistently in the majority of respondents (Adiutama, Fauzi, & Ellina, 2021).

Researchers assume that the high statistical significance of this study occurs because the digital reminder system works repeatedly and scheduled, thus forming new habit patterns in respondents within four weeks of intervention. The consistent repetition of the reminder stimulus allows the automation of drug-taking behavior without requiring great cognitive effort from the elderly with memory impairment. In addition, the nursing care assistance that accompanies the digital system is likely to provide emotional reinforcement that makes respondents feel more cared for and motivated to be disciplined. This combination of technological stimuli and the human touch of nurses is thought to be the main cause of the large statistical significance effect obtained.

When it comes to characteristics, the majority of respondents are in the age group of 60-74 years (75.8%), which according to research on the characteristics and compliance of the elderly in the management of hypertension treatment tend to still have a fairly good adaptation capacity to changes in behavior patterns than the older age group (≥ 75 years). This young-old age group generally still has relatively adequate cognitive and physical function to adapt to simple reminder technology. The predominance of this age group in the study sample likely contributed to the large proportion of positive ranks found in the Wilcoxon test. This shows that the age characteristics of respondents dominated by the young-old group are one of the supporting factors for achieving significant changes (Brigita, Hijrawati, & Artama, 2023).

Theoretically, the significance of these results can also be explained through a review of the cognitive factors that contribute to treatment adherence of patients with chronic conditions, where forgetfulness due to decreased memory function is one of the main barriers that can be overcome through consistent external intervention. The digital reminder system works directly at the root of these cognitive problems, so the results obtained statistically show large and meaningful changes. This effectiveness is more optimal when the intervention is carried out repeatedly over a certain



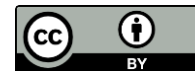
period of time so that the respondent has enough time to form new habit patterns. This framework reinforces the understanding that the statistical significance of this study is not accidental, but rather the result of a well-targeted intervention mechanism on the cognitive barriers of the elderly (Kvarnström et al., 2021).

The educational characteristics of the respondents showed that more than half of the respondents (54.8%) only attended primary education, but the results of the Wilcoxon test still showed very significant changes. These findings are in line with research on the relationship of the Health Belief Model with medication adherence, which suggests that perceptions of the benefits and threats of disease can be reshaped through appropriate intervention approaches, regardless of the patient's formal educational background. This indicates that the statistical success of this study is not solely determined by the level of education of respondents, but rather influenced by the suitability of intervention methods with the needs and adaptability of the elderly. The suitability of this simple and consistent approach seems to be able to overcome the limitations of health literacy that respondents with a basic education background have (Laili, Aini, & Rahmayanti, 2023).

Researchers assume that the success of achieving statistical significance despite the majority of respondents being Elementary educated is due to the nature of digital reminder systems that do not demand high literacy skills, but rather only require simple responses to notifications received. Direct assistance by nurses helped bridge the gap in understanding that may arise due to the limited formal education of respondents. Thus, the educational limitations described in Table 1 are not necessarily an obstacle to achieving statistically meaningful behavioral changes. This confirms that a simple and human-based intervention design can reach groups of elderly people with various educational backgrounds equally.

The statistical significance of this study can also be analyzed through the theoretical framework of Imogene King's nursing interaction model, which emphasizes the importance of the process of mutual interaction between nurses and patients in achieving shared health goals. Research that applied this theory to hypertensive patients found that a structured process of interaction between nurses, patients, and support systems was able to produce high levels of compliance in the majority of respondents. The compatibility between the theoretical framework and the results of the Wilcoxon test in this study shows that the success of the intervention is not solely due to the elements of digital technology, but also by the accompanying nursing interaction process. This synergy between nursing theory and statistical evidence reinforces the scientific justification that nursing care remains a central element in the success of technology-based interventions (Sunaringtyas, Bint, & Habibah, 2023).

The existence of 3 respondents with negative ranks and 5 respondents with ties in the Wilcoxon test results show that not all respondents responded the same to the intervention given. Research on family support for hypertension medication adherence in the elderly found that weak family support factors can be an obstacle to the success of interventions even though patients have received adequate reminder systems. Variations in this kind of response are common in health intervention research, considering that each individual has different psychosocial conditions and



supporting environments. The presence of this small group of respondents who did not respond positively is an important note that the effectiveness of the intervention, although significant overall, still needs to be balanced with special attention to Groups at risk of not responding (Wanta et al., 2024).

The researchers assumed that 3 respondents who experienced a decrease in compliance scores (negative ranks) were caused by external factors that could not be fully controlled by the digital reminder system, such as deteriorating health conditions, changes in family situations, or lack of respondent skills in operating the reminder device independently. Meanwhile, 5 respondents with ties category is suspected to be a group that from the beginning has had a fairly good level of compliance, so the room for improvement of the score is relatively limited (ceiling effect). This small variation overall does not detract from the strength of the main findings of the study, given that the proportion of respondents with a positive response is much more predominant. This condition actually gives a realistic picture that health interventions in the elderly population still have individual limitations that need to be considered in the application of the program widely.

Overall, the results of the Wilcoxon Signed Rank Test showed a value of $p = 0.000$ provide strong statistical evidence that the nursing care-based digital reminder system effectively improves the adherence of elderly treatment at Puskesmas Dayeuhkolot Bandung. When associated with the characteristics of respondents predominantly young-old age group, primary education, and long duration of chronic pain this significance indicates that the effectiveness of the intervention is inclusive and able to reach elderly groups with various demographic limitations. Researchers assume that this success lies in the design of interventions that combine the simplicity of technology with the warmth of the interaction of nursing care, so as to overcome cognitive, educational, and motivational barriers simultaneously.

CONCLUSIONS

This study uses a quantitative approach with a quasi experimental design one group pretest-posttest on 62 elderly people with chronic diseases in Dayeuhkolot Health Center Bandung selected through purposive sampling techniques according to inclusion criteria. The majority of respondents were 60-74 years old (75.8%) and female (67.7%). Treatment adherence Data was collected using the Morisky Medication Adherence Scale (MMAS-8) questionnaire before and after the intervention for four weeks, supplemented by an observation sheet using the reminder application. The results of the univariate analysis showed a clear improvement in the distribution of compliance levels, where the low category decreased from 61.3% to 12.9% and the high category increased sharply from 11.3% to 54.8% after the intervention was administered. The results of the Wilcoxon Signed Rank Test reinforced the findings statistically with a value of $p=0.000$ ($p<0.05$), indicating a significant difference between the level of treatment adherence before and after the implementation of the digital reminder system. Based on these findings, it can be concluded that the nursing care-based digital reminder system is effective in improving treatment adherence of

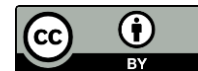


the elderly in the community, so that it can be used as one of the community nursing intervention strategies in supporting the management of chronic diseases in the elderly group.

Nevertheless, this study has some limitations that need to be considered in interpreting the results. First, the one group pretest-posttest design without a control group led to researchers being unable to completely rule out the possibility of the influence of other external factors, such as the Hawthorne effect (changes in behavior because respondents feel cared for/observed) or improvements in compliance that occur naturally over time without a direct link to the intervention. Secondly, the relatively limited number of samples (62 respondents) and purposive sampling in one working area of the health center limit the generalization of research results to the elderly population in other regions with different demographic and socio-economic characteristics. Third, the duration of the intervention, which only lasted for four weeks, was not enough to assess the sustainability of the effect of increasing adherence in the long term, considering that treatment adherence in chronic diseases requires lifelong consistency. Fourth, the measurement of compliance using the MMAS-8 questionnaire is self-report, so it has the potential to contain social bias when respondents tend to report better behavior than the actual condition. Therefore, further studies are recommended to use experimental designs with control groups, expand sample coverage in several areas of work of puskesmas, extend the duration of post-intervention monitoring, and add objective indicators such as blood pressure measurements or the amount of drug remaining to strengthen the validity of the findings regarding the effectiveness of nursing care-based digital reminder systems.

REFERENCES

- Adiutama, N. M., Fauzi, A. K., & Ellina, A. D. (2021). Theory of Planned Behavior-Based Educational Intervention to Improve Treatment Adherence. *Jurnal Ilmiah Keperawatan*, 7(1), 117–126.
- Andriyani, A., Azika, A., Fitriani, A. P., Rahmawati, A. D., Mawaddah, F., Anggraeni, F., Putri, H., & Adil, M. A. (2023). Community Empowerment Through the Drug Intake Supervisor (PMO) Program for Hypertensive Patients with Irregular Medication Adherence in the Working Area of UPT Puskesmas Pamulang. *AS-SYIFA: Jurnal Pengabdian dan Pemberdayaan Kesehatan Masyarakat*, 4(2), 58–65.
- Anjarsari Ranum, Padoli, P., & W, K. O. (2023). Medication Adherence and Quality of Life among Hypertensive Patients in the Kenjeran Community Health Center, Surabaya. *Jurnal Keperawatan*, 17(2), 65–72.
- Artika, N. M. P., Suastini, N. M., & Kumara, N. W. R. (2023). The Effect of WhatsApp Reminder Messages on Medication Adherence among Hypertensive Patients at Community Health Center X. *Jurnal Skala Husada*, 20(1), 30–35.
- Azhimah, H., Syafhan, N. F., & Manurung, N. (2022). The Effectiveness of Educational Videos and Medication Reminder Cards on Medication Adherence and Blood Pressure Control among Hypertensive Patients. *Jurnal Sains Farmasi & Klinis*, 9(3), 291–301.



- Azijah, A. N., Rochmah, N., Rahmawati, A. N., & Apriliyani, I. (2021). Description of Psychological Well-Being According to the Severity of Hypertension among Older Adults. *Jurnal Keperawatan Notokusumo*, 9(2), 36–40.
- Badan Pusat Statistik. (2024). Statistics of the Older Population. BPS RI.
- Brigita, M., Hijrawati, H., & Artama, S. (2023). Characteristics and Adherence of the Elderly to the Management of Hypertension Treatment. *Jurnal Ilmiah Kesehatan Sandi Husada*, 12(2), 435–444.
- Bura, A. S. N., Mahmud, N. U., & Masriadi, M. (2023). Characteristics of Hypertension Behavior among Older Adults in the Working Area of Antara Community Health Center, Makassar. *Window of Public Health Journal*, 4(4), 678–689.
- Chang, D., Melia, S., & Ginting, M. (2023). Analysis of Factors Associated with Medication Adherence among Older Adults with Hypertension at Katapang Community Health Center. *Jurnal Ilmu Kesehatan Immanuel*, 17(1).
- Dinas Kesehatan Provinsi Jawa Barat. (2024). Number of Hypertension Patients Receiving Health Services by Regency/City in West Java. Open Data Jabar.
- Fauziah, W., Mulyani, D., & Elly. (2022). The Relationship Between Knowledge and the Level of Adherence to Antihypertensive Medication. *Indonesian Journal of Pharmaceutical Education*, 2(2), 94–100.
- Fitriananci, D., Suryani, L., & Yusnilasari. (2022). Analysis of Medication Adherence among Older Adults with Hypertension at Pengandonan Community Health Center, Pagar Alam City. *Jurnal Kesehatan Saelmakers PERDANA*, 5(1), 116–124.
- Jurnal Keperawatan Malang*. (2021). Experience of Implementing Nurses' Roles and Functions in Providing Nursing Care for Older Adults with Hypertension in the Community. 6(2).
- Kementerian Kesehatan RI. (2023). Indonesia Health Survey (SKI) 2023.
- Kvarnström, K., Westerholm, A., Airaksinen, M., & Liira, H. (2021). Factors Contributing to Medication Adherence in Patients with a Chronic Condition: A Scoping Review of Qualitative Research. *Pharmaceutics*, 13(7), 1–41.
- Laili, N., Aini, E. N., & Rahmayanti, P. (2023). The Relationship Between the Health Belief Model and Medication Adherence among Hypertensive Patients. *Jurnal Kesehatan Holistic*, 7(2), 1–13.
- Massa, K., & Manafe, L. A. (2022). Medication Adherence among Older Adults with Hypertension. *Sam Ratulangi Journal of Public Health*, 2(2), 046.
- Merlis, S. (2022). The Relationship Between Duration of Hypertension, Treatment Motivation, and Medication Adherence among Hypertensive Patients. *Nursing Inside Community*.
- Noviyanti, M., Triharini, M., & Ulfiana, E. (2024). The Effect of Mobile Health (m-Health) on Medication Adherence among Hypertensive Patients. *Journal of Telenursing (JOTING)*, 6(1).
- Nurscope: Jurnal Penelitian dan Pemikiran Ilmiah Keperawatan*. (2022). The Effectiveness of Mobile Health in Monitoring Medication Adherence among Hypertensive Patients: A Systematic Review. 7(2), 132–140.



This work is licensed under a [Creative Commons Attribution 4.0 International license](https://creativecommons.org/licenses/by/4.0/)

Professional Evidence-based Research and Advances in Wellness and Treatment (PERAWAT)

Vol. 03, No. 3, September 2026

- Perhimpunan Gerontologi Medik Indonesia (PERGEMI). (2022). Common Chronic Diseases among Older Adults in Indonesia. Databoks Katadata.
- Riskesdas. (2018). Basic Health Research 2018. Kementerian Kesehatan RI.
- Ruksakulpiwat, S., Schiltz, N. K., Irani, E., Josephson, R. A., Adams, J., & Still, C. H. (2024). Medication Adherence of Older Adults with Hypertension: A Systematic Review. *Patient Preference and Adherence*, 18, 957–975.
- Salamah, S., Khafiyya, A. N., Ramadhani, R., Arfiana, M. R., Syamsuri, I., Faizah, N. N., Nugraha, D., Arifin, B., & Alkaff, F. F. (2023). Outcomes of the Indonesian Chronic Disease Management Program (PROLANIS) in Patients with Hypertension During the COVID-19 Pandemic in Rural Areas.
- Sunaringtyas, W., Binti, D., & Habibah, T. (2023). Medication Adherence Based on Imogene King's Theory Model among Hypertensive Patients. *TRIAGE Jurnal Ilmu Keperawatan*, 10(2), 33–38.
- Sundari, R. K., Latifah, L., & Tasalim, R. (2024). Adherence to Antihypertensive Medication among Older Adults with Hypertension. *Jurnal Ilmiah Permas: Jurnal Ilmiah STIKES Kendal*, 14(3), 1063–1072.
- Wanta, M. V. M., Karepouwan, J. G., Sigar, A. E. E., Caroline, A., & Pitoy, F. F. (2024). Family Support and Hypertension Medication Adherence among Older Adults in Ratahan District.
- World Health Organization. (2023). *World Health Statistics 2023: Monitoring Health for the SDGs*. Geneva: WHO.
- Yusmaniar, Susanto, Y., Surahman, & Alfian, R. (2020). The Effect of Medication Alarm Reminders on Improving Medication Adherence among Hypertensive Patients. *Jurnal Ilmiah Ibnu Sina*, 5(1), 97–98.